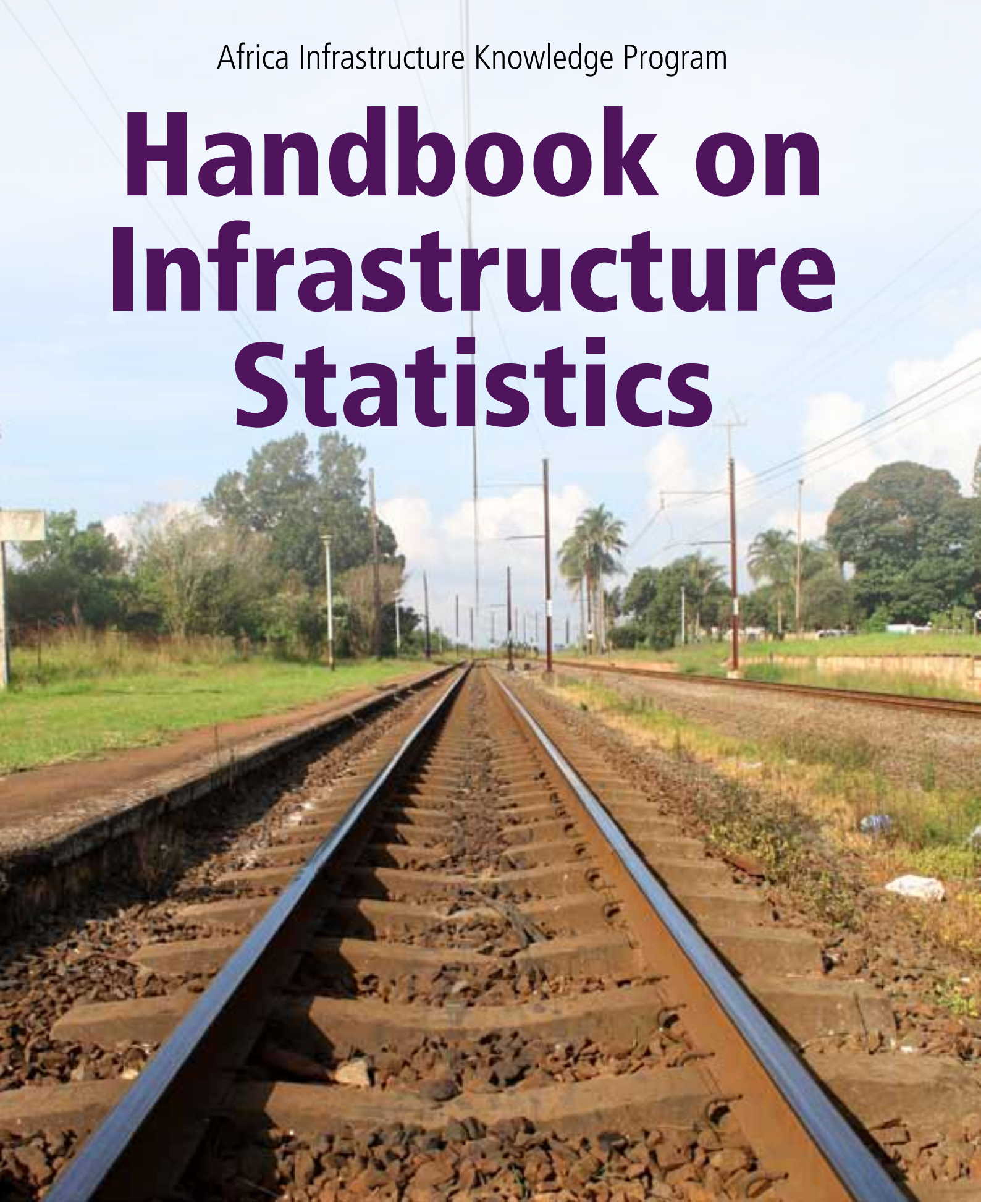
Africa Infrastructure Knowledge Program

Handbook on Infrastructure Statistics



African Development Bank Group

World Bank

The Infrastructure Consortium for Africa
Le Consortium pour les infrastructures en Afrique

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December 2011

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Foreword

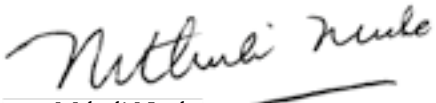
Infrastructure development is a key driver of the African development agenda. It is a critical enabler for economic growth and contributes significantly to human development, poverty reduction and the attainment of the Millennium Development Goals (MDG). Following the G-8 Summit in Gleneagles, Scotland, in 2005, the international community pledged to substantially increase official development assistance to Africa and to the infrastructure sector in particular. In the same year, the Infrastructure Consortium for Africa (ICA) was established to coordinate donor investments and efforts to improve the knowledge base for infrastructure development on the continent. During the same year, at its inaugural meeting, the ICA commissioned the World Bank to undertake the Africa Infrastructure Country Diagnostic (AICD) study to generate a common quantitative baseline database against which to measure future developments. The study has been very successful in providing a wealth of data and knowledge on infrastructure in Africa.

The AICD counted on the guidance of a Steering Committee chaired by the African Union Commission and that included representatives from the African Development Bank, the New Partnership for Africa's Development, the regional economic communities (Common Market for Eastern and Southern Africa, East African Community, Economic Community of Central African States, Economic Community of West African States, and Southern African Development Community). Agence Française de Développement, the Department for International Development, the European Commission, the Public-Private Infrastructure Advisory Facility, and the World Bank pledged resources to the project.

Since 2010, the African Development Bank (AfDB) has taken over leadership for managing the infrastructure database and knowledge work under its Africa Infrastructure Knowledge Program (AIKP). The AIKP builds on the AICD but has a longer-term perspective to provide a platform for (i) regular updating of the infrastructure database on African countries; (ii) defining and developing analytic knowledge products to guide policy and funding decisions and to inform development policy and program management activities; and (iii) building infrastructure statistical capacity in the region. The AIKP is therefore intended to provide a sustainable framework for generating reliable and timely data on the various infrastructure sectors to guide policy design, monitoring and evaluation and to improve efficiency and delivery of infrastructure services.

To facilitate this process, in a joint effort, the World Bank prepared this *Handbook on Infrastructure Statistics* in collaboration with the African Development Bank. The Handbook is intended to serve as a main reference document to guide African countries and regional institutions in collecting standardized and comparable data on infrastructure. In this context, the AfDB is also currently developing tools to facilitate data collection, validation, and analysis. In addition, the Handbook will be used as an important instrument for the wider statistical capacity-building efforts led by the AfDB aimed at fostering evidence-based policy-making on the continent, including in the critical area of infrastructure development.

The Handbook and its supporting sector-specific booklets and data collection templates, together with the database, are available at http://www.infrastructureafrica.org/



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Acknowledgement

This Handbook, a product of the Africa Infrastructure Country Diagnostic (AICD), was prepared by the World Bank in partnership with the African Development Bank. The Handbook consolidates the methodologies developed under the AICD with the long-term purpose of guiding data collection, processing, and dissemination of infrastructure indicators across African countries. It is, therefore, based on five years of experience of developing, collecting, and analyzing infrastructure indicators and, as such, it represents a tried and tested approach. The World Bank team was led by Vivien Foster and Cecilia Briceno-Garmendia. The main chapter authors were Vivien Foster (Chapters 1, 2, 3, 6 and 7), Cecilia Briceno-Garmendia (Chapters 1, 2, 3 and 5), Maria Vagliasindi (Chapter 4), Sudeshna G. Banerjee (Chapters 7 and 13), Michael Minges (Chapter 8), Alberto Nogales (Chapter 9), Dick Bullock (Chapter 10), Ocean Shipping Consultants (Chapter 11) and Henry Bofinger (Chapter 12).

The Handbook was reviewed by an Expert group Meeting (EGM) of representatives of national statistical offices (NSOs), sub-regional organizations, specialized regional bodies, and independent peer reviewers, held from 6–8 April 2011, in Lusaka, Zambia. The EGM unanimously endorsed the use of the Handbook on Infrastructure Statistics as the main reference document for the production of infrastructure statistics and indicators in Africa. The Handbook will also be tabled at the next Statistical Commission for Africa (STATCOM-Africa) meeting for broader endorsement.

A number of independent peer reviewers provided valuable comments that helped to improve the quality of the document, notably: Enock F. Chinganda (Consultant), Alexander Danilenko (Water and Sanitation Program), Tshepo Kgare (Sub-Saharan Africa Transport Program), Jasper Oduor (Eastern Africa Power Pool), Isaac O. Omoke (Port Management Association of East and Southern Africa), Victoria T. Tarfa (Port Management Association of West and Central Africa), Susan Teltscher (International Telecommunication Union) Pierre Nignon (Consultant) and Adam Vickers (Consultant).

Additional technical reviewing of this handbook has been undertaken jointly by task teams from the Statistics department of the AfDB and the Department of Statistics of the World Bank. The AfDB team was led by Beejaye Kokil (Manager, Social and Economic Statistics Division) and comprised Maurice Mubila (Chief Statistician), Kwaku A. Twum-Baah (Infrastructure Statistics Specialist) and Ernst Schaltegger. The World Bank team was led by Misha Melkindas and included Vilas Mandeklar and Shelly Lai Fu.

Fayre Makeig helped with the editing of the entire document

The Handbook was prepared under the overall guidance of Charles Leyeka Lufumpa, Director of the Statistics Department at the AfDB and Jamal Sahgir, Director of the Africa Region Department of Sustainable Development at the World Bank.

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List of Acronyms

AADT	Average Annual Daily Traffic
ADG	(Seabury's) Airlines Data Group
AFD	Agence Française de Développement
AfDB	African Development Bank
AGETIP	Agence d'Exécution des Travaux d'Intérêt Public
AICD	Africa Infrastructure Country Diagnostic
AIKP	Africa Infrastructure Knowledge Program
ARPU	Average Revenue per User
ATAR	Air Traffic Accident Rate
CDMA	Code Division Multiple Access
CEMAC	Economic and Monetary Community of Central Africa
CFAA	Country Financial Accountability Assessment
COFOG	Classification of Functions of Government
COMESA	Common Market for Eastern and Southern Africa
CPIA	Country Policy and Institutional Performance Assessment
CWIQ	Core Welfare Indicators Questionnaires
DBSA	Development Bank of South Africa
DFID	(U.K) Department for International Development
DHS	Demographic and Health Survey
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African State
ESMAP	Energy Sector Management Assistance Program
ETWTR	(World Bank) Energy, Transport and Water Department Transport Anchor
EU	European Commission
FAA	(U.S) Federal Aviation Authority
FAO	(UN) Food and Agricultural Organization
GDP	Gross Domestic Product
GFSM	Government Finance Statistics Manual
GIS	Geographic Information System
GSM	Global System for Mobile Communications
GTZ	German Technical Cooperation
HDM	Highway Development and Management Model
HIES	Household income and Expenditure Survey
IAPC	International Auditing Practices Committee
IATA	International Air Transport Association
ICA	Infrastructure Consortium for Africa
ICAO	International Civil Aviation Organization
ICAS	Investment Climate Assessment Survey
IEA	International Energy Agency
IES	Income and Expenditure Survey
IFAC	International Federation of Accountants
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
INTOSAI	International Organization of Supreme Audit Institutions
IOSA	IATA Operational Safety Audit
ISPS	International Ship and Ports Facility Security (Code)
ITU	International Telecommunications Union
KfW	Germany Entwicklungsbank
LIC	Low-Income Country
LSMS	Living Standards Measurement Survey
MDG	Millennium Development Goals
MIC	Middle-Income Country
MICS	Multiple Indicator Cluster Survey
MTEF	Medium-Term Expenditure Framework
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organizations
NISO	National Information Standards Organization
NSO	National Statistical Office
OAG	Official Airline Guide
O&M	Operations and Maintenance
ODA	Overseas Development Assistance
OECD	Organisation for Economic Co-operations and Development
PMAESA	Ports Management Association of East and Southern Africa
PMAWCA	Ports Management Association of West and Central Africa
PPI	Private Participation in Infrastructure
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Public-Private Partnership
PS	Poverty Survey
PSP	Private Sector Participation
RAI	Rural Accessibility Index
REC	Regional Economic Community
RIO	Reference Interconnection Offer
ROCKS	Road Costs Knowledge System
RONET	Road Network Evaluation Tool
SADC	Southern African Development Community
SARA	Southern Africa Railway Association
SOE	State-Owned Enterprises
SSA	Sub-Saharan Africa
SSATP	Sub-Saharan Africa Transport Policy Program
TAZARA	Tanzania-Zambia Railway Authority
UMA	Union Maghreb Arabe (Arab Maghreb Union)
UNICEF	United Nations Children's Fund

USAID	United States Agency for International Development	WAEMU	West African Economic and Monetary Union
		WHO	(UN) World Health Organization
USOAP	Universal Safety Oversight Audit Programme	WSP	Water Supply and Sanitation Program
VTMS	Vessel Traffic Management System		

Section 1

General Data Aspects

1. Introduction

1.1 Motivation

Infrastructure is a critical enabler of growth in Africa. Across Africa, infrastructure contributed about 99 basis points to per capita economic growth over the period 1990 to 2005, compared with 68 basis points attributable to structural and stabilization policies. If all African countries had infrastructure as good as that of Mauritius, the leading infrastructure provider in terms of access and quality, per capita economic growth in the region could increase by 2.2 percentage points. As of now, infrastructure is a constraint on doing business in many African countries, depressing firm productivity by around 40 percent. Moreover, without improving infrastructure provision, Africa will find it difficult to deliver the social services needed to meet the Millennium Development Goals.

Africa's infrastructure is by far the most deficient and costly in the developing world. On just about any measure of infrastructure coverage, Sub-Saharan African countries lag behind their developing country peers, and the gap with Asia is widening over time. Some 30 percent of Africa's infrastructure is dilapidated and in urgent need of refurbishment. Moreover, the prices of Sub-Saharan Africa's infrastructure services are up to at least twice as high as other developing countries, due to diseconomies of scale and lack of competition.

Solving the problem will require sustained spending of $93 billion per year. This sum represents around 15 percent of the gross domestic product (GDP) of Sub-Saharan Africa, and would represent a level of infrastructure development comparable to that seen in China during the 2000s. Spending needs are split evenly between investment and operations and maintenance expenditure. Almost half of this total is associated with the power sector alone. The infrastructure spending needs of fragile states are particularly onerous when expressed as a percentage of their national GDP.

During the early 2000s, Africa spent a total of $45 billion annually on infrastructure, much of it from domestic sources. Meanwhile, resources worth about $17 billion were wasted through various kinds of inefficiencies, including distribution losses, low revenue collection, under-pricing of services, lack of maintenance, and under-execution of capital budgets. If these efficiency gains could be fully captured, the remaining funding gap would amount to $31 billion per year.

Addressing inefficiencies and closing the funding gap for infrastructure are critical to Africa's economic future. However, without dependable statistics on the infrastructure sectors it is difficult for policy makers to determine infrastructure priorities, track progress on infrastructure development, benchmark performance against peers, and evaluate the impact of past investments. The need for comprehensive, comparable and reliable information on infrastructure is widely recognized. For the sustainability of infrastructure databases in Africa, national statistical offices (NSOs) are expected to mainstream the collection and compilation of infrastructure statistics into their routine statistical data gathering and compilation activities over time, so that countries have time series data on infrastructure indicators to help monitor and evaluate key policy challenges. It is to this end that this *Handbook on Infrastructure Statistics* has been developed to provide a rigorous and consistent basis for the measurement of infrastructure trends in Africa and to ensure the harmonization and standardization of data collection methodologies to allow for benchmarking against regional, subregional, and country-level indicators and for further analysis.

The Handbook draws heavily on the years of experience in developing, collecting, and analyzing infrastructure indicators under the Africa Infrastructure Country Diagnostic (AICD) and, as such, represents a tried and tested approach. The AICD on which the above opening paragraphs are based was a major multi-stakeholder project that made a first attempt to document and portray Africa's infrastructure situation through the comprehensive collection of primary data on infrastructure across Africa and across 5 major infrastructure sectors (see Box 1.1). The guidance provided in this Handbook is a distillation of that experience and incorporates the lessons learned. The set of infrastructure indicators offered have been streamlined and fine-tuned to focus on those that are relatively tractable to collect and offer the greatest policy relevance.

The Handbook is directed to four main audiences:

(i) data providers at source (regulators, line ministers, utilities, operators, etc.);
(ii) data collectors (analysts and consultants in the field);
(iii) data managers (focal persons at the National Statistical Offices in charge of consolidating and disseminating infrastructure statistics, and the Statistics Department of the African Development Bank); and
(iv) data users (sector specialists and specialized agencies).

Box 1.1 An overview of the AICD

The main objectives of the AICD were to:

- assist individual countries in benchmarking the relative performance of their infrastructure sector and formulating their own country-specific strategies in the light of regional experience;
- assist donors in designing appropriate support for infrastructure reform, finance, regulation, and investment;
- allow an improved evaluation of the collective efforts to meet Africa's needs by establishing a baseline of the current situation on the continent;
- act as a core reference document on all strategic issues relating to infrastructure and hence a vehicle for building consensus about the appropriate response to Africa's infrastructure problems

The study evolved under the guidance of a Steering Committee chaired by the African Union Commission and comprising the New Partnerships for Africa's Development (NEPAD), the African Development Bank (AfDB), Africa's regional economic communities, the Development Bank of South Africa (DBSA), and major infrastructure donors. Financing for the AICD was from a multi-donor trust fund supported by the U.K. Department for International Development (DFID), the Public-Private Infrastructure Advisory Facility (PPIAF), the Agence Française de Développement (AFD), the European Commission, and the Germany KfW Entwicklungsbank. Numerous technical bodies at the regional and national level contributed to its implementation.

By providing an improved infrastructure knowledge base, the AICD has helped to monitor the impact of increased investment in the sector. As a result, it has been possible for the first time to portray the magnitude of the continent's infrastructure challenges and to provide detailed and substantiated estimates on spending needs, funding gaps, and the potential efficiency dividends from policy reform. The AICD has produced continent-wide analysis of many aspects of Africa's infrastructure agenda. The main findings were synthesized in a flagship report entitled *Africa's Infrastructure: A Time for Transformation*, published in November 2009. This report targeted policy makers and necessarily focused on high-level conclusions, and has helped draw global attention to Africa's infrastructure challenges, shaping the way policy makers view these sectors. In addition to the flagship report, the AICD has produced a wealth of analytical products, hosted through the AfDB web portal (www.infrastructureafrica.org), that include:

- technical reports with detailed findings on the power, water, ICT, and transport sectors;
- country-specific reports analyzing infrastructure performance and funding gaps;
- regional reports documenting the extent of the regional integration of infrastructure networks;
- a series of online databases, web-based models, and interactive atlases;
- numerous research papers

The AICD was conceived of as a one-off special study, covering 24 sub-Saharan countries that together represented 80 per cent of the population, and GDP of the region, with the objective of improving the infrastructure knowledge base. Following the successful implementation of the study, in July 2008 the ICA Steering Committee agreed to extend the diagnostic study to a second phase that would cover additional countries in Sub-Saharan Africa and to some extent North Africa. The African Development Bank (AfDB), as the lead agency for infrastructure development on the continent, was subsequently given the responsibility for hosting the AICD baseline data and for ensuring the maintenance (periodic updates) and sustainable collection of infrastructure indicators for the continent going forward.

In order to cater to the needs of these difference audiences, the Handbook is packaged as a complete reference of infrastructure statistics, including all infrastructure subsector and cross-sector themes. Each individual chapter, focused on a sector or theme, is conceived as a self-standing piece and includes a final section of annexes containing all relevant templates and definitions. *The text of each chapter should not be separated from the annexes; that is, each chapter should always be read and printed in tandem with the definitions and templates detailed in the annexes*. In addition, a series of data collection booklets extracts the pure data collection aspects of the Handbook as a handy reference for fieldwork for data collection experts and come together with electronic versions of the data collection templates.

The Handbook is grouped under five sections:

I General Data Aspects
II Cross-Cutting Issues
III Utility Infrastructure
IV Transport Infrastructure
V Household Viewpoint

Section I deals with general cross-sectoral guidelines for the collection of raw infrastructure data from the field (identifying target institutions and data sources, entering data into intelligent data templates, verifying for completeness of data) and for the processing of such data in the office (cleaning the data, collating secondary sources, generating parameters for normalization, and publishing of data).

Section II deals with institutional and fiscal issues that cut across infrastructure performance and spending. The institutional issues relate to national level reforms and regulations as well as provider level governance structures in the utility infrastructure sector (energy, water, telecommunications), while the fiscal issues relate to spending and financing of infrastructure.

Section III deals with institutional as well as operational and financial performance variables for the utility infrastructure sector (energy, water, telecommunications) while Section IV deals with these variables for the transport infrastructure sector (roads, railways, ports, and air transport).

Section V discusses the demand-side indicators of household access to infrastructure services to complement the supply-side indicators derived from the utility service provider coverage.

The Handbook on Infrastructure Statistics is also an important component of the wider and long-standing statistical capacity-building effort led by the AfDB. In this context, the AfDB is currently developing software tools that will facilitate data collection, validation, and analysis, derivation of standardized indicators and dissemination of infrastructure statistics.

The Handbook and its supporting sector-specific booklets and data collection templates, together with the database, will be available at http://www.afdb.org/en/knowledge/statistics/data-portal/

1.2 Defining Infrastructure

For the purposes of this Handbook, the term *infrastructure* is defined to include all the main networks that support economic and social activity, including those associated with transport (including roads, railways, maritime, and air), water, sanitation, power, and information and communication technologies.[1] The definitions used here are based on the Classification of Functions of Government (COFOG) in the Government Finance Statistics Manual (GFSM) of the International Monetary Fund (IMF) and are detailed below.

- *Road transport* includes the administration of affairs concerning the operation, use, construction, and maintenance of road transport systems and facilities (roads, bridges, tunnels, parking facilities, bus terminals, and so on). It includes highways, urban and rural roads, streets, bicycle paths, and footpaths.
- *Railway transport* includes the administration of affairs and services concerning the operation, use, construction, or maintenance of railway transport systems and facilities (railway roadbeds, terminals, tunnels, bridges, embankments, cuttings, and so on). It includes long-line and interurban railway transport systems; urban rapid transit railway systems, and other street railway transport systems; and the acquisition and maintenance of rolling stock.
- *Maritime transport* includes the administration of affairs and services concerning the operation, use, construction, and maintenance of inland, coastal, and ocean transport systems and facilities (harbors, docks, navigation aids and equipment, canals, bridges, tunnels, channels, breakwaters, piers, wharves, terminals, and so on).
- *Air transport* includes the administration of affairs and services concerning the operation, use, construction, and maintenance of air transport systems and facilities (airports, runways, terminals, hangars, navigation aids and equipment, air control amenities, and so on). It also includes radio and satellite navigation aids; emergency rescue services; scheduled and nonscheduled freight and passenger services; and the regulation and control of flying by private individuals.
- *Water supply* includes the administration of water supply affairs, the assessment of future needs and the determination of available resources to meet those needs, and the supervision and regulation of all facets of portable water supply including water purity, price, and quality controls.
- *Sanitation (wastewater management)* includes the administration, supervision, inspection, operation, and support of sewerage systems and wastewater treatment;
- *Electricity (power)* covers both traditional sources of electricity such as thermal or hydropower supplies and newer sources such as wind or solar; the administration of electricity affairs and services; the construction, development, and rationalized exploitation of electricity supplies; and the supervision and regulation of the generation, transmission, and distribution of electricity.
- *Nonelectric energy* covers the administration, construction, maintenance and, operation of nonelectric energy affairs and services, which chiefly concern the production, distribution, and utilization of heat in the form of steam, hot water, or hot air.

1 Foster, Vivien, and Cecilia Briceño-Garmendia, eds. 2009. *Africa's Infrastructure: A Time for Transformation*. Paris and Washington, DC: Agence Française de Développement and World Bank (genesis of the report, page 32).

- *Other fuels* include the administration, construction, maintenance and operation of affairs and services involving fuels such as alcohol, wood and wood waste, bagasse, and other noncommercial fuels.
- *Information and communication technology (ICT)* includes the administration of affairs and services concerning the construction, extension, improvement, operation, and maintenance of communication systems (postal, telephone, telegraph, wireless, and satellite communication systems).

1.3 Data Sources

There are many sources of data on infrastructure that can be tapped for the development of infrastructure statistics. The primary one is the administrative records of infrastructure service providers and associated line ministries and government bodies. These records portray the sector from the supply side, as it is perceived by the institutions responsible for service provision. Furthermore, censuses and surveys of various kinds also provide valuable complementary data from the perspective of the users. In addition to national data sources, numerous public and private global databases can also provide valuable information on Africa's infrastructure.

Administrative data sources

Administrative records (or administrative statistics) are data that are generated as part of administrative routine through the completion of forms by individuals; the interviews of respondents by enumerators; and mail questionnaires completed by institutions, operators, or regulators. In many African countries administrative records are not well developed to satisfy statistical needs. While administrative processes provide good records of administrative decision making, their use as a source of statistics tends to be secondary. Moreover, many administrative records do not provide detailed information on households or families (Suharto 2000).

Administrative statistics are the primary source of data on infrastructure in Africa. The nature of administrative statistics varies according to the type of institution and, typically, a large number of institutions within each country need to be contacted to obtain a full picture of the infrastructure situation. For example the Ministry of Finance may have statistics on financial or budget laws, and the financial statements and annual reports of each line ministry and government department. The Ministry of Transport and Communication may have statistics on vehicles owned by individuals by type, vehicle licensing, records of government vehicles, and number of passengers for each landing and departing aircraft. The regional water board may have statistics, for example, on subscribers with piped water inside their house, and the number of complaints on faulty water meters received monthly. The power authority may have records on subscribers organized by locality and consumption of electricity.

Household and enterprise surveys

Household surveys are conducted at the national level, and replicated in nearly all African countries, by Macro International, Inc. (Demographic and Health Surveys, DHS), United Nations Children's Fund (Multiple Indicator Cluster Survey, MICS) and the World Bank (Living Standards Measurement Surveys, LSMS). These organizations collaborate with the National Statistical Offices of countries when conducting these surveys. The DHS is sponsored by the United States Agency for International Development (USAID), while UNICEF and the World Bank respectively sponsor the MICS and LSMS.

In many African countries, household surveys are a valuable source of data on the extent to which different infrastructure services, including ICT, power, water and sanitation, reach the general population. Household surveys are in general conducted frequently at the national level by the National Statistical Offices. One characteristic of household surveys is that they have the flexibility of collecting any type of data about the conditions under which people live. In this respect, household surveys have become an important source of data on social phenomena that are pertinent to the measurement and monitoring, including the evaluation, of some infrastructure sectors.

Enterprise and establishment surveys can also be a valuable source of information about infrastructure services as they are perceived and experienced by the productive sector. The most widely available types of enterprise surveys for Africa are the Investment Climate Assessment (ICA) Surveys conducted by the World Bank's *Doing Business* initiative.

Population and housing censuses

A population and housing census is a major source of socioeconomic and demographic data. It is an ideal source of information on population size, composition, and its spatial distribution. In addition, the census has the advantage of generating data for small administrative domains. Information on the size, distribution, and characteristics of a country's population is critical for the development of infrastructure, in particular the allocation of infrastructure resources across localities.

Censuses sometimes include a few questions about dwelling characteristics, including the presence of infrastructure services. Their answers are helpful in providing a comprehensive picture of access to services. But the number of such questions asked is quite limited and varies across countries. Moreover, census data are only available, at best, once a decade.

Regional and international databases

In addition to national data sources, numerous public and private international databases may be relevant. Two important categories to consider are databases maintained by:

(i) International organizations such as the Food and Agricultural Organization, the African Development Bank, and the World Bank, which are usually available online free of charge; and

(ii) Specialized infrastructure bodies such as the Sub-Saharan Africa Transport Policy Program (SSATP), Water Supply Program (WSP), International Civil Aviation Organization (ICAO), ESMAP, Ports Management Association of East and Southern Africa (PMAESA), Ports Management Association of West and Central Africa (PMAWCA), International Telecommunications Union (ITU), International Energy Agency (IEA), Southern Africa Railway Association (SARA), African power pools and river basin organizations, among others.

Less known, but sometimes very valuable, are private databases maintained by commercial entities that usually charge for their use. These include, to name but a few, the Official Airline Guide (OAG) and Seabury's Airline Data Group (ADG) databases on global flight schedules, the GSM Association database on mobile coverage, and Platt's database on power generation infrastructure.

By way of summary, Table 1.1 provides an overview of the various data sources and summarizes some of the key issues involved with each one.

1.4 Roles and Responsibilities

The two central actors in the collection and processing of infrastructure data are the African Development Bank Statistical Department (AFDB-SD) and the National Statistical Offices (NSOs). The AFDB-SD plays a central or anchoring role, while the NSOs are the decentralized actors. The roles and responsibilities of these two actors vary according to the different stages in the process, and may evolve over time. The key stages and tasks are as follows.

- *Data collection* comprises the identification of target institutions and data sources, the entering of the data into intelligent data templates, and the validation of the data collected. The generic procedures for data collection are described in detail in Chapter 2, while sector-specific considerations can be found in each of the corresponding sector chapters.
- *Data processing* comprises data cleaning, data normalization, collation of secondary data sources, and data

Table 1.1 Challenges posed by different data sources

Administrative data	Household and enterprise surveys	Population and housing censuses	Regional, international, and private data providers (including global databases)
Poor quality in terms of accuracy and timeliness	Sampling designs can be very complex	Challenging and not always undertaken in a timely fashion	Data may not be complete due to non-reporting by some countries
Lack of meaningful data availability through publications or other method of dissemination	Estimation procedures can be complex depending on the design	Require careful control for non-sampling errors	Data may be tailored to institutional needs
Lack of qualified human resources for their collection and analysis	Require well-trained field enumerators	Results can be delayed due to the time involved in processing large data sets	Requires users to study the methodology used to obtain the data
Lack of systematic storage or archiving of the data in periodically maintained databases for further analysis	Availability of up-to-date sampling frames is sometimes lacking	Cost of censuses is generally high and requires government commitment	For private data providers, the cost may be prohibitive

publishing. The generic procedures for data processing are described in detail in Chapter 3, while sector-specific considerations can be found in each of the corresponding sector chapters.

In general, NSOs retain primary responsibility for data collection activities, with financial and technical support from the AFDB-SD. Within an NSO, responsibilities will be divided between the so-called *focal person* and the data collection collectors or enumerators. AFDB-SD retains primary responsibility for data processing and dissemination, for which technical analysts, specialized in each sector, should be trained. The data processing can be gradually delegated to NSOs, depending on interest and capacity, as their experience in the collection of infrastructure statistics develops.

2. Data Collection

This chapter provides general cross-sectoral guidelines for the collection of raw infrastructure data from the field. The main stages that are involved in data collection are as follows:

- Identification of target institutions and data sources
- Entering of data into intelligent data templates
- Validation of data collected

2.1 Identifying Target Institutions

The first step of data collection is to identify the target institutions that will need to be approached. These will typically include line ministries and the various parastatals and state-owned enterprises active in the sector. Each sector-focused chapter provides detailed information on the target institutions that are relevant to each case, including annexes identifying the key institutions in each country. These lists were accurate as of March 2011, and are a useful starting point for the data collection process in the field. But the universe of operators is always evolving, and data collectors should begin by validating and updating the list for their respective countries before initiating their fieldwork. In particular, they will want to look out for:

- *Operators that have ceased to operate*. In some cases, infrastructure providers go out of business and cease operations. This is the case with a number of African railways that have ceased to provide service (for example, CFB in northern Angola). If the data collector finds that any of the listed operators have ceased to operate, this should be recorded in the data template.
- *Operators that have changed name due to reform*. More often, infrastructure operators undergo institutional reforms that may lead to a change of name, and typically a change of management (for example, the Kenya-Uganda Railway became known as the Rift Valley Rail Corporation following the award of a concession to a private operator). These reforms may include restructuring, privatization, the award of a concession or management contract, and decentralization. It is very important to record in the comments column of the data template the exact date that the reform took place, the nature of the reform, and the new name of the operator; such information is very useful for analytical purposes.
- *New operators that have come into being*. These may be completely new Greenfield operators, as in the case of a new mobile phone company, in which case the data collector should complete a new data template for the new operator. It is important to provide the exact date at which the new operator began offering service, as this will affect the interpretation of the data; for example, if operations open in the middle of the year, the first year's data do not necessarily reflect a full year of operations. If the "new" operator is simply the reopening of a closed operation, such as a rehabilitated rail service, this should also be noted in the template.

A wide range of different types of sector organizations can be found across Africa. While there are cases of single national operators, as in the case of national power utilities, infrastructure service provision is often performed by a number of different operators covering different subnational markets. Data collectors should simply report data for each relevant operator. No attempt should be made to aggregate data to the national level.

Several types of market structures may pose particular challenges for data collection:

- *Some operators serve multiple sectors*. The most common example is the multiutility, that is, a single utility that provides both power and water service (for example, Electrogaz in Rwanda). Since the infrastructure data must be collected separately for each sector served by the multiutility, the difficulty here lies in separating out the utility's financial data for the two sectors. An attempt should be made to separate out both costs and revenues between the different sectors served by the multiutility. Data collectors should seek the advice of the utility's General Manager in doing this.
- *Some operators span more than one country*. The most common example is a binational railway that connects a landlocked country to a port in a coastal country (for example, TAZARA in Tanzania and Zambia). The difficulty lies in separating variables between the two countries. This should be attempted for only some of the basic variables, such as the quantity of infrastructure physically located in each country, and the volumes of traffic generated in each country. Other assets, such as employees and rolling stock, cannot readily be allocated to one country or another since they form part of an integrated operation. In this case, the total value for the railway as a whole should be reported for each of the countries involved.
- *Many countries have numerous operators*. The most challenging is the water sector, where many countries have

decentralized service to the local level and there may be dozens of operators. In such a case, the objective is to limit the data collection to (i) those operators whose client base represents at least 10 percent of the national client base for that service, or (ii) at least the three largest operators.

The completion of the questionnaire will usually involve a combination of face-to-face interviews with key personnel in the target institutions and a review of key source documents. The sector chapters also provide guidance on the types of source documents that may be relevant to each specific case. Where source documents are readily available from websites and other sources, it may be helpful to review these and extract any relevant information prior to conducting interviews. In some cases, the personal interview may be the starting point, to be followed by the subsequent review of reports provided by the institution. Wherever source documents are provided, these should be carefully retained and archived.

As a general principle, the frequency of infrastructure data collection is biennial. To ease the process, data is collected on a staggered cycle: data for half of the countries is collected in one year, and data for the other half of the countries is collected in the next. Although data is only collected biennially, the data series is largely annual in nature. Thus, *during any given collection year, data should be collected for each of the two preceding years*, given that there is typically a one-year lag in the availability of data. For example, data collection in 2012 will involve collecting data for the years 2010 and 2011.

In the case of the first phase of the second round of data collection, a longer time series may need to be covered. Because the baseline data collection was undertaken gradually in a number of phases over an extended period, the first phase of data collection (in 2011) needs to cover a longer time series than two years. Users should refer to the online database (www.infrastructureafrica.org) to ascertain the last year that data was collected for their country. For example, if the baseline data include power indicators for Uganda up to the year 2006, then the round of data collection in 2011 will need to cover the four-year period of 2007, 2008, 2009, and 2010.

2.2 Entering the Data into Templates

Data collection is organized around a series of data templates that are made available for download online or distributed by the Statistical Department of the African Development Bank (AfDB-SD). The templates should be completed electronically. There are a number of templates involved in the data collection for any given sector, and a detailed description of the contents of each template is provided in the corresponding sectoral chapter. Typically, each template relates to a block of data that can be collected from a particular target institution in the sector. The more target institutions are involved, the greater the number of templates that will be needed.

The design of each template is entirely standardized. The first block of each template corresponds to template-level metadata. The standard row headings are explained in Table 2.1. The name of each template is prefilled and comes as an unambiguous identifier.

The second block is the area for inputting the data. The standard column headings are explained in Table 2.2. The columns *policy category, series code, variable*, and *definition* are prefilled and cannot be modified by the data collector.

Table 2.1 Generic data collection form: Template metadata

NAME OF TEMPLATE (Sector + Theme) — Level of Data (national/operator/subnational) level		
Country:	Meaning	Name of the country
Sector:		Infrastructure subsector
Utility name:		Actual name of the operator whose data is being collected; for national data this is "not applicable"
Name of data collector:		Specific names or list of names of people responsible for collecting the data
Period of data collection:		Period during which the data were collected
Source institution:		Primary source of data
Source name of interviewee:		Names of contact people at the source institution

Table 2.2 Generic data collection form: Indicator metadata

Policy category	Series Code	Variable	Definition	Units	Comments	Metadata
Meaning:						
Thematic classification of variables	Unique numerical identifier for each variable	Short name of variable	Full technical definition of variable	Units of measurement in which variables are supposed to be collected	Any observations or departures from normal practice	Specific information about the source and nature of the data

These column headings include:

- *Policy category*. Data variables are classified into a number of policy categories that cover the main data themes of the online database. The themes and their abbreviations are as follows: institutions (INS), access (ACC), usage (USA), technical (TEC), and pricing (PRI).
- *Series code*. Each variable has a unique identifying code, which also appears in the online database. The code allows for the unambiguous integration of new data collected into the database. The code comprises letters that identify the sector, and numbers that identify the variable (Box 2.1).
- *Variable*. Each variable has a short name to facilitate its reference. For ease of association, the name provided in the Handbook matches the name given in the online database.
- *Definition*. There is a large number of complex technical data variables involved. Detailed technical definitions are therefore provided in the data templates, and further clarified in the text of the Handbook, as needed. It is important that data collectors develop a clear understanding of the meaning of these definitions, without which it would be difficult to evaluate whether data provided by the source institutions meet requirements.
- *Units*. Every variable has one or more possible units of measurement associated with it. Data collectors should identify which unit they are using to report the data using the drop-down menu provided. A wide range of technical units is used to measure the data, elucidated throughout the Handbook.
- *Comments*. It is difficult to foresee all the difficulties and issues that may arise during the data collection process in the field. There may be instances when the data do not perfectly correspond to the categories defined. The purpose of the comments column is to alert AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable. These may be entered in free form in the final column of the data template. Data collectors should provide as many comments as needed to help AfDB-SD to make sense of the data.
- *Indicator metadata*. Indicator metadata describe the meaning, accuracy, availability, and other important features of the indicator data. They are structured bits of information that describe, explain, locate, or otherwise make it easier to retrieve, use, or manage an information resource.[2] Metadata include, for instance, the source of the data and the precise technical definition of the variable.

Box 2.1 Overview of variable coding system

The series code assigned to each variable—in addition to being a unique identifier—is designed in such a way as to provide a significant amount of information about the type of variable concerned. The 13-digit string identifying each variable can be broken down and interpreted as follows:

- XXX—*Sector*: The first three digits identify the sector to which the variable belongs
- XX—*Level*: The next two digits identify whether the variable provides data at the national (N), subnational (S), or operator (O) level.
- XXX—*Policy*: The next three digits identify the policy area to which the variable relates. The possibilities are institutions (INS), access (ACC), usage (USA), technical (TEC), and pricing (PRI).
- X—*Variable type*: The next digit identifies whether the variable takes the form of raw data collected directly from a primary source (R), is derived from raw data by subsequent processing (D), or is a benchmark value (B).
- X—Variable status: The next digit identifies whether the variable is an interim one (I) that arises as a stage in data processing or a final variable (F) that will be shared with the public.
- XXX—*Sequence*: The final three digits give the numerical sequence that identifies the variable.

The template contains numerous boxes that are shaded in yellow, which denote the areas where data must be entered.

- Where the required response is a qualitative or categorical one, the user should click on the "select one option" box and double click on the appropriate response.
- Where the required response is a numeric string, this should be entered directly into the yellow box.

Data templates are intelligent in that they are programmed to recognize invalid, that is, logically impossible, responses. For example, the volume of power generated in a country cannot be a negative number, and neither can the water distribution losses be outside the 0 to 100 percentage range. Any invalid response of this kind will not be accepted.

In order to facilitate the data collection process, data templates also include (where available) historical time series of data, as well as averages for relevant benchmark groups. This allows the data collector to identify values that appear to be suspicious, whether because they represent a dramatic shift from recent trends in the country or are implausibly distant from the benchmark reference levels.

2.3 Validating the Data Collected

There are numerous pitfalls that can arise in the data collection process. It is therefore crucial to conduct a thorough validation of the data that has been entered into the template in-country before it is submitted to the AfDB-SD. The following guidelines provide a checklist of issues that need to be reviewed in the validation process, with specific instructions in each case. In order to safeguard the consistency and comparability of the data, it is essential to ensure that these guidelines are consistently adhered to.

Ensure that what has been collected are raw data variables

The objective of the field data collection process undertaken by the national statistical offices (NSOs) is to collect *raw data variables* only. The conversion of raw data variables into indicators is something that should ideally be undertaken centrally by the AfDB-SD, but in this case the NSOs will undertake the conversion of the data variables into indicators that will then be verified by the AfDB-SD. This verification process is important to ensure the consistency of the derived indicators for cross-country comparability, which is a key objective of the infrastructure online database.

If there is an imperative need to overwrite a derived value, the data collector should do so through the country's focal point, in close consultation with sector experts and the AfDB-SD.

Ensure that all financial data are in nominal local currency units

Applying this general principle to financial data leads to a number of additional guidelines. Financial data are particularly complex to measure, and particularly vulnerable to manipulation at source. In order to avoid these risks, financial data should always be collected in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. The date on which the financial data is collected should also be reported as accurately as possible in the comments column, as this will greatly assist the AfDB-SD in its subsequent processing of the data.

The two key points to remember are as follows:

- No currency conversion calculations should ever be performed in the field.
- No inflationary adjustments should ever be performed in the field.

Finally, in a handful of cases, infrastructure services are charged and accounted for in international rather than local currency units. Examples might include air transport and ports that operate in an international market, or railway concessions that may be anchored in international currency terms to reduce investor risk. Where this issue arises, the data collector should not under any circumstances attempt to convert international currency units back into local currency units. Instead, the international currency unit should be entered into the unit column, the variable reported in international currency, and the deviation noted in the comments column.

Code missing data correctly

In some cases, the desired data variable may be absent. There are a number of different reasons why this might be the case, and it is essential to ensure that these are appropriately coded:

- *Zero*. In this case, data exist but take a value of zero. It should be coded with a numerical zero: "0." An example might be a passenger railway that did not carry any passenger traffic that year due to the collapse of a bridge on its main passenger route.
- *Not available*. Data should exist, but for whatever reason cannot be provided by the source institution. This should

be coded with the letters "nav", an abbreviation for "not available". An example might be a railway that provided passenger services but did not keep accurate records of passenger traffic.

- *Not applicable*. Data should not exist since they are not relevant to the local situation. This should be coded with the letters "nap," for "not applicable." Cells should not be left blank. An example might be a railway that no longer provides passenger service.
- It is absolutely critical to distinguish accurately between these three different reasons, because they have widely differing implications for the downstream processing and interpreting of the data.

Use a consistent numbering convention

Two numbering conventions are prevalent in Africa:

- *Comma-dot*. Refers to a convention whereby commas are used to separate thousands, and dots are used to indicate a decimal place. This convention is widely used in anglophone countries.
- *Dot-comma*. Refers to a convention whereby dots are used to separate thousands, and commas are used to indicate a decimal place. This convention is widely used in francophone countries.

NSOs should indicate, on the front page of each data template, which of these two conventions is being utilized. *Once the convention has been chosen, it must be used systematically throughout the data template*. Failure to declare the convention being used, or switching from one convention to another, can lead to great problems in interpreting the data.

Use correct units of measurement

As noted earlier, every variable in this Handbook is associated with one or more clearly defined units of measurement. For example, national power consumption may be measured in kilowatt-hours, megawatt-hours, or gigawatt-hours. It is critical to clarify which of these three units are being reported, since they are each three orders of magnitude apart.

Although the units of measurement given are the most widely used in Africa, it may happen in some cases that the data variable may not be available in exactly the units of measurement requested. Where this is the case, *the data collector should not under any circumstances attempt to convert from one unit of measurement to the other*. There are two reasons for this. First, it risks introducing inconsistencies into the data across countries. Second, it prevents a clear audit trail between the data source and the data collection form. Instead, the data collector should note in the comments column the actual unit of measurement that applies to the data entered.

Due to the wide range of variables and sectors, a wide range of units of measurement exist that go beyond local currency units to include technical measures such as cubic meters, kilowatt-hours, minutes of voice communication, kilometers of road, airplane seats, tonne-kilometers of rail freight, tonnes of sea cargo, and so on. Many of the units of measurement are technically complex and should be carefully studied and clearly understood before proceeding with data collection.

A special word is in order concerning numbering conventions.

- For variables that are expressed in number units, great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor.
- Where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is 79 percent should be entered as 79).
- To avoid confusion in the processing and interpretation of the data, it is essential that the data collector identify which dot-comma convention is being used in the comments section.

Ensure that data are time stamped

Generally, data should be collected for the end of the financial year, with financial data being preferably audited. The end of the financial year may mean December 31 for many countries, but not necessarily for all, since in a number of cases the calendar year and the fiscal year are not synchronized. The actual date that applies to the data should be reported in the comments column so that data are always clearly time stamped. If data only relate to a sub-period of the year, this should also be clearly reported in the comments column, since it has important implications for data interpretation. In the case of budget data, it is relevant to collect not only budget execution, but also (necessarily unaudited) data on budget estimates and releases, where available, since these shed valuable light on the process of allocating and using public sector funds.

3. Data processing

This chapter provides general cross-sectoral guidelines for the processing of infrastructure data once they have been collected from the field. The main stages that are involved in data collection are as follows:

- Data cleaning
- Collation of secondary sources
- Data normalization and aggregation
- Data publishing

3.1 Cleaning the Data

Data editing occurs at every stage of statistical investigation, with the objective of ensuring that the data received are as accurate, complete, and consistent as possible. Editing is necessary to correct for non-sampling errors that may arise during various stages of the statistical operation.

During data collection, several actions could lead to data errors. The following are some examples:

- Respondent misunderstood question
- Interviewer checked the wrong response
- Interviewer miscoded the response
- Interviewer forgot to ask the question or record the response
- Respondent provided incorrect response

The objective of data editing is to ensure accuracy, consistency, completeness, and coherence, and to obtain the best possible data available. During the process, the information collected is inspected using intelligent templates to detect missing, inconsistent, and incorrectly reported data and to take corrective action where required.

At the country level, editing and validating infrastructure data occurs in two stages: in the field and in the office (at the national

Table 3.1 Field and office editing and validation

Activity and level of editing	Field editing	Office editing (NSO)	Office editing (AfDB-SD)
Editing raw data (Templates) (*Micro* level)	Examine important or difficult items that experience has taught often include errors Check for omissions, completeness (blank cells or non-responses)	Screen to check if questions were not answered satisfactorily Check for omissions Check data against other similar data series generated internally Check that data are of the right magnitude Check compliance with the dos and *don'ts* of data collection	Check for outliers or strange data patterns and request explanations where necessary
Basic validation (*Micro* and *macro* levels)	Check for accuracy (have concepts and definitions been strictly followed?; are units, zeros, *nav*, and *nap* correctly recorded?) Consult with sector experts to validate the data	Compare against the data of countries in similar economic situations or with other studies (where available)	Critically examine and look for trends in the data, norms, and expected values
Statistical validation (*Macro* level)	None	Check descriptive statistics: mean, median, range, standard deviation, variance: - Draw scatter charts - Identify outliers - Undertake time series and cross-country comparisons of the data	Compare against the data of countries in the same region or economic zone

statistical office, or NSO). A third level of editing takes place at the African Development Bank Statistical Department (AfDB-SD). Table 3.1 outlines some of the elements to be covered at each of the three stages of editing.

There are two levels of data editing: *micro and macro*.[3] At the micro level, editing is done at the recording level; at the macro level, aggregate data are analyzed and compared against data from other surveys or administrative files.

At the AfDB-SD, the correction of data errors will be based on what is assumed to be the most probable entry. At the earlier editing stages, however, corrections will be made while in contact with the respondent or the data collector (s) in the field. Editing at the AfDB-SD will also extend beyond a single county's data to examine comparability with other countries in similar socioeconomic conditions (external consistency).

There are several principles of data editing that should be followed. These include:

- Make the minimal number of changes in the originally recorded data.
- Check for apparent inconsistencies across entries.
- Pay particular attention to definitions of the data variables to ensure consistency and comparability.

Good editing procedures must be based on a probability approach; that is, accounting for the relative frequency of certain occurrences or associations of characteristics in a given milieu.

Editing can be conducted to check various aspects of the data.[4] These include validity (Local Currency Units, LCUs, used for financial data), range (values, ratios in a prescribed range), duplication (by examining one record at a time to ensure there are no duplicates), consistency (by checking that answers to a question are consistent with answers to other similar questions), historical (examining current and previous data), statistical (examining all data, descriptive statistics, and time series analysis).

Data validation involves checking the accuracy of the data to ensure that it is correct and reliable. In some cases data validation and editing may overlap. Accurate data are vital for further analysis to ensure that correct decisions are made. As Stapenhurst (2009) points out, "Validation not only ensures that data are correct, it often uncovers important information for use in the analysis and reporting phases."[5]

Four types of data validation checks to be performed are:

(i) Checking that data are complete (blank cells and/or non-response items are unacceptable).
(ii) Checking for self-consistency (the use of correct units; the right magnitude of figures; the logical consistency of groups of figures, such as manpower costs and hours).
(iii) Comparing data against those of a similar type.
(iv) Cross-checking data against those of similar countries, and accounting for norms and expected values.

For less obvious errors, other validation tools can be used such as charts, scatter charts, and the calculation of descriptive statistics including time series analysis (see Table 3.1).

3 Statistics Canada <http://www.statcan.gc.ca/edu/power-pouvoir/ch3/editing-edition/5214781-eng.htm>

4 Statistics Canada <http://www.statcan.gc.ca/edu/power-pouvoir/ch3/editing-edition/5214781-eng.htm>

5 Tim Stapenhurst (2009): *The benchmarking book*, Elsevier Butterworth-Hinemann.

3.2 Collating Data from Secondary Sources

Before data normalization can begin, it is necessary to complement data collected directly from the field with other valuable data that can be collated from secondary sources such as public or private databases.

Two kinds of secondary data are relevant:

- Macroeconomic data, used to normalize raw data variables, are needed across all sectors. These include data on exchange rates, deflators, gross domestic product (GDP), population, and land area.
- Sector-specific data that complement information that can be obtained directly at the country level. More guidance on these is given in each sector chapter.

3.3 Data Normalization and Aggregation

Once data have been collected, entered, and validated, a significant amount of data processing is required in order to convert raw data variables into usable and useful indicators of infrastructure performance. Much of the data processing is sector-specific in nature, and the associated calculations and transformations will be covered in detail in the corresponding sector chapters. But

there is a core of data processing procedures that are general in nature. These apply across all sectors and, importantly, should be consistently applied across sectors in order to maintain the overall coherence of the infrastructure data. These general procedures, described in this chapter, consist of (i) the normalization of variables for ease of interpretation and (ii) the aggregation of variables to support higher levels of analysis and the creation of benchmarks to facilitate cross-country comparisons.

Normalization

Many of the raw data variables collected are difficult to interpret without some prior normalization. Normalization facilitates the interpretation of both time trends and cross-country comparisons. Normalization is done using the identified standard macroeconomic variables.

Exchange rate: All financial variables are converted into a common financial unit, namely US dollars. This facilitates cross-country comparisons, and simplifies analysis by avoiding a proliferation of monetary units. The exchange rates used are sourced from the AfDB data portal and are calculated as the average exchange rate for the corresponding year. See the following web link: http://www.afdb.org/en/knowledge/statistics/data-portal/. The variable used is Exchange rate (LCU per US$, period average)

Inflation: All financial variables are expressed in current values; no correction for inflation is made in the database. Analysts are at liberty to make their own inflationary adjustments.

GDP: Many financial variables can be more readily interpreted when expressed as a percentage of GDP. Dividing by GDP essentially scales financial values relative to the size of the economy, and helps to highlight how significant they are in macroeconomic terms. For example, it may be more striking to say that a country is allocating 2 percent of GDP to power subsidies than to say that power subsidies are worth $20 million annually. This type of normalization is particularly relevant to fiscal variables. The GDP estimates are sourced from the AfDB data portal in local currency. See the following web link: http://www.afdb.org/en/knowledge/statistics/data-portal/. The variable used is GDP (series name: GDP (national currency))

Land area: Dividing infrastructure variables by land area gives an indication of density, which can be helpful in visualizing issues from a spatial perspective. This is particularly relevant for transport infrastructure. For example, it is relevant to know how many kilometers of road network a country has per square kilometer of land area. In countries that have large tracts of sparsely populated land, such as desert or virgin rain forest, measures of arable land area may provide a more accurate picture of infrastructure density than measures of total land area. Land area data are sourced from the AfDB data portal. See the following web link: http://www.afdb.org/en/knowledge/statistics/data-portal/

The variable used is land area (series name: Total Land area (ha))

Population: A number of variables can usefully be normalized against population. This type of normalization is relevant to both financial and physical variables, and is particularly relevant to information on access to services. For example, it is essential to know what percentage of the population has a piped water connection. And it may be useful to know how much a country is spending on infrastructure per capita. Population estimates are sourced from the AfDB data portal. See the following web link: http://www.afdb.org/en/knowledge/statistics/data-portal/. The variable used is Population (series name: Population, Total).

Other normalizations: Other normalizations of particular relevance to specific infrastructure sectors will be covered in the appropriate sector chapters.

Aggregation

Data are collected at the level of individual service providers. It is often necessary to aggregate data in order to provide a useful basis for analysis. Two types of aggregation are relevant:

- *Aggregation across service providers*. Many infrastructure services are decentralized, with multiple service providers operating within a given country. Since the focus of analysis is often national performance, it is desirable to provide aggregate measures of all indicators at the national level.
- *Aggregation across countries*. It is often also necessary to aggregate across all countries, or groups of countries, to get an overall picture of the performance of different groups.

Regarding the methodology, two types of aggregation can take place. The choice between them depends on the type of variable involved.

- *Simple summation*. For variables that consist in absolute financial or physical measures, simple summation across all the constituent members of the group is adequate for aggregation. For example, to find out the total number of water connections in a country, one would simply sum the number of connections reported by each water utility in that country. A similar approach would be used to find the total volume of treated water produced in the country.

- *Weighted averages*. For variables that are in the form of ratios, aggregation demands the use of weighted averages. The choice of the weighting variable varies according to the indicator, and these are clearly identified in the database. In general, financial ratios should be weighted using the relevant financial measures, while physical variables should be weighted using the relevant physical measures. For example, distribution losses of different utilities should be weighted by each utility's total water production in order to obtain a national indicator for distribution losses. Or again, collection ratios of different utilities should be weighted by each utility's total revenues in order to obtain a national indicator for collection ratios. When taking weighted averages across countries, GDP is generally used to weight financial ratios; population is generally used to weight physical variables.

One question that often arises is how to aggregate indicators for which there are missing variables.

Handling data gaps

For some specific variables and indicators, data might not be available for a given year or simply not generated on a yearly basis.[6] While there is not much an analyst can do to fill in the blanks with the actual value of missing observations, some common practices are used to maximize the comparability and coverage of the data in reports and dissemination instruments. In this Handbook, the standard assumed for the dissemination of indicators with missing values is to report the *most recent value* within the five years preceding the year reported.

"Missing" data points are either not available (nav) or not applicable (nap), with implications for calculations. This Handbook suggests handling these cases as follows:

- For addition and subtraction: *A + "nav" = A and A - "nav" = A*, where *A* is a value (zero, negative, or positive)
- For multiplication and division: *A* "nav" = "nav"; A / "nav" = "nav" and "nav" / A = "nav",* where *A* is a value (zero, negative, or positive)
- For simple averages: *AVERAGE (X1, X2, X3, X4)* where, for example, if *X3* is "nav" this will result in *(X1+ X2+X4)/3*
- For weighted averages: *W-AVERAGE (Xi, Yi) = (X1*Y1 + X2*Y2 + X3*Y3 + ….Xi*Yi)/ (Y1 + Y2 + Y3 + … Yi),* where *Yi* is the weight. If either *Xi* or *Yi* were to be "nav" then the product *(Xi*Yi)* in the above computation, would be treated as "nav" Furthermore, the Yi would be removed from the denominator in this case.

The same criteria will be used for "nap"

Benchmarking

For an organization, benchmarking is a method of measuring and improving performance by comparing against best practices (benchmark). Benchmarking is therefore a comparison of X relative to Y. In the case of infrastructure, X could be an indicator established from a recent data collection exercise while Y is the benchmark (stored in the database). The comparison can be across countries, regions, economic groupings, or other defined criteria.

Benchmarking is an important tool for commenting on data or indicators in the context of previously established data used as a benchmark. There are many reasons why benchmarking can prove to be useful; including the following:

- *To compare performance levels and decide responses*. Comparing an indicator against the benchmark may influence decisions on the next course of action.
- *To identify appropriate target performance levels*. If the performance level of an indicator is less than the benchmark, the benchmark might represent a target performance level to be achieved.
- *To solve a specific problem by studying how others attained certain levels*. Particularly where the performance level of a benchmark in a given country is low, that country may wish to study how others achieved that performance level and the problems they encountered.
- *To help justify manpower and/or expenditure increases as well as decreases*. This may apply when draft project proposals are being prepared.

The methodology for calculating benchmarks is the same as that described for aggregating based on weighted averages. Benchmarks are simply a special case of aggregation.

Benchmarks are groups of countries that serve as useful comparators. The following is the classification of benchmarks that has been adopted for infrastructure data in Africa (Table 3.2). Annex A3.1 identifies the exact country membership of each of these benchmark groups. Some of the benchmark classifications are mutually exclusive (such as income group) while others (such as regional economic community) are not.

- *Region/Sub-Saharan Africa*. The simplest benchmark of all is to look at the overall average for the African region or Sub-Saharan Africa.

6 The most illustrative example of data not generated annually is household survey data. Household surveys are very costly exercises that monitor socioeconomic variables whose annual variations are usually smooth and does not justify more than biennial monitoring.

Table 3.2 Overview of benchmark groups used for the analysis of infrastructure indicators

Cross-sectoral	Sectoral
Africa region/Sub-Saharan Africa	**Power**
Economic CPIA	**Power pool**
Low-income fragile	North Africa Power Pool
Low-income non-fragile	Eastern Africa Power Pool
Middle income	Central Africa Power Pool
Resource rich	Western Africa Power Pool
	Southern Africa Power Pool
Regional economic community	**Generation technology**
CEMAC	Predominantly hydro generated
COMESA	Predominantly thermal generated
ECCAS	Installed capacity
EAC	Small (< 200 MW)
ECOWAS	Medium (200–1,000 MW)
SADC	Large (> 1,000 MW)
UMA	
Region	**Water and sanitation**
North Africa	**Water scarcity**
East Africa	Low renewable internal fresh water resources per capita >3,000m^3
Central Africa	
West Africa	
Southern Africa	High renewable internal fresh water resources per capita <3,000m^3
Geography	**Roads:**
Coastal	**Type of terrain**
Landlocked	Rolling and humid
Island	Flat and arid
	Railways
Income	**Institutional arrangements**
Low income	Concession
Middle income	Non-concession

Note: CPIA = Country Policy and Institutional Performance Assessment; CEMAC = Monetary and Economic Community of Central Africa; COMESA = Common Market for Eastern and Southern Africa; ECCAS = Economic Community of Central African States; EAC = East African Community; ECOWAS = Economic Community of West African State; SADC = Southern African Development Community; WAEMU = West African Economic and Monetary Union; UMA = Arab Maghreb Union.

- *Economic CPIA*. One of the most useful sets of benchmarks is the four-way country typology developed for the Africa Infrastructure Country Diagnostic, which is based on a combination of economic and governance criteria, and turns out to be quite powerful in portraying differences in infrastructure performance across countries. This typology, the World Bank's Country Policy and Institutional Performance Assessment (CPIA), categorizes countries into middle-income, resource-rich, fragile, or other low-income (Box 3.1).
- *Regional economic community*. Given the importance of regional political and trade groupings within Africa, it is also relevant to calculate benchmarks by membership in regional economic communities.
- *Sub-region*. It is also of interest to examine benchmarks for specific geographic regions of Africa, such as southern, central, west, and so on.
- *Geography*. Since geographical location has a bearing on infrastructure development, geographical benchmarks are also of interest. These divide countries according to whether they are coastal, landlocked, or islands.
- *Income group*. Another standard and useful benchmark is that based on income group, which consists in a simple separation between low- and middle-income countries.

In addition to the general benchmark groups that are broadly relevant to all sectors, there are additional benchmarks that are relevant to only certain sectors. For example, for the water sector, the level of water scarcity is a key exogenous variable that affects sector performance, and thus is relevant to calculate separate benchmarks for water-scarce and water-abundant countries. Similarly, in the case of roads, countries with flat and arid terrains face much easier conditions for road network development than those with rolling and humid terrains. These kinds of sector-specific benchmarks will be dealt with in detail in each of the corresponding sectoral chapters, as will the specific country membership of each benchmark group.

Box 3.1 Introducing the CPIA country typology

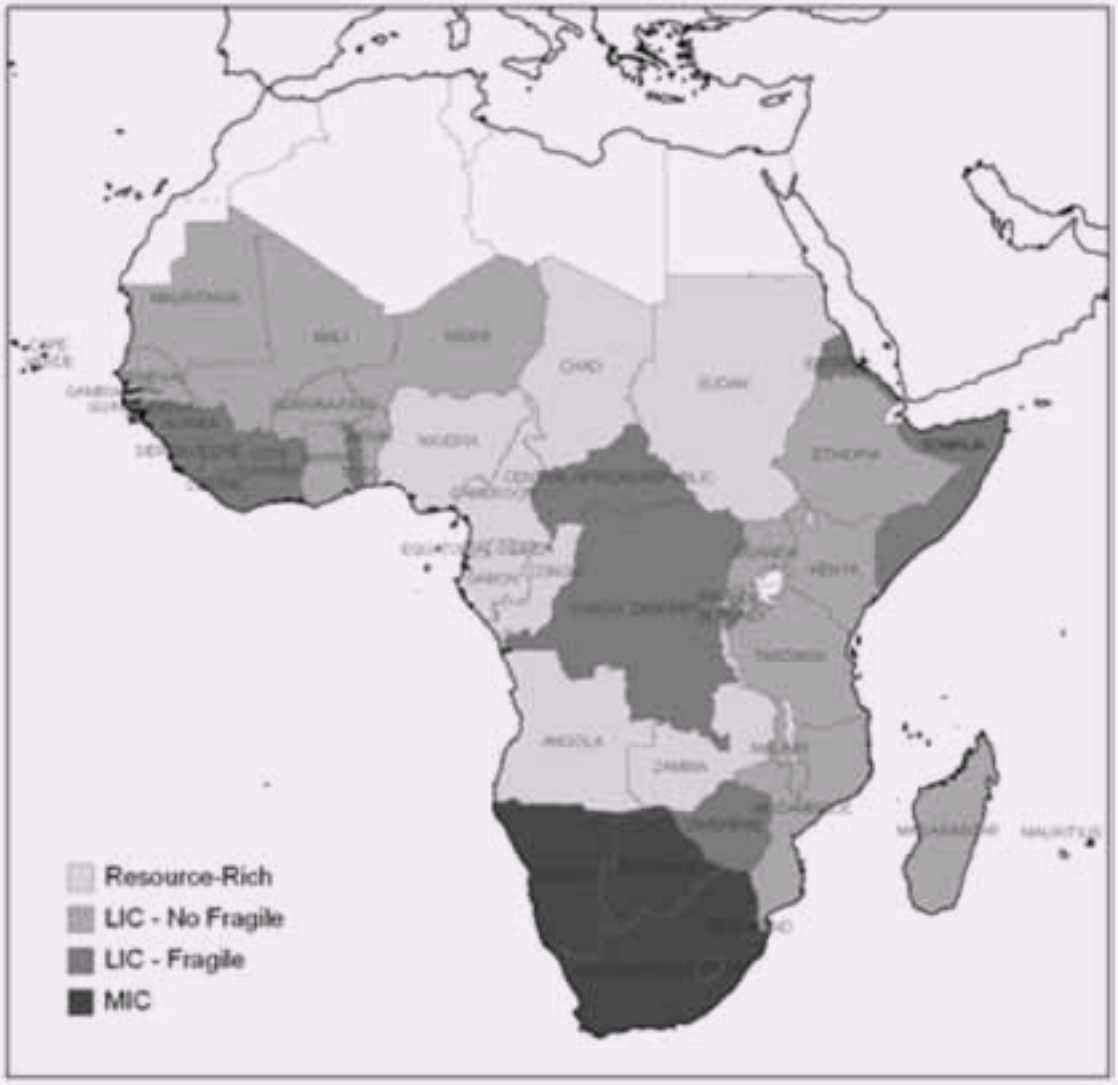
Africa's numerous countries face a wide range of economic situations. On the understanding that countries' growth and financing challenges, as well as their economic decisions, are affected by structural differences in their economies and institutions, we introduce a four-way country typology to organize the discussion. This typology provides a succinct way of illustrating the diversity of infrastructure financing challenges faced by different African countries.

Middle-income countries: These are countries with gross domestic product (GDP) per capita in excess of $745 but less than $9,206. Examples include Cape Verde, Lesotho, and South Africa.

Resource-rich countries: These are low-income countries whose behaviors are strongly affected by their endowment of natural resources. Resource-rich countries typically depend on minerals and/or petroleum. A country is classified as resource-rich if primary commodity rents exceed 10 percent of GDP (South Africa is not classified as resource-rich, using this criterion). Examples include Cameroon, Nigeria, and Zambia.

Fragile states: These are low-income countries that face particularly severe development challenges such as weak governance, limited administrative capacity, violence, and the legacy of conflict. In defining policies and approaches toward fragile states, different organizations have used different criteria and terms. Countries that score less than 3.2 on the World Bank's Country Policy and Institutional Performance Assessment (CPIA) scale are considered to belong to this group. Some 14 countries of Sub-Saharan Africa belong to this category. Examples include Côte d'Ivoire, the Democratic Republic of Congo, and Sudan.

Other low-income countries: This is a residual category of countries with GDP per capita below $745, which are neither resource-rich nor fragile. Examples include Benin, Ethiopia, Senegal, and Uganda.



3.4 Publishing the Data

Once data processing is complete, the final set of indicators will be uploaded to the public access database and packaged in different forms that target different audiences. The complete database is available at the AfDB data portal. See the following web link:

http://www.afdb.org/en/knowledge/statistics/data-portal/

In addition, the AfDB-SD will initiate and facilitate the publishing of infrastructure statistics in three types of reports:

- Sector reports, under the responsibility of specialized agencies
- Country reports, produced under the leadership of the NSO
- Regional reports, generated by the AfDB-SD

This enables a wider audience for the data. The publication of reports will be countercyclical to the data collection, so that NSOs and the users and producers of the data will maintain their continuous involvement in the generation and production of indicators.

A3. Annexes to chapter 3: Data processing

Annex A3.1 Country membership of main cross-sectoral benchmarking groups

	Country name	Resource-rich	MIC	LIC, fragile	LIC, Non-fragile	ECO-WAS	SADC	CEMAC	EAC	WAE-MU	COME-SA	UMA
1	Algeria	1	-	-	-	-	-	-	-	-	-	1
2	Angola	1	–	–	–	–	1	–	–	–	–	-
3	Benin	–	–	–	1	1	–	–	–	1	–	-
4	Botswana	–	1	–	–	–	1	–	–	–	–	-
5	Burkina Faso	–	–	–	1	1	–	–	–	1	–	-
6	Burundi	–	–	1	–	–	–	–	1	–	1	-
7	Cameroon	1	–	–	–	–	–	1	–	–	–	-
8	Cape Verde	–	1	–	–	1	–	–	–	–	–	-
9	Central African Republic	–	–	1	–	–	–	1	–	–	–	-
10	Chad	1	–	–	–	–	–	1	–	–	–	-
11	Comoros	–	–	1	–	–	–	–	–	–	1	-
12	Congo, Rep. of	1	–	–	–	–	–	1	–	–	–	-
13	Cote d'Ivoire	–	–	1	–	1	–	–	–	1	–	-
14	Congo, Dem. Rep. of	–	–	1	–	–	1	–	–	–	1	-
15	Egypt	1	-	-	-	-	-	-	-	-	1	-
16	Equatorial Guinea	1	–	–	–	–	–	1	–	–	–	-
17	Eritrea	–	–	1	–	–	–	–	–	–	1	-
18	Ethiopia	–	–	–	1	–	–	–	–	–	1	-
19	Gabon	1	–	–	–	–	–	1	–	–	–	-
20	Gambia, The	–	–	1	–	1	–	–	–	–	–	-
21	Ghana	–	–	–	1	1	–	–	–	–	–	-
22	Guinea	–	–	1	–	1	–	–	–	–	–	-
23	Guinea-Bissau	–	–	1	–	1	–	–	–	1	–	-
24	Kenya	–	–	–	1	–	–	–	1	–	1	-
25	Lesotho	–	1	–	–	–	1	–	–	–	–	-
26	Liberia	–	–	1	–	1	–	–	–	–	–	-
27	Libya	1	-	-	-	-	-	-	-	-	-	1
28	Madagascar	–	–	–	1	–	1	–	–	–	1	-
29	Malawi	–	–	–	1	–	1	–	–	–	1	-
30	Mali	–	–	–	1	1	–	–	–	1	–	-

	Country name	Resource-rich	MIC	LIC, fragile	LIC, Non-fragile	ECO-WAS	SADC	CEMAC	EAC	WAE-MU	COME-SA	UMA
31	Mauritania	–	–	–	1	–	–	–	–	–	–	-
32	Mauritius	–	1	–	–	–	1	–	–	–	1	-
33	Mayotte	–	1	–	–	–	–	–	–	–	–	-
34	Morocco	1	-	-	-	-	-	-	-	-	-	1
35	Mozambique	–	–	–	1	–	1	–	–	–	–	-
36	Namibia	–	1	–	–	–	1	–	–	–	–	-
37	Niger	–	–	–	1	1	–	–	–	1	–	-
38	Nigeria	1	–	–	–	1	–	–	–	–	–	-
39	Rwanda	–	–	–	1	–	–	–	1	–	1	-
40	São Tomé and Príncipe	–	–	1	–	–	–	1	–	–	–	-
41	Senegal	–	–	–	1	1	–	–	–	1	–	-
42	Seychelles	–	1	–	–	–	1	–	–	–	1	-
43	Sierra Leone	–	–	1	–	1	–	–	–	–	–	-
44	Somalia	–	–	1	–	–	–	–	–	–	–	-
45	South Africa	–	1	–	–	–	1	–	–	–	–	-
46	Sudan	1	–	–	–	–	–	–	–	–	1	-
47	Swaziland	–	1	–	–	–	1	–	–	–	1	-
48	Tanzania	–	–	–	1	–	1	–	1	–	–	-
49	Togo	–	–	1	–	1	–	–	–	1	–	-
50	Tunisia	1	-	-	-	-	-	-	-	-	-	1
51	Uganda	–	–	–	1	–	–	–	1	–	1	-
52	Zambia	1	–	–	–	–	1	–	–	–	1	-
53	Zimbabwe	–	–	1	–	–	1	–	–	–	1	-

Note: MIC = middle-income country; LIC = low-income country; ECOWAS = Economic Community Of West African State; SADC =Southern African Development Community; CEMAC = Monetary and Economic Community of Central Africa; EAC = East African Community; WAEMU = West African Economic and Monetary Union; COMESA = Common Market for Eastern and Southern Africa; UMA = Arab Maghreb Union.

Section 2

Cross-Cutting Issues

4. Institutions

4.1 Motivation

Institutional competence and capacity are important determinants of the performance of infrastructure providers in every sector. While this may seem obvious, there has been little systematic analysis of the nature and extent of the links between stronger institutions and better outcomes such as broader access, higher service quality, and more financially efficient service.

The standard infrastructure reform and policy prescription package of the 1990s, which included market restructuring, private involvement up to and including privatization, the establishment of independent regulators, and enhanced competition, yielded a fair number of positive results in Africa. This conclusion deserves stress, since the beneficial outcomes following the application of these reforms have often been unacknowledged or underappreciated. But the successes are measurable, even in the face of challenges: Reforms have proved more difficult to apply in Africa than in other regions. There have been numerous failures to implement, or fully implement, the policy package; numerous renegotiations or cancellations of contracts with private providers; outcomes below expectations; and a high degree of official and public skepticism about whether the application of the standard package is producing (or even can produce) the desired results. The underpinning of such failures is thought to lie in the relative weakness of African practices, policies, and agencies (that is, institutions) that guide and oversee African infrastructure sectors and firms, public or private.

The results suggest that institutions make a difference. It reveals strong links between (i) institutional reforms and enhanced governance at the country, sector, and enterprise level, and (ii) improvements in the quantity and quality of infrastructure services (with some variation across sectors). Given the link between institutional development and performance improvements, and the high costs of inaction, strengthening sectoral institutions and country and sectoral governance is a worthwhile investment.

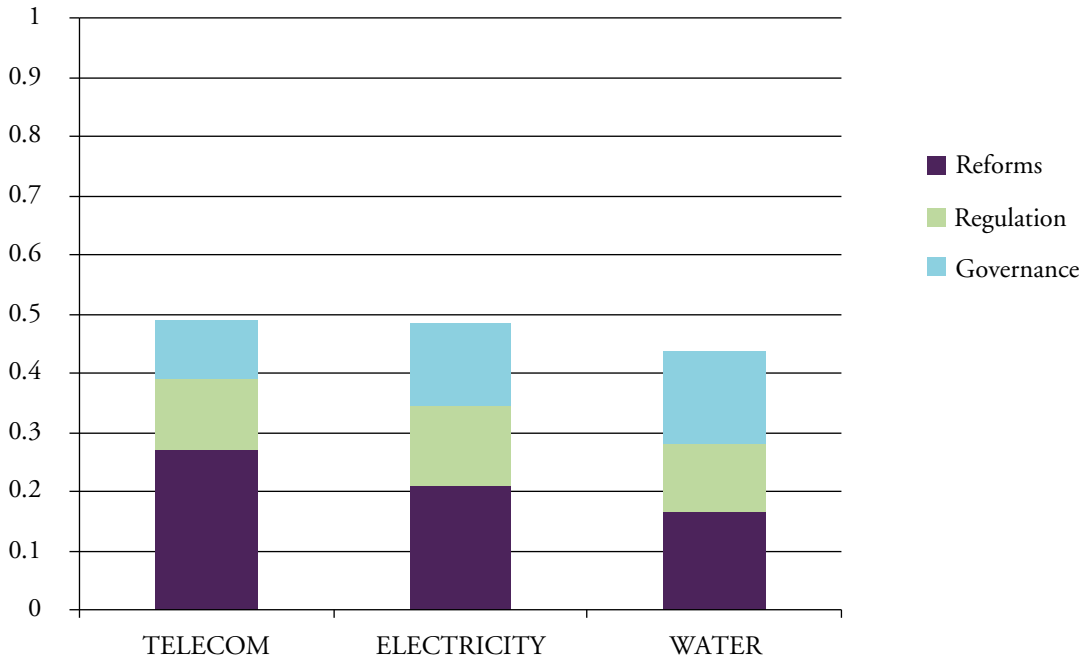
Most African countries have undertaken the initial or preliminary institutional reforms recommended, that is, the broader sectoral policy and legal measures, many of which can be accomplished by the stroke of a pen. What has lagged are regulatory and governance reforms. For instance, effective regulation requires building organizations that challenge established, vested interests. Governance improvements, particularly in state-owned enterprises (SOEs), require aligning internal and external incentives, which again require broader reforms of the external environment for infrastructure service providers.

Across countries, the greatest progress has been in sector-level reform. Average scores exceed 60 percent for reform legislation and 50 percent for sector restructuring, policy oversight, and private sector participation (Figure 4.1). Telecommunications, the most advanced sector, scores about 80 percent on the best-practice index across all areas of sector reform. The equivalent score for electricity is about 60 percent, and for water about 50 percent.

Interference from government continues to undermine regulatory independence in many countries. Infrastructure regulation in Africa is still in its early days. Typically, new laws and regulatory bodies exist for telecommunications and electricity, whereas few countries have created water or transport regulators. The quality of regulation can be measured along several dimensions. On the technical side, regulation needs to be founded on solid methodological tools, and the resulting decisions need to be communicated to the public in a transparent manner. African regulators score the highest on these dimensions, even if (in absolute terms) they still have some way to go. On the political side, regulation requires a certain degree of autonomy from government interference while remaining accountable to society. These aspects of regulation have proved more challenging, with scores remaining lower than in other regions.

Governance lags behind other areas of institutional development, and the limited progress shows up mainly in internal managerial practices. While the relevance of sectoral and regulatory reforms has generally been well recognized, the governance regime has received less attention from policy makers and analysts. Almost all Sub-Saharan countries ranked significantly and consistently lower on this dimension of institutional development than on the others. Most countries are doing better on internal governance than on external governance. Internal governance relates to structures within the service provision entity, such as the extent to which its structure approximates standard corporate forms; the qualifications and autonomy of its senior management and board of directors; the nature, quality, and timeliness of the information it submits to its overseers; and the adoption of accounting and disclosure standards. External governance, by contrast, refers to external market disciplines: being subject to private rather than public sector accounting and auditing systems, contracting out noncore activities to private providers, and being obliged to raise debt or equity funds on private capital markets, domestic or international.

Figure 4.1 Institutional progress across sectors



Source: Vagliasindi 2008c.

4.2 Tracking Performance

The sector synopsis highlights some of the key institutional issues facing the utilities sector. In order to continue to track sector performance over time, a number of indicators are needed to shed light on each of the key institutional dimensions of reform, regulation, and governance.

To analyze the links between institutional factors related to infrastructure and performance outcomes at the sector and enterprise levels, this study devised a standardized survey-based methodology that describes the nature of each institutional reform proposed and implemented and that measures the intensity of the reform efforts. This report also compares its findings on these factors with previous conclusions found in the literature.

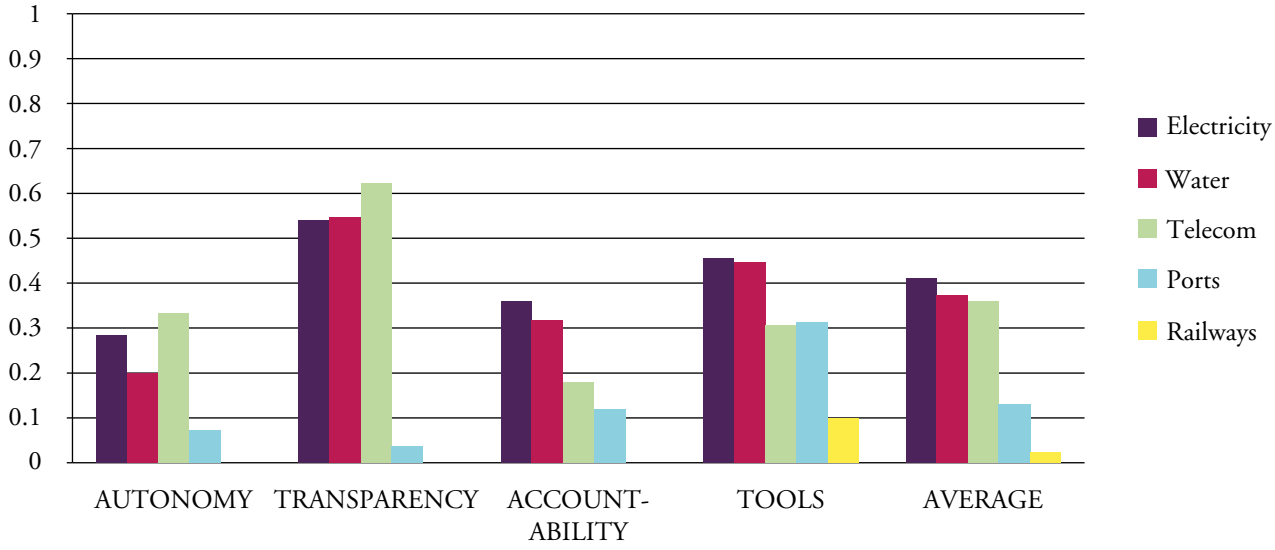
This methodology yields a "scorecard": a succinct snapshot of what has happened, sector by sector, along three key institutional dimensions: (i) broad sectoral policy reforms, (ii) the amount and quality of regulation, and (iii) enterprise governance. Reform is defined as implementing sectoral legislation, restructuring enterprises, and introducing policy oversight and private sector participation. The *quality of regulation* entails progress in establishing autonomous, transparent, and responsible regulatory agencies and regulatory tools (tariff methodology). Governance entails the implementation of measures inside the enterprise (such as strengthening the quality of shareholder voice and supervision, board and management autonomy, and mechanisms for accounting and disclosure) and measures aimed at improving the external environment in which the enterprise operates (including outsourcing to the private sector and introducing discipline from a competitive labor and capital market). The first aggregate measure is the average, by sector and indicator, of the number of steps actually undertaken. It is simply a presentation of what has happened. The quality or the performance effect of these actions is not yet being discussed. Note that reform and regulation are country-level indicators, whereas governance is measured at the enterprise level.

The resulting list of institutional reforms represents a refinement and extension of previous attempts to generate a global scorecard of institutional reforms for infrastructure sectors. The choice of the indicators was made in consultation with infrastructure sector experts. Operationally relevant indicators were selected, each of which had to meet two conditions: First, an action was chosen if a consensus existed that it represented a "best practice" and was being applied across different sectors. Second, the data needed to calculate the indicator had to be relatively easy to obtain at the sectoral and enterprise levels. Together, the three sets of indicators (reform, regulatory, and governance) summarize the level and type of institutional reforms in any given country (see Figure 4.2). Separately, each indicator serves as a basis for measuring the (aggregate and disaggregate) effect of progress in reforms and enterprise performance.

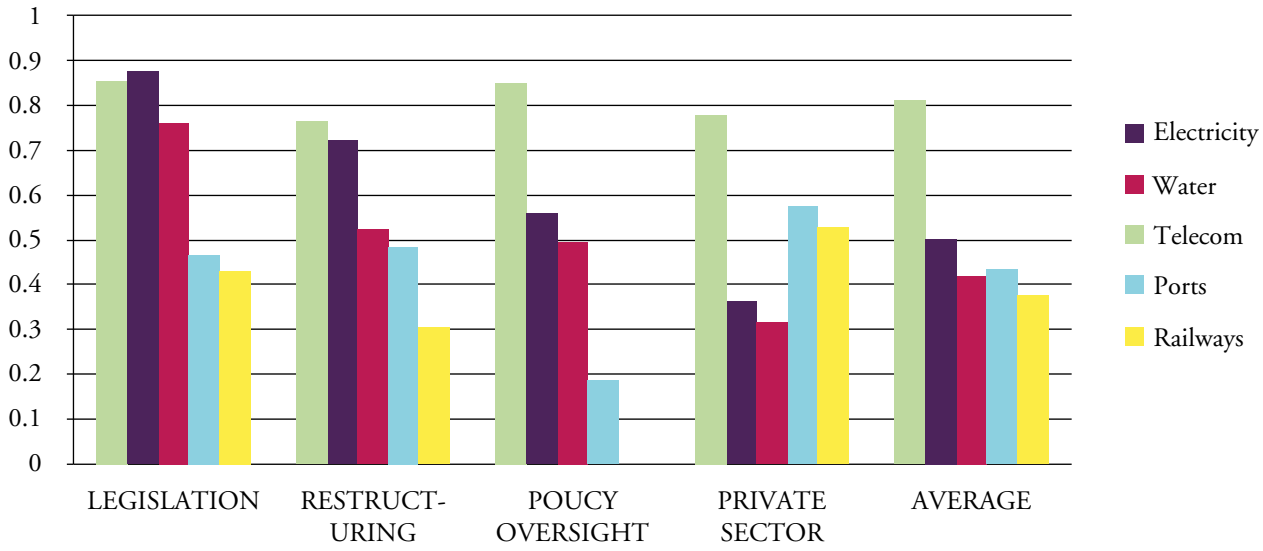
For further discussion and illustration of how institutional indicators can be used to inform policy analysis, refer to: Vivien Foster and Cecilia Briceño-Garmendia. 2009. *Africa's Infrastructure: A Time for Transformation*, chapter 4, "Building Sound Institutions," World Bank, Washington DC.

Figure 4.2 Average institutional scores in regulation, reforms, and governance

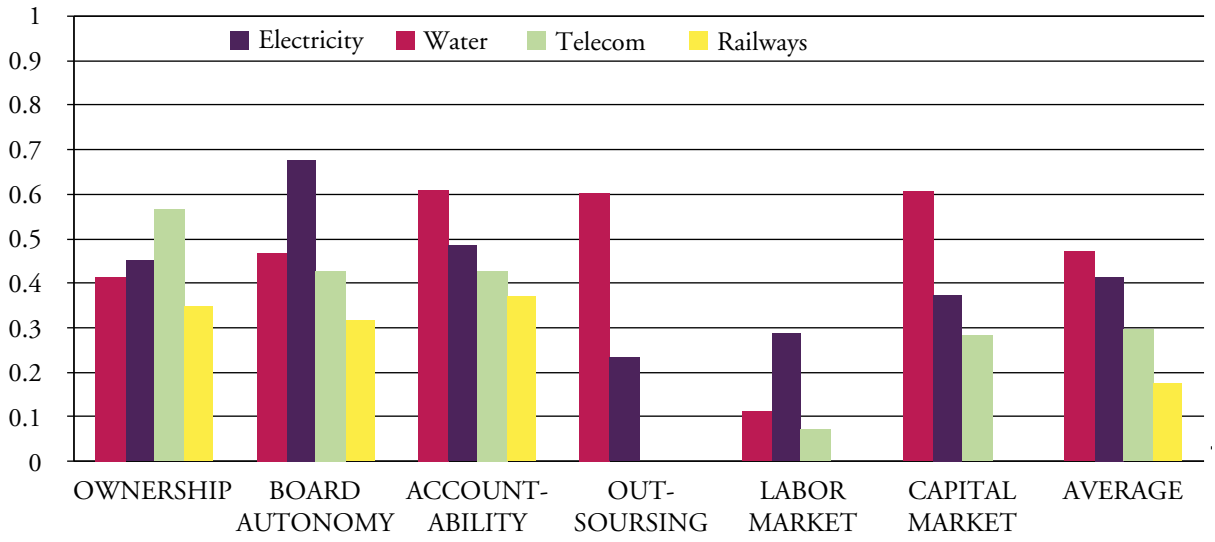
a. Regulatory quality



b. Sectoral reforms



c. Governance quality



Source: Vagliasindi and Nellis 2009.

4.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor a country's institutional and regulatory framework for the utility sectors is provided in Annex A4.1. While the full list of indicators amounts to several hundred items, the indicators can easily be grouped around a smaller number of some 20 primary indicators. A synthetic overview of these primary indicators is provided in Table 4.1.

Institutional indicators take the form of indices that summarize information on a number of underlying institutional variables. There is one overall institutional index, which averages the results obtained on separate indices covering reform, regulation, and governance issues. Each of these indices, as well as the overall index, is calculated separately for the information and communication technology (ICT), power, and water and sanitation sectors. They can also be averaged across sectors to give a cross-sectoral national picture of institutional development. All of these indices are based on the average score on a number of subindices summarizing various pieces of information relevant to some particular aspect of the institutional framework. For example, the regulation index is an average of four subindices covering accountability, autonomy, tools, and transparency.

All of these subindices are based on the average score for a number of underlying categorical variables. These categorical variables are typically in binary form with a value of 1 denoting the presence of the corresponding institutional characteristic and a value of 0 denoting its absence. In some cases, the original variable has more than two categories, but the responses must always be converted to binary form. For example, the tools subindex of the regulation index is based on four underlying variables capturing the existence of a sound tariff review methodology, the practice of tariff indexation, the existence of a periodic tariff review, and the time elapsed between mandatory tariff reviews. Where relevant, benchmarks are calculated to facilitate cross-country comparisons. These benchmarks were introduced in Chapter 3.

4.4 Data Collection

The following Box presents a summary of the cross-cutting generic guidelines and procedures for collecting infrastructure data discussed in detail in Chapter 2. It is necessary to reflect on and understand their relevance to the exercise before the actual data collection starts.

Target institutions

This section describes the type of institutions to approach to gather the information needed to create the institutional indicators described earlier. The target institutions are essentially in three categories:

- *Line ministries* refer to the government ministries responsible for overseeing each of the utility sectors. They should have a detailed understanding of the overall institutional framework for the sector.
- Regulators. Many African countries have established independent regulators and restructured the sector

Table 4.1 Overview of institutional indices and sub-indices

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
General	Institutions: General Index	A=MEAN(B,C,D)	ICT/Power/Water	%	Sector	National	Derived
Reform	Reform: General Index	B=MEAN(E,F,G,H)*100	ICT/Power/Water	%	Sector	National	Institutional template A
	Reform: Legislation Subindex	E	Reform Legal reform Sector law				
	Reform: Policy Oversight Subindex	F	Dispute arbitration Investment plan Regulation Tariff approval Technical standards				
	Reform: Private Sector Involvement Subindex	G	No distress No renationalization No renegotiation PPI de jure PPI de facto Private ownership Private management				
	Reform: Restructuring Subindex	H	Corporatization				
Regulation	Regulation: General Index	C=MEAN(I,J,K,L)*100	ICT/Power/Water	%	Sector	National	Institutional template B
	Regulation: Accountability Subindex	I					
	Regulation: Autonomy Subindex	J					
	Regulation: Tools Subindex	K					
	Regulation: Transparency Subindex	L					
Governance	Governance: General Index	D= MEAN(M,N,O,P,Q,R)*100	ICT/Power/Water	%	Operator	Sector / National	Institutional template C
	Governance: Accounting, Disclosure, Performance Monitoring Subindex	M					
	Governance: Capital Market Discipline Subindex	N					
	Governance: Labor Market Discipline Subindex	O					
	Governance: Managerial and Board Autonomy Subindex	P					
	Governance: Outsourcing Subindex	Q					
	Governance: Ownership and Shareholder Quality Subindex	R					

Source: Author's own elaboration.

Note: ICT = information and communication technology; PPI = private participation in infrastructure.

to promote competition in generation and private sector participation. Regulators can provide detailed information about the functioning of the regulatory framework, but will also have a wealth of information about the broader institutional architecture of the sector.

- *State-owned enterprises* refer to the main infrastructure service providers, such as power and water utilities, national telecommunication incumbent, railway, ports, and others. SOEs should be able to provide detailed information regarding their governance arrangements.

Each sector chapter of this Handbook provides a list of country-specific institutions in its annexes. Each list contains the name and reference information for the target line ministries, regulators, and SOEs in each country as of March 2011. Given the constant change in the sectors, these lists need to be updated each time the data collection is carried out.

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   - Indicate whether the *comma-dot* or *dot-comma* convention will be followed.
   - Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the national statistical offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between *zero*¸ *not available*¸ and *not applicable*: (i) *zero* refers to a situation where data exists but has a value of zero; (ii) *not available* refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) *not applicable* refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

Note: For details refer to chapter 2 of the Handbook on Infrastructure Statistics.

Data templates

The data collection process for each sector divides into a number of parts, each with its corresponding template. Annex A4.2 of this chapter provides the complete set of data collection templates.

- *Institutional template A*. Data for institutional template A is best collected directly from the line ministry. A separate version of institutional template A is filled out for each *sector* (ICT, power, water and sanitation).
- *Institutional template B*. Data for institutional template B is best collected directly from the regulator for each sector, where these exist. Otherwise the information can be obtained from the line ministry. A separate version of institutional template B is filled out for each *sector* (ICT, power, water and sanitation).
- *Institutional template C*. Data for institutional template C is best collected directly from each SOE. A separate version of institutional template C should be filled out for each major state-owned *enterprise* in the country.

Turning to institutional template A in greater detail, there are four blocks of questions covering different aspects of sector reform:

- *Legislation*: The legislation subindex is based on the following block of questions. These questions seek to capture the existence, depth, and maturity of any reform process in the sector, by gauging to what extent the reform process has led to a profound change in the legal framework, and how long these changes have taken before having any real impact on the sector. The responses to most questions are binary and cumulative, meaning that the positive responses given to any question add up to a higher score, denoting a more thorough and mature reform process.
    - *Existence of reform*: Whether or not a government-led reform process has taken place or is taking place in the sector.
    - *Legal reform*: Whether or not a reform process under way has involved changes to legislation.
    - *Sector law*: Whether or not a reform process under way has resulted in the passing of a completely new law for the sector.
    - *Sector law, year*: If a new sector law has been passed, the year in which it was passed.

- *Restructuring*: The restructuring subindex is based on the following block of questions. These questions seek to capture the extent to which the reform process has led to fundamental changes in the scope and responsibilities of sector institutions. The questions are formatted such that institutional good practices result in positive responses; the accumulated responses to every question provide a measure of the advancement toward good practice.
    - *General*: Whether or not reform has resulted in some restructuring of the roles and responsibilities of sector institutions.
    - *Separate regulatory body*: Whether or not reform has resulted in the creation of a separate regulatory body distinct from the line ministry.
    - *Corporatization*: Whether or not reform has resulted in the creation of a separate legal entity responsible for service provision that is distinct from the public administration and has its own separate financial accounts. For example, the water department of a local municipality has now become a separate water utility.
    - *Separation of business lines*: Whether or not reform has resulted in the separation of a number of activities previously undertaken by a single corporation into a number of different business lines, each with its own distinct financial accounts and potentially undertaken by separate corporations. For example, where one telecommunications operator was previously responsible for all aspects of the service, there may now be two operators, one responsible for fixed-line and one for mobile service.
    - *Vertical unbundling*: Whether or not reform has resulted in the creation of separate corporations to provide for different stages in the production of a given service. For example, where one power utility was previously responsible for all aspects of the service, there may now be two power utilities, one responsible for generation and one for transmission and distribution.
    - *Vertical unbundling, year*: Where vertical unbundling has taken place, the year is recorded.

- *Policy oversight*: The policy oversight subindex is based on the following block of questions. These questions seek to capture the existence of clearly assigned institutional responsibilities for oversight of various important aspects of infrastructure services. In each case, the options include the line ministry, a special entity within the ministry, an autonomous regulatory body, some other institution, or none. The responses are later converted into binary variables by giving a value of 1 in cases where some kind of institutions is clearly assigned and 0 otherwise. Since policy oversight of all aspects is important, the greater the number of areas covered, the higher the score on the subindex.

- *Dispute arbitration oversight*: Whether or not reform has clearly assigned responsibility for the arbitration of disputes.
- *Regulation monitoring oversight*: Whether or not reform has clearly assigned responsibility for monitoring the regulatory compliance of infrastructure operators (for example, verifying whether an operator is engaging in anticompetitive practices).
- *Technical standard oversight*: Whether or not reform has clearly assigned responsibility for monitoring compliance with technical service standards (for example, verifying whether drinking water is potable).
- *Investment-plan oversight*: Whether or not reform has clearly assigned responsibility for monitoring compliance with investment plans (for example, whether an operator has implemented required construction projects).
- *Tariff approval oversight*: Whether or not reform has clearly assigned responsibility for monitoring compliance with approved tariffs (for example, whether an operator has increased prices beyond ceilings established by regulation).

- *Private sector involvement*: The private sector involvement subindex is based on the following block of questions. These questions seek to capture whether private sector involvement is legally sanctioned, the extent to which it has taken place, and its sustainability. The higher the number of positive responses, the more advanced is the extent of private sector involvement in the sector.
  - *Private de jure*: Whether or not reform has legally sanctioned the involvement of private operators in infrastructure service provision.
  - *Private de facto*: Whether or not some kind of private sector involvement, once sanctioned, has actually taken place.
  - *Private management*: Whether or not the private sector involvement that has taken place has involved the transfer of managerial responsibilities to the private sector.
  - *Private investment*: Whether or not the private sector involvement that has taken place has involved the transfer of investment responsibilities to the private sector.
  - *Private ownership*: Whether or not the private sector involvement that has taken place has involved the transfer of ownership of infrastructure assets to the private sector.
  - *Absence of distress*: Whether or not the private sector involvement that has taken place has been able to keep the financial operator from falling into financial distress.
  - *Absence of renegotiation*: Whether or not the private sector involvement that has taken place has been able to avoid the renegotiation of the associated contract.
  - *Absence of renationalization*: Whether or not the private sector involvement that has taken place has been able to prevent an ultimate reversion to public ownership.

Turning to institutional template B in detail, there are four blocks of questions covering different aspects of regulation.

- *Autonomy*: The autonomy subindex is based on the following block of questions. These questions seek to capture the extent to which any regulatory body enjoys formal, financial, and managerial autonomy vis-à-vis the public administration. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score and denote a more autonomous regulatory body.
  - *Regulatory body, hiring*: Identifies which of the following parties has the power to hire the head(s) of the regulatory board: president, parliament, line minister, or other. This response is then converted into a binary variable as follows. If the head(s) are appointed by an entity other than the line ministry, the regulatory board is said to enjoy *formal autonomy* with respect to hiring.
  - *Regulatory body, firing*: Identifies which of the following parties has the power to fire the head(s) of the regulatory board: president, parliament, line minister, or other. This response is then converted into a binary variable as follows. If the head(s) can only be fired by an entity other than the line ministry, the regulatory board is said to enjoy *formal autonomy* with respect to firing.
  - *Regulatory body, funding*: Identifies the percentage of a regulator's budget funded by sector levies that revert directly to the regulator without going through the public budget. This response is then converted into two binary variables as follows. If the percentage is 100 percent, the regulatory body is said to enjoy *full financial autonomy*. If the percentage is between 0 and 100 percent, the regulatory body is said to enjoy *partial financial autonomy*.

- *Regulatory body, veto decisions*: Identifies which of the following parties has the power to veto the decisions of the regulator: president, parliament, line minister, or other. This response is then converted into two binary variables as follows. If its decisions cannot be vetoed by any other entity, the regulator is said to enjoy full managerial autonomy. If its decisions can be vetoed by the president or parliament, but not by the corresponding line ministry, the regulator is said to enjoy *partial managerial autonomy.*
- *Regulatory board, year*: The year in which the regulatory board was established.
- *Regulatory board, head*: Whether or not the regulatory board is headed by a committee of some kind.
- *Regulatory board, multisectoral*: Whether or not the regulatory board is responsible for more than one sector.

- *Accountability*: The accountability subindex is based on the following block of questions. These questions seek to capture the extent to which any regulatory body is accountable to regulated entities for its decisions through the appeals process. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting a more autonomous regulatory body.
  - *Appealing*: Whether or not the regulatory framework gives regulated entities the right to appeal regulatory decisions.
  - *Appealing to whom*: Identifies which of the following institutions acts as the appeals body: executive, judiciary, domestic, or international arbitration. These responses are later recoded to indicate whether the appeal body provides full or partial independence to the appeal process. A right of appeal to any body other than the executive is considered to provide at least partial independence, while a right of arbitration is considered to provide full independence

- *Transparency*: The transparency subindex is based on the following block of questions. These questions seek to capture the extent to which regulatory decision making is transparent to public scrutiny. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting a more autonomous regulatory body.
  - *Decision publicly available*: Whether or not the regulatory framework requires the regulator to make its decisions, and the associated arguments on which they are based, available to the public.
  - *Decision publicly available via public hearing*: Whether or not the regulatory framework requires the regulator to make its decisions, and the associated arguments on which they are based, available to the public by means of a public hearing.
  - *Decision publicly available via Internet*: Whether or not the regulatory framework requires the regulator to make its decisions, and the associated arguments on which they are based, available to the public by publishing the relevant technical documents on the Internet.

- *Tools*: The tools subindex is based on the following block of questions. These questions seek to capture the extent to which the regulator has developed the full set of technical tools needed to underpin the regulatory process. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting that the regulator has a better set of technical tools.
  - *Tariff methodology*: Identifies which tariff methodology has been adopted by the regulator, whether a price cap, rate of return, some other, or none at all. The results are later converted to a binary variable, where the adoption of a price cap, rate of return, or some other explicit tariff methodology counts as a positive response.
  - *Tariff indexation*: Whether or not the regulator practices regular indexation of tariffs according to some objective price index. A related question asks how frequently tariffs are indexed.
  - *Tariff review*: Whether or not the regulatory practices a periodic tariff review where a full cost-based recalculation of the tariff is undertaken. A related question asks about the number of years that elapse between tariff reviews.

Turning to institutional template C, there are six blocks of questions covering different aspects of the governance of SOEs.

- *Ownership and shareholder quality*: The ownership and shareholder quality subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise has a clear ownership structure and is financially accountable to its owners. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting superior governance.
  - *Ownership*: Gives the percentage of the enterprise that is owned by different groups: government,

private sector, and employees. These responses are converted into a binary variable in the following way. The enterprise is said to enjoy diversification of ownership as long as it is not owned 100 percent by government.

- *Legal status*: Identifies whether the legal status of the company is an uncorporatized state-owned entity, a corporatized state-owned entity, a limited liability share-owned company, or something else. These responses are converted into a couple of binary variables in the following way. The enterprise is said to enjoy *corporatization* as long as it is not an uncorporatized state-owned entity. The enterprise is said to enjoy limited liability if it is a *limited liability* share-owned company.
- *Rate of return policy*: Whether or not the enterprise is required to earn a rate of return on its assets.
- *Dividend policy*: Whether or not the enterprise is required to pay dividends to its shareholders (even if the state is the sole shareholder).

- *Managerial and board autonomy*: The managerial and board autonomy subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise has the freedom to take decisions in line with its own best commercial interest. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting superior governance.
  - *Size of board*: The number of members of the enterprise board of directors. This response is converted into a binary variable in the following way. The enterprise is said to enjoy a large board as long as the board comprises more than five members.
  - *Selection of board members*: Whether or not the board members are appointed by all shareholders and not only by the government.
  - *Presence of independent directors*: Whether or not there is at least one member of the board of directors who is not a government employee.
  - *Hiring*: Whether or not managers have the most decisive influence in decisions to hire employees.
  - *Laying-off*: Whether or not managers have the most decisive influence in decisions to lay off employees.
  - *Wages*: Whether or not managers have the most decisive influence in setting wages and other aspects of the remuneration package.
  - *Production*: Whether or not managers have the most decisive influence in deciding how much and what kind of products to produce.
  - *Sales*: Whether or not managers have the most decisive influence in deciding to whom output will be sold.

- *Accounting, disclosure, and performance monitoring*: The accounting, disclosure, and performance monitoring subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise practices modern transparent accounting and is held accountable to its shareholders. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting superior governance.
  - External audits: Records whether the enterprise performs operational and financial audits. The data are then converted into a binary variable as follows. If at least an operational audit is performed, the enterprise is considered to be undertaking external audits of performance.
  - Audit publication: Whether or not the enterprise's external audits are routinely published.
  - IFRS: Whether or not the enterprise complies with international financial reporting standards.
  - Publication of annual report: Whether or not the enterprise routinely publishes an annual report.
  - Monitoring: Whether or not the enterprise subjects itself to performance monitoring.
  - Third party monitoring: Whether or not the enterprise subjects itself to performance monitoring by an external third party.
  - Noncommercial: Whether or not the enterprise is explicitly remunerated by the government for discharging loss-making social obligations.
  - Performance contracts: Whether or not the enterprise has signed a performance contract with the government.
  - Performance contracts with incentives: Whether or not the enterprise has signed a performance contract with the government that explicitly incorporates financial incentives to achieve or exceed the associated targets.
  - Penalties for poor performance: Whether or not the enterprise has signed a performance contract with the government that explicitly incorporates financial penalties for failure to achieve the associated targets.

- *Outsourcing*: The outsourcing subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise is contracting

out its activities to third parties as a way of controlling costs. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting superior governance.

- *Information technology*: Whether or not the enterprise is outsourcing information technology services.
- *Human resources*: Whether or not the enterprise is outsourcing human resource services.
- *Meter reading*: Whether or not the enterprise is outsourcing meter reading services.
- *Billing and collection*: Whether or not the enterprise is outsourcing billing and collection services.

- *Labor market discipline*: The labor market discipline subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise has the freedom to treat employees in accordance with market conditions and the dictates of commercial law. The responses to most questions are binary and cumulative: the positive responses given to any question add up to a higher score, denoting superior governance.
  - *Wages*: Whether or not wages are at or close to market levels found in the private sector.
  - *Benefits*: Whether or not benefits are at or close to market levels found in the private sector.
  - *Restriction to dismiss*: Whether or not management faces any restrictions to dismissing employees according to the practices in the code of commercial law.

- *Capital market discipline*: The capital market discipline subindex is based on the following block of questions. These questions seek to capture the extent to which the enterprise is subject to the full financial rigors of market risk, corporate taxation, and capital market conditions. The responses to most questions are binary and cumulative, meaning that any positive responses to them add up to a higher score, denoting superior governance.
  - *Access to debt compared to private sector*: Whether or not the enterprise can only access debt at rates that are at least as high as those prevalent in the local capital markets.
  - *No state guarantees*: Whether the enterprise is not protected from assuming risk by means of state guarantees.
  - *No exemption from taxation*: Whether the enterprise is liable for the full gamut of corporate taxes.

Supporting documents

While most of the variables just outlined are best collected by directly interviewing knowledgeable government employees, it is also valuable to collect relevant sector legislation and regulations against which any ambiguous or unclear responses can be verified. No data from secondary sources are needed to calculate institutional indicators.

4.5 Data Processing

Once the data are collected in accordance with the templates, the process of converting them into usable indicators is relatively straightforward.

- *Conversion to binary variables*. Most variables are already collected as binary indicators structured in such a way that a response of 1 denotes a good performance and a response of 0 a bad performance. This sometimes makes for rather awkward formatting of questions. For example, the template asks whether SOEs are not exempt from taxation (instead of the more natural question of whether they are exempt from taxation), because it is good practice not to exempt SOEs from taxation, and in this way a positive response always indicates good practice and can be added straight to the index. In a few cases, it is difficult to pose the question in binary terms, and therefore numerical or categorical variables are first collected. Detailed instructions of how to convert each categorical variable into a binary variable are given above. *Only binary variables are used in the creation of the indicators.*
- *Aggregation to subindices*. All variables are divided into groups that belong to a particular theme or subindex. In order to convert the binary variables into subindices, the total score on the binary variables is summed and expressed as a percentage of the maximum possible score on that same set of variables; so the subindices are in base 100.
- *Aggregation to indices*. All subindices belong to one of the three main indices: reform, regulation, or governance. In order to convert the subindices into indices, an un-weighted average of the scores across all subindices should be taken. In the case of the governance index, once an overall governance score has been established for each enterprise, an average score across enterprises can be taken to obtain a national index. It is also possible to take an average score across utility sectors to obtain a national score for, say, regulation.
- *Aggregation to overall index*. Finally, an average of all three indices can be taken to create a national score.

A4. Annexes to Chapter 4: Institutions

Annex A4.1 Comprehensive list of indicators and definitions: Institutional

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF001	Reform: General index National (base 100)	Index that ranks the level of effort that a country has in incepting modern reforms to foster competition, private sector participation, independent institutions across all utility infrastructures. A score of 100 indicates the most advanced reform setting.	National	Derived	AVG (REF006) across sectors
	REF002	Reform: Private Sector Involvement: Subindex National (base 100)	Index that ranks how friendly and effective a country is in allowing private participation in infrastructure sectors. A score of 100 indicates the most private participation investment environment.	National	Derived	AVG (REF007) across sectors
	REF003	Reform: Policy Oversight: Subindex National (base 100)	Index that ranks how effective a country is to oversight the well functioning of infrastructure provision. A score of 100 indicates optimal policy oversight.	National	Derived	AVG (REF008) across sectors
	REF004	Reform: Restructuring: Subindex National (base 100)	Index that ranks whether the country is fostering independent operators and vertical separation of the industry. This implicitly assumes that vertical separation and corporatization are desirable institutional objectives. A score of 100 indicates the country has fully corporatized and restructured its infrastructure sectors.	National	Derived	AVG (REF009) across sectors
	REF005	Reform: Legislation: Subindex National (base 100)	Index that ranks whether modern legislation has been recently introduced to support the functioning of infrastructure service providers, private participation, and adequate support of vulnerable users.	National	Derived	AVG (REF010) across sectors
	REF006	Reform: General index Sector (base 100)	Compounded index that ranks the level of effort that a sector within a country has in incepting modern reforms to foster competition, private sector participation, and independent institutions across all utility infrastructures. A score of 100 indicates the most advanced reform setting.	Sector	Derived	AVG (REF010 REF009 REF008 REF007)
	REF007	Reform: Private Sector Involvement: Subindex Sector (base 100)	Index that ranks how friendly and effective a country is to private participation in a specific sector. A scare of 100 indicates the most private participation investment environment.	Sector	Derived	AVG (REF018 REF017 REF016 REF015 REF014 REF013 REF012 REF011) x 100
	REF008	Reform: Policy Oversight: Subindex Sector (base 100)	Index that ranks how effective a country is to oversight the well functioning of the provision of a specific infrastructure service. A score of 100 indicates optimal policy oversight.	Sector	Derived	AVG (REF023 REF022 REF021 REF022 REF020 REF019) x 100
	REF009	Reform: Restructuring: Subindex Sector (base 100)	Index that ranks whether the country is fostering independent operators and vertical separation of the industry. This implicitly assumes that vertical separation and corporatization are desirable institutional objectives. A score of 100 indicates the country has fully corporatized and restructured its infrastructure sectors.	Sector	Derived	AVG (REF035 REF034 REF032 REF031 REF030) x 100

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF010	Reform: Legislation: Subindex Sector (base 100)	Index that ranks whether modern legislation has been recently introduced to support the functioning of the providers within a specific sector, private participation, and adequate support of vulnerable users.	Sector	Derived	AVG (REF037 REF036) x 100
	REF011	Reform: Private Sector Involvement: Absence of Renationalization (1=yes, 0=no)	Positively scores a sector within a country that has been able to avoid renationalization.	Sector	Raw	(blank)
	REF012	Reform: Private Sector Involvement: Private Ownership (1=yes, 0=no)	Positively scores a sector that within a country has been able to develop private ownership of infrastructure operators, even if in the form of partial privatization.	Sector	Raw	(blank)
	REF013	Reform: Private Sector Involvement: Absence of Renegotiation in Private Sector Contracts (1=yes, 0=no)	Positively scores a sector within a country that has been able to avoid renegotiation of contracts with operators.	Sector	Raw	(blank)
	REF014	Reform: Private Sector Involvement: Absence of Distressed Private Sector Contracts (1=yes, 0=no)	Positively scores a sector within a country that has been unaffected by distress, including cancellation or arbitration.	Sector	Raw	(blank)
	REF015	Reform: Private Sector Involvement: Private Sector Investment (1=yes, 0=no)	Positively scores a sector within a country that has been to attract private investment.	Sector	Raw	(blank)
	REF016	Reform: Private Sector Involvement: Private Sector Management (1=yes, 0=no)	Positively scores a sector within a country that has been to attract any form of private sector management via contract or actual privatization.	Sector	Raw	(blank)
	REF017	Reform: Private Sector Involvement: Private de facto (1=yes, 0=no)	Positively scores a sector within a country that has been to develop any form of private sector participation (management, investment, or a mix of the two).	Sector	Raw	(blank)
	REF018	Reform: Private Sector Involvement: PPI de jure (1=yes, 0=no)	Positively scores if private (local or international) participation in the sector is allowed by law.	Sector	Raw	nap
	REF019	Reform: Policy Oversight: Dispute Arbitration Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on dispute resolution is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	if REF024 >0, 1, otherwise 0
	REF020	Reform: Policy Oversight: Regulation Monitoring Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight in regulatory monitoring is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	if REF025 >0, 1, otherwise 0
	REF021	Reform: Policy Oversight: Technical Standard Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight in technical standards is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	if REF026 >0, 1, otherwise 0

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF022	Reform: Policy Oversight: Investment Plan Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight in investment plans is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	if REF027 >0, 1, otherwise 0
	REF023	Reform: Policy Oversight: Tariff Approval Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight in tariff approval is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	if REF029 >0, 1, otherwise 0
	REF024	Reform: Policy Oversight: Arbitration (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that arbitrates disputes.	Sector	Raw	nap
	REF025	Reform: Policy Oversight: Compliance with Regulation (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that monitors and enforces compliance with regulation.	Sector	Raw	nap
	REF026	Reform: Policy Oversight: Technical Standards (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that establishes technical standards and minimum service levels.	Sector	Raw	nap
	REF027	Reform: Policy Oversight: Investment Plans (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that approves investment plans.	Sector	Raw	nap
	REF028	Reform: Policy Oversight: Licenses (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that grants licenses.	Sector	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF029	Reform: Policy Oversight: Tariffs (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)	Categorical value between 0 and 4 that characterizes the body that approves tariffs.	Sector	Raw	nap
	REF030	Reform: Restructuring: Separate Regulatory Body (1=yes, 0=no)	Positively scores a sector within a country that has incepted an autonomous and functional regulatory body.	Sector	Raw	nap
	REF031	Reform: Restructuring: General (1=yes, 0=no)	Positively scores a sector that has incepted sound regulation.	Sector	Raw	nap
	REF032	Reform: Restructuring: Corporatization (1=yes, 0=no)	Positively scores a sector within a country whose utility has been corporatized—that is, it has several or all of these characteristics: a separate legal identity, corporate governance, ring-fenced finances, and partial or full ownership by government. A corporatized utility can be majority or fully government owned.	Sector	Raw	nap
	REF033	Reform: Restructuring: Vertical Unbundling Year (YEAR)	Vertical separation of the sector took place in a given year.	Sector	Raw	nap
	REF034	Reform: Restructuring: Vertical Unbundling (1=yes, 0=no)	Positively scores a sector within a country that by law allows different activities for producing and delivering services being provided by different operators; for example, the power utility does NOT provide generation, transmission, and distribution simultaneously.	Sector	Raw	nap
	REF035	Reform: Restructuring: Separation Of Business Lines (1=yes, 0=no)	Positively scores a sector within a country that by law does not allow operators providing services in a sector being involved in providing services in any other sector; for example, power and water, or water and wastewater, are provided by different operators.	Sector	Raw	nap
	REF036	Reform: Legislation: Legal reform (1=yes, 0=no)	Positively scores a sector within a country where a sector legislation has been passed within the past 10 years.	Sector	Derived	if REF039 =1 AND REF038>2000, 1, otherwise 0
	REF037	Reform: Legislation: Existence of reform (1=yes, 0=no)	Positively scores a sector within a country that has undertaken at least one key reform of the sector.	Sector	Derived	if REF041 =1 OR REF040 =1, 1, otherwise 0
	REF038	Reform: Legislation: Sector Law: Time (YEAR)	Year sector law was passed.	Sector	Raw	nap
	REF039	Reform: Legislation: Sector Law (1=yes, 0=no)	Positively scores a sector within a country that has a law passed by the parliament.	Sector	Raw	nap
	REF040	Reform: Legislation: Past 10 Years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms during past ten years.	Sector	Derived	If REF039 < Current Year - 10, 1, otherwise 0

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF041	Reform: Legislation: 10 or More Years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms.	Sector	Derived	If REF039 > Current Year - 10, 1, otherwise 1
	REG001	Regulation: General Index National (base 100)	Index that ranks the level of effort that a country is incepting modern and not invasive regulations to foster transparency, autonomy, and provide adequate tools for regulation across all utility infrastructures. A score of 100 indicates the most advanced regulatory setting.	National	Derived	AVG (REG006) across sectors
	REG002	Regulation: Tools: Subindex National (base 100)	Index that ranks whether a country has modern, flexible, and transparent mechanisms for tariff setting in infrastructure sectors. A score of 100 indicates good tools.	National	Derived	AVG (REG007) across sectors
	REG003	Regulation: Accountability: Subindex National (base 100)	Index that ranks whether a country has mechanisms for the operators and the users to appeal regulatory decisions taken by the regulatory bodies. A score of 100 indicates that good mechanisms to regulate the regulator are in place.	National	Derived	AVG (REG008) across sectors
	REG004	Regulation: Transparency: Subindex National (base 100)	Index that ranks whether a country has mechanisms to make regulatory decisions public and easily available to operators and users. A score of 100 indicates information on regulation is easily available.	National	Derived	AVG (REG009) across sectors
	REG005	Regulation: Autonomy: Subindex National (base 100)	Index that ranks whether a country has a regulatory body able to work independently without capture by interest groups or being revoked by the government. A score of 100 indicates the regulatory body is independent.	National	Derived	AVG (REG010) across sectors
	REG006	Regulation: General Index Sector (base 100)	Index that ranks the level of effort that a sector within country is incepting modern and not invasive regulations to foster transparency, autonomy, and provide adequate tools for regulation across all utility infrastructures. A score of 100 indicates the most advanced regulatory setting.	Sector	Derived	AVG (REG010 REG009 REG008 REG007)
	REG007	Regulation: Tools: Subindex Sector (base 100)	Index that ranks whether a sector within a country has modern, flexible, and transparent mechanisms for tariff setting in infrastructure sectors. A score of 100 indicates good tools.	Sector	Derived	AVG (REG015 REG014 REG012 REG011) x 100
	REG008	Regulation: Accountability: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms for the operators and the users to appeal regulatory decision taken by the regulatory bodies. A score of 100 indicates that good mechanisms to regulate the regulator are in place.	Sector	Derived	AVG (REG020 REG018 REG017) x 100
	REG009	Regulation: Transparency: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to make regulatory decisions public and easily available to operators and users. A score of 100 indicates information on regulation is easily available.	Sector	Derived	AVG (REG023 REG022 REG021) x 100

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REG010	Regulation: Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has a regulatory bodies able to work independently without capture by interest groups or being revoked by the government. A score of 100 indicates the regulatory body is independent.	Sector	Derived	AVG (REG029 REG028 REG027 REG026 REG025 REG024 REG031 REG030) x 100
	REG011	Regulation: Tools: Length Regulatory Review (1=yes, 0=no)	Positively scores a sector within a country that has tariff reviews in periods not longer than 3 years.	Sector	Derived	if REG013 >=3, 1, otherwise 0
	REG012	Regulation: Tools: Tariff Methodology (1=yes, 0=no)	Positively scores a sector within a country that has a clear tariff methodology set in place.	Sector	Derived	if REG016 >0, 1, otherwise 0
	REG013	Regulation: Tools: Tariff Indexation periodicity (INTEGER)	Number of years elapsed between periodic tariff reviews.	Sector	Raw	nap
	REG014	Regulation: Tools: Tariff Review (1=yes, 0=no)	Positively scores a sector within a country that has periodic tariff reviews in place.	Sector	Raw	nap
	REG015	Regulation: Tools: Tariff Indexation (1=yes, 0=no)	Positively scores a sector within a country that has tariffs indexed (adjusted to inflation).	Sector	Raw	nap
	REG016	Regulation: Tools: Tariff Methodology (0=none, 1=price cap, 2=rate of return, 3=other)	Categorical values between 0 and 3 that characterize the tariff regulation methodology used.	Sector	Raw	nap
	REG017	Regulation: Accountability: Full Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows the possibility to appeal regulatory decisions to independent arbitration.	Sector	Derived	if REG019 >0, 1, otherwise 0
	REG018	Regulation: Accountability: Partial Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows to appeal regulatory decisions to bodies other than government/line ministries.	Sector	Derived	if REG019 >0, 1, otherwise 0
	REG019	Regulation: Accountability: Appealing: to whom (0=Executive, 1=Judiciary, 2= Domestic Arbitration, 3=International Arbitration)	Categorical values between 0 and 3 that characterize to whom regulatory decision appeals can be made.	Sector	Raw	nap
	REG020	Regulation: Accountability: Appealing (1=yes, 0=no)	Positively scores a sector within a country that grants utilities the right to appeal regulatory decisions.	Sector	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REG021	Regulation: Transparency: Decision Publicly Available via Public Hearing (1=yes, 0=no)	Positively scores a sector within a country where public hearings are used to make regulatory decisions publicly available.	Sector	Raw	nap
	REG022	Regulation: Transparency: Decision Publicly Available Internet (1=yes, 0=no)	Positively scores a sector within a country where regulatory decisions are publicly available via Internet.	Sector	Raw	nap
	REG023	Regulation: Transparency: Decision Publicly Available (1=yes, 0=no)	Positively scores a sector within a country where regulatory decisions are publicly available through reports.	Sector	Raw	nap
	REG024	Regulation: Autonomy: Full Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where government agencies, line ministry, or any other state body can veto a regulatory decision.	Sector	Derived	if REG032 <>0,1,2, OR 3, 1, otherwise 0
	REG025	Regulation: Autonomy: Partial Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where entities other that the government or ministries can veto regulatory decisions.	Sector	Derived	if REG032 >1, 1, otherwise 0
	REG026	Regulation: Autonomy: Full Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget fully funded through fees.	Sector	Derived	if REG033 =100%, 1, otherwise 0
	REG027	Regulation: Autonomy: Partial Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget that at least partially is funded through fees and/or donors.	Sector	Derived	if REG033 >100%, 1, otherwise 0
	REG028	Regulation: Autonomy: Formal autonomy - fire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory authorities cannot be fired by government/ line ministry.	Sector	Derived	if REG034 >1, 1, otherwise 0
	REG029	Regulation: Autonomy: Formal autonomy - hire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body is not directly appointed by government/line ministry officials.	Sector	Derived	if REG035 >1, 1, otherwise 0
	REG030	Regulation: Autonomy: RB - head (0=individual, 1=board)	Positively scores a sector within a country whose regulatory body is led by a board (as opposed to a single individual).	Sector	Raw	nap
	REG031	Regulation: Autonomy: RB - multisectoral (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body regulate has jurisdiction in more than one sector.	Sector	Raw	nap
	REG032	Regulation: Autonomy: RB – veto decisions (0=president, 1=line minister, 2=parliament, 3=other)	Categorical values between 0 and 3 that characterize who has the authority to veto decisions of the head or the board.	Sector	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REG033	Regulation: Autonomy: RB – funding (percent)	Percent of the regulatory body funded from fees and/or donors.	Sector	Raw	nap
	REG034	Regulation: Autonomy: RB – firing (0=president, 1=line minister, 2=parliament, 3=other)	Categorical values between 0 and 3 that characterize who has the authority to fire the head or the board.	Sector	Raw	nap
	REG035	Regulation: Autonomy: RB – appointment (0=president, 1=line minister, 2=parliament, 3=other)	Categorical values between 0 and 3 that characterize who appoints the head or the board.	Sector	Raw	nap
	REG036	Regulation: Autonomy: RB – year (YEAR)	Year the regulatory body was created.	Sector	Raw	nap
	GOV001	Governance: General Index National (base 100)	Index that ranks to what degree a country fosters an independent and self-regulating environment for infrastructure operators. A score of 100 indicates the most pro-self-regulating environment for operators.	National	Derived	AVG (GOV008) across sectors
	GOV002	Governance: Capital Market Discipline: Subindex National (base 100)	Index that ranks how intense capital discipline is established for operators through various capital market mechanisms within a country. A score of 100 indicates the capital market discipline is in place.	National	Derived	AVG (GOV009) across sectors
	GOV003	Governance: Labor Market Discipline: Subindex National (base 100)	Index that ranks how intense labor discipline is established for operators through various free labor market mechanisms within a country. A score of 100 indicates the labor market discipline is in place.	National	Derived	AVG (GOV010) across sectors
	GOV004	Governance: Outsourcing: Subindex National (base 100)	Index that ranks whether outsourcing mechanisms are introduced to improve operators' governance within a country. A score of 100 indicates key outsourcing elements are allowed.	National	Derived	AVG (GOV011) across sectors
	GOV005	Governance: Accounting and Disclosure and Performance Monitoring: Subindex National (base 100)	Index that ranks whether the country has mechanisms to account, monitor, and disclose key performance indicators. A score of 100 indicates key mechanisms are in place.	National	Derived	AVG (GOV012) across sectors
	GOV006	Governance: Managerial and Board Autonomy: Subindex National (base 100)	Index that ranks whether the country has mechanisms to avoid interference of governments in operators' managerial decisions. A score of 100 indicates the operator board is substantially autonomous.	National	Derived	AVG (GOV013) across sectors
	GOV007	Governance: Ownership and Shareholder Quality: Subindex National (base 100)	Index that ranks whether the country has in place mechanisms for ownership and shareholder quality. A score of 100 indicates highest quality.	National	Derived	AVG (GOV014) across sectors

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV008	Governance: General Index Sector (base 100)	Index that ranks to what degree there is an independent and self-regulating environment for infrastructure operators in specific sectors. A score of 100 indicates the most pro-self-regulating environment for operators.	Sector	Derived	AVG (GOV014 GOV013 GOV012 GOV011 GOV010 GOV009) across operators within a sector
	GOV009	Governance: Capital Market Discipline: Subindex Sector (base 100)	Index that ranks how intense capital discipline is established for operators through various capital market mechanisms within a sector. A score of 100 indicates that capital market discipline is in place.	Sector	Derived	(AVG (GOV018 GOV015 GOV016) across operators within a sector) x 100
	GOV010	Governance: Labor Market Discipline: Subindex Sector (base 100)	Index that ranks how intense labor discipline is established for operators through various free labor market mechanisms within a sector. A score of 100 indicates that labor market discipline is in place.	Sector	Derived	(AVG (GOV021 GOV020 GOV019)across operators within a sector) x 100
	GOV011	Governance: Outsourcing: Subindex Sector (base 100)	Index that ranks whether outsourcing mechanisms are introduced to improve operators' governance within a sector. A score of 100 indicates key outsourcing elements are allowed.	Sector	Derived	(AVG (GOV028 GOV027 GOV026 GOV025) across operators within a sector) x 100
	GOV012	Governance: Accounting and Disclosure and Performance Monitoring: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to account, to monitor, and to disclose key performance indicators. A score of 100 indicates key mechanisms are in place.	Sector	Derived	(AVG (GOV039 GOV038 GOV029 GOV036 GOV035 GOV034 GOV033 GOV032 GOV031 GOV030) across operators within a sector) x 100
	GOV013	Governance: Managerial and Board Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to avoid interference of governments in operators' managerial decisions. A score of 100 indicates the operator board is substantially autonomous.	Sector	Derived	(AVG (GOV049 GOV048 GOV047 GOV046 GOV045 GOV041 GOV040) across operators within a sector) x 100

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV014	Governance: Ownership and Shareholder Quality: Subindex Sector (base 100)	Index that ranks whether a sector within a country has in place mechanisms for ownership and shareholder quality. A score of 100 indicates highest quality.	Sector	Derived	(AVG (GOV052 GOV051 GOV050 GOV054 GOV053) across operators within a sector) x 100
	GOV015	Governance: Capital Market Discipline: Access to debt, compared to private sector (1=yes, 0=no)	Positively scores an enterprise that has access to debt at rates equal or above the market rate.	Operator	Derived	if GOV017 >0, 1, otherwise 0
	GOV016	Governance: Capital Market Discipline: State guarantees (1=yes, 0=no)	Positively scores an enterprise that does not holds guarantees by the state.	Operator	Raw	nap
	GOV017	Governance: Capital Market Discipline: Access to debt (0=below market rate, 1=equal to market rate, 2= above the market rate)	Categorical values between 0 and 3 that characterize the conditions under which an enterprise has access to debt.	Operator	Raw	nap
	GOV018	Governance: Capital Market Discipline: No exemption from taxation (1=yes, 0=no)	Positively scores an enterprise that is not exempt from any form of taxation (for example, VAT).	Operator	Raw	nap
	GOV019	Governance: Labor Market Discipline: Benefits, compared to private sector (1=yes, 0=no)	Positively scores an enterprise whose employees have benefits compared to private sector (or in between public and private sector).	Operator	Derived	if GOV022 >0, 1, otherwise 0
	GOV020	Governance: Labor Market Discipline: Wages, compared to private sector (1=yes, 0=no)	Positively scores an enterprise whose employees have wages compared to private sector (or in between public and private sector).	Operator	Derived	if GOV023 >0, 1, otherwise 0
	GOV021	Governance: Labor Market Discipline: Restriction to dismiss employees (1=yes, 0=no)	Positively scores an enterprise that has restrictions to dismiss employees either according to corporate law or contract.	Operator	Derived	if GOV024 >0, 1, otherwise 0
	GOV022	Governance: Labor Market Discipline: Benefits (0=comparable to public sector benefits, 1=comparable to private sector benefits, 2=somewhere in between public and private benefits)	Categorical values between 0 and 3 that characterize the enterprise's benefits compared to those in the private and public sector.	Operator	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV023	Governance: Labor Market Discipline: Wages (0=comparable to public sector salaries, 1=comparable to private sector salaries, 2=somewhere in between public and private salaries)	Categorical values between 0 and 3 that characterize the level of the salaries of the operators' employees compared to those the private sector.	Operator	Raw	nap
	GOV024	Governance: Labor Market Discipline: Restriction to dismiss employees (0=public service guidelines, 1= corporate law, 2=performance contract)	Categorical values between 0 and 3 that characterize the framework guiding the enterprise's restrictions to dismiss employees.	Operator	Raw	nap
	GOV025	Governance: Outsourcing: IT (1=yes, 0=no)	Positively scores an enterprise that contracts out information technology services.	Operator	Raw	nap
	GOV026	Governance: Outsourcing: Human Resources (HR) (1=yes, 0=no)	Positively scores an enterprise that contracts out human resources.	Operator	Raw	nap
	GOV027	Governance: Outsourcing: Meter Reading (1=yes, 0=no)	Positively scores an enterprise that contracts out meter reading.	Operator	Raw	nap
	GOV028	Governance: Outsourcing: Billing and collection (1=yes, 0=no)	Positively scores an enterprise that contracts out billing and bill collection.	Operator	Raw	nap
	GOV029	Governance: Accounting and Disclosure and Performance Monitoring: External Audits (1=yes, 0=no)	Positively scores an enterprise that has at least some form of external audit.	Operator	Derived	if GOV037 >0, 1, otherwise 0
	GOV030	Governance: Accounting and Disclosure and Performance Monitoring: Third-party monitoring (1=yes, 0=no)	Positively scores an enterprise that has performance monitoring by an independent entity (private sector auditor).	Operator	Raw	nap
	GOV031	Governance: Accounting and Disclosure and Performance Monitoring: Monitoring (1=yes, 0=no)	Positively scores an enterprise that has a periodic formal monitoring of managerial performance.	Operator	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV032	Governance: Accounting and Disclosure and Performance Monitoring: Penalties Poor Performance (1=yes, 0=no)	Positively scores an enterprise that has penalties for poor performance of managers.	Operator	Raw	nap
	GOV033	Governance: Accounting and Disclosure and Performance Monitoring: PC with incentives (1=yes, 0=no)	Positively scores an enterprise that has performance based incentive systems in which payments and promotion of managers are determined by their performance.	Operator	Raw	nap
	GOV034	Governance: Accounting and Disclosure and Performance Monitoring: Performance Contracts (1=yes, 0=no)	Positively scores an enterprise that has any management or performance contracts made between the enterprise and the responsible government authority.	Operator	Raw	nap
	GOV035	Governance: Accounting and Disclosure and Performance Monitoring: Noncommercial (1=yes, 0=no)	Positively scores an enterprise that remunerates non-commercial activity to the company.	Operator	Raw	nap
	GOV036	Governance: Accounting and Disclosure and Performance Monitoring: Audit Publication (1=yes, 0=no)	Positively scores an enterprise that makes audit results public.	Operator	Raw	nap
	GOV037	Governance: Accounting and Disclosure and Performance Monitoring: External audits (0=none, 1=operational audit, 2=financial and operational audit, 3=external audit, 4=independent audit)	Categorical values between 0 and 3 that characterize the type audit for the firm.	Operator	Raw	nap
	GOV038	Governance: Accounting and Disclosure and Performance Monitoring: IFRS (1=yes, 0=no)	Positively scores an enterprise that follows the International Financial Reporting Standards (IFRS).	Operator	Raw	nap
	GOV039	Governance: Accounting and Disclosure and Performance Monitoring: Publication Annual Report (1=yes, 0=no)	Positively scores an enterprise whose annual reports on enterprise financial performance are available to the public.	Operator	Raw	nap

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV040	Governance: Managerial and Board Autonomy: Presence of Independent Directors (1=yes, 0=no)	Positively scores an enterprise that has at least one independent director on the board.	Operator	Derived	if GOV042 >0, 1, otherwise 0
	GOV041	Governance: Managerial and Board Autonomy: Size of the Board (1=yes, 0=no)	Positively scores an enterprise whose board is larger than a given threshold.	Operator	Derived	if GOV044 =>5, 1, otherwise 0
	GOV042	Governance: Managerial and board autonomy: Independent Directors (INTEGER)	Number of members on the board of directors that are drawn from independent private sector organizations.	Operator	Raw	nap
	GOV043	Governance: Managerial and board autonomy: Board Selection (0= only government, 1=shareholders)	Categorical values between 0 and 3 that characterize the instance that selects board members.	Operator	Raw	nap
	GOV044	Governance: Managerial and board autonomy: Size Board (INTEGER)	Number of members in the board of directors.	Operator	Raw	nap
	GOV045	Governance: Managerial and board autonomy: Sales (1=yes, 0=no)	Positively scores an enterprise whose manager is at liberty of determining to whom the output of the enterprise should be sold	Operator	Raw	nap
	GOV046	Governance: Managerial and board autonomy: Production (1=yes, 0=no)	Positively scores an enterprise that is at liberty to set production levels.	Operator	Raw	nap
	GOV047	Governance: Managerial and board autonomy: Salaries (1=yes, 0=no)	Positively scores an enterprise that is at liberty to set salaries	Operator	Raw	nap
	GOV048	Governance: Managerial and board autonomy: Laying off (1=yes, 0=no)	Positively scores an enterprise that is at liberty to lay off workers if needed.	Operator	Raw	nap
	GOV049	Governance: Managerial and board autonomy: Hiring (1=yes, 0=no)	Positively scores an enterprise that is at liberty to hire workers if needed.	Operator	Raw	nap
	GOV050	Governance: Ownership and Shareholder Quality: Limited Liability (1=yes, 0=no)	Positively scores an enterprise that was established as a limited liability company.	Operator	Derived	if GOV055 =2, 1, otherwise 0
	GOV051	Governance: Ownership and Shareholder Quality: Corporatization (1=yes, 0=no)	Positively scores an enterprise that is corporatized.	Operator	Derived	if GOV055 >0, 1, otherwise 0

Policy	Temp Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV052	Governance: Ownership and Shareholder Quality: Diversification of Ownership (1=yes, 0=no)	Positively scores an enterprise whose ownership is fully diversified.	Operator	Derived	if GOV058 =100%, 0, otherwise 1
	GOV053	Governance: Ownership and shareholder quality: Dividends (1=yes, 0=no)	Positively scores an enterprise that is required to pay dividends.	Operator	Raw	nap
	GOV054	Governance: Ownership and shareholder quality: Rate of Return (1=yes, 0=no)	Positively scores an enterprise that is required to earn a specific rate of return.	Operator	Raw	nap
	GOV055	Governance: Ownership and shareholder quality: Legal Status (0=Uncorporatized state-owned enterprise, 1=corporatized state-owned enterprise, 2=limited liability share-owned company, 3=other)	Categorical values between 0 and 3 that characterize the legal status of the company.	Operator	Raw	nap
	GOV056	Governance: Ownership and shareholder quality: Ownership Employees (Percent)	Percentage of the utility owned by employees.	Operator	Raw	nap
	GOV057	Governance: Ownership and shareholder quality: Ownership Private (Percent)	Percentage of the utility owned by local or foreign private sector.	Operator	Raw	nap
	GOV058	Governance: Ownership and shareholder quality: Ownership (Percent)	Percentage of the utility owned by central or local governments.	Operator	Raw	nap

Note: PPI = producer price index; RB = regulatory body; VAT = value added tax; PC = performance contract.

Annex A4.2 Data collection templates

Institutional template A. Reform variables—national level

Country:
Sector:
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

			New	History
Policy Category	**Temp Code**	**Indicator Name**	**2011**	**2010**
Private Sector	REF011	Reform: Private Sector Involvement: Absence of Renationalization (1=yes, 0=no)		
	REF012	Reform: Private Sector Involvement: Private Ownership (1=yes, 0=no)		
	REF013	Reform: Private Sector Involvement: Absence of Renegotiation in Pr (1=yes, 0=no)		
	REF014	Reform: Private Sector Involvement: Absence of Distressed Private (1=yes, 0=no)		
	REF015	Reform: Private Sector Involvement: Private Sector Investment (1=yes, 0=no)		
	REF016	Reform: Private Sector Involvement: Private Sector Management (1=yes, 0=no)		
	REF017	Reform: Private Sector Involvement: Private de facto (1=yes, 0=no)		
	REF018	Reform: Private Sector Involvement: PPI de jure (1=yes, 0=no)		
Policy Oversight	REF024	Reform: Policy Oversight: Arbitration (0=line Ministry, 1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
	REF025	Reform: Policy Oversight: Compliance With Regulation (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
	REF026	Reform: Policy Oversight: Technical Standards (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
	REF027	Reform: Policy Oversight: Investment Plans (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
	REF028	Reform: Policy Oversight: Licenses (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
	REF029	Reform: Policy Oversight: Tariffs (0=line Ministry,1=Special Entity within Ministry, 2= Autonomous Regulatory Board, 3=Other Institution, 4=Unregulated)		
Restructuring	REF030	Reform: Restructuring: Separate Regulatory Body (1=yes, 0=no)		
	REF031	Reform: Restructuring: General (1=yes, 0=no)		
	REF032	Reform: Restructuring: Corporatization (1=yes, 0=no)		
	REF033	Reform: Restructuring: Vertical Unbundling Year (YEAR)		
	REF034	Reform: Restructuring: Vertical Unbundling (1=yes, 0=no)		
	REF035	Reform: Restructuring: Separation Of Business Lines (1=yes, 0=no)		
Legislation	REF038	Reform: Legislation: Sector Law: Time (YEAR)		
	REF039	Reform: Legislation: Sector Law (1=yes, 0=no)		

Institutional template B. Regulation variables—national level

Country:
Sector:
Utility Name: Non-applicable

Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

			New	History
Policy Category	**Temp Code**	**Indicator Name**	**2011**	**2010**
Tools	REG013	Regulation: Tools: Tariff Indexation periodicity (INTEGER)		
	REG014	Regulation: Tools: Tariff Review (1=yes, 0=no)		
	REG015	Regulation: Tools: Tariff Indexation (1=yes, 0=no)		
	REG016	Regulation: Tools: Tariff Methodology (0=none, 1=price cap, 2=rate of return, 3=other)		
Account-ability	REG019	Regulation: Accountability: Appealing: to whom (0=Executive, 1=Judiciary, 2= Domestic Arbitration, 3=International Arbitration)		
	REG020	Regulation: Accountability: Appealing (1=yes, 0=no)		
Transpar-ency	REG021	Regulation: Transparency: Decision Publicly Available via Public Hearing (1=yes, 0=no)		
	REG022	Regulation: Transparency: Decision Publicly Available Internet (1=yes, 0=no)		
	REG023	Regulation: Transparency: Decision Publicly Available (1=yes, 0=no)		
Autonomy	REG030	Regulation: Autonomy: RB - head (0=individual, 1=board)		
	REG031	Regulation: Autonomy: RB - multisectoral (1=yes, 0=no)		
	REG032	Regulation: Autonomy: RB - veto decisions (0=president, 1=line minister, 2=parliament, 3=Other)		
	REG033	Regulation: Autonomy: RB - funding (Percent)		
	REG034	Regulation: Autonomy: RB - firing (0=president, 1=line minister, 2=parliament, 3=Other)		
	REG035	Regulation: Autonomy: RB - appointment (0=president, 1=line minister, 2=parliament, 3=Other)		
	REG036	Regulation: Autonomy: RB - year (YEAR)		

Institutional template C. Governance variables—utility level

Country:
Sector:
Utility Name: Non-applicable

Collector:
Period of Data:
Collection:
Source(s):
Name of Interviewee:

			New	History
Policy Category	**Temp Code**	**Indicator Name**	**2011**	**2010**
Capital Market	GOV016	Governance: Capital Market Discipline: State guarantees (1=yes, 0=no)		
	GOV017	Governance: Capital Market Discipline: Access to debt (0=below market rate, 1=equal to market rate, 2= above the market rate)		
	GOV018	Governance: Capital Market Discipline: No Exemption from taxation (1=yes, 0=no)		
Labor Market	GOV022	Governance: Labor Market Discipline: Benefits (0=comparable to public sector benefits, 1=comparable to private sector benefits, 2=somewhere in between public and private benefits)		
	GOV023	Governance: Labor Market Discipline: Wages (0=comparable to public sector salaries, 1=comparable to private sector salaries, 2=somewhere in between public and private salaries)		
	GOV024	Governance: Labor Market Discipline: Restriction to dismiss employees (0=public service guidelines, 1= corporate law, 2=performance contract)		
Outsourcing	GOV025	Governance: Outsourcing: IT (1=yes, 0=no)		
	GOV026	Governance: Outsourcing: Human Resources (HR) (1=yes, 0=no)		
	GOV027	Governance: Outsourcing: Meter Reading (1=yes, 0=no)		
	GOV028	Governance: Outsourcing: Billing and collection (1=yes, 0=no)		
Accounting: Disclosure and Monitoring	GOV030	Governance: Accounting and Disclosure and Performance Monitoring: Third-party monitoring (1=yes, 0=no)		
	GOV031	Governance: Accounting and Disclosure and Performance Monitoring: Monitoring (1=yes, 0=no)		
	GOV032	Governance: Accounting and Disclosure and Performance Monitoring: Penalties Poor Performance (1=yes, 0=no)		
	GOV033	Governance: Accounting and Disclosure and Performance Monitoring: PC with incentives (1=yes, 0=no)		
	GOV034	Governance: Accounting and Disclosure and Performance Monitoring: Performance Contracts (1=yes, 0=no)		
	GOV035	Governance: Accounting and Disclosure and Performance Monitoring: Noncommercial (1=yes, 0=no)		
	GOV036	Governance: Accounting and Disclosure and Performance Monitoring: Audit Publication (1=yes, 0=no)		

			New	History
Policy Category	**Temp Code**	**Indicator Name**	**2011**	**2010**
Accounting: Disclosure and Monitoring	GOV037	Governance: Accounting and Disclosure and Performance Monitoring: External audits (0=none, 1=operational audit, 2=financial and operational audit, 3=external audit, 4=independent audit)		
	GOV038	Governance: Accounting and Disclosure and Performance Monitoring: IFRS (1=yes, 0=no)		
	GOV039	Governance: Accounting and Disclosure and Performance Monitoring: Publication Annual Report (1=yes, 0=no)		
Autonomy	GOV042	Governance: Managerial and board autonomy: Independent Directors (INTEGER)		
	GOV043	Governance: Managerial and board autonomy: Board Selection (0= only government, 1=shareholders)		
	GOV044	Governance: Managerial and board autonomy: Size Board (INTEGER)		
	GOV045	Governance: Managerial and board autonomy: Sales (1=yes, 0=no)		
	GOV046	Governance: Managerial and board autonomy: Production (1=yes, 0=no)		
	GOV047	Governance: Managerial and board autonomy: Salaries (1=yes, 0=no)		
	GOV048	Governance: Managerial and board autonomy: Laying off (1=yes, 0=no)		
	GOV049	Governance: Managerial and board autonomy: Hiring (1=yes, 0=no)		
Ownership and Shareholder Quality	GOV053	Governance: Ownership and shareholder quality: Dividends (1=yes, 0=no)		
	GOV054	Governance: Ownership and shareholder quality: Rate of Return (1=yes, 0=no)		
	GOV055	Governance: Ownership and shareholder quality: Legal Status (0=Uncorporatized state-owned enterprise, 1=corporatized state-owned enterprise, 2=limited liability share-owned company, 3=other)		
	GOV056	Governance: Ownership and shareholder quality: Ownership Employees (Percent)		
	GOV057	Governance: Ownership and shareholder quality: Ownership Private (Percent)		
	GOV058	Governance: Ownership and shareholder quality: Ownership (Percent)		

5. Fiscal Spending

5.1 Motivation

Africa is spending $45 billion a year to address its infrastructure needs. This represents roughly half of what would be needed to reach the Millennium Development Goals (MDG) and, specifically, establish basic connectivity across the continent over a period of ten years (Table 5.1). Middle-income countries account for a third of total spending, while the low-income fragile states account for less than 5 percent of the total. For middle-income and resource-rich countries, the private sector is the key source of external finance; meanwhile, for the low-income non-fragile states, overseas development assistance (ODA) is the main source of finance. Finance from outside of the Organisation for Economic Co-operation and Development (OECD) countries is almost on par with ODA in the low-income fragile states.

Though higher than might be expected, the level of effort required of African governments to bolster infrastructure pales when compared to that of East Asian countries in recent decades. China, for example, adopted the clear path of increasing infrastructure investment to accelerate economic growth. Fixed capital formation in China more than doubled between 1998 and 2005. By 2006 capital infrastructure investment was higher than 14 percent of gross domestic product (GDP), perhaps the highest in the world. This is very telling for the future of Africa, as the region is yet to develop institutions and the appropriate investment climate to attract nonpublic financiers.

Overall, Sub-Saharan countries are spending close to 8 percent of GDP on infrastructure (Figure 5.1). The largest effort is among low-income non-fragile states, which spend 10 percent of GDP. The lowest effort is among resource-rich countries, which spend barely 5 percent of GDP and where the level of operations and maintenance (O&M) is very low. Middle-income countries spend mainly on O&M, since most of the assets they need are already in place. By contrast other countries spend mainly on investment, since they are in the process of developing infrastructure.

The public sector, with the lion's share of spending, is by far the most important financier. In the middle-income countries, domestic public sector resources, comprising tax revenues and user charges, account for the bulk of spending across all infrastructures. Across the low-income and resource-rich countries, domestic public sector resources contribute approximately half of total spending. One-third of this aggregate public sector spending, or an equivalent of 1.5 percent of GDP, can be traced exclusively to capital investments.

Considering the fiscal spending allocated to infrastructure, including both capital and O&M spending, most governments in Sub-Saharan Africa spend about 6–12 percent of their GDP each year on infrastructure (Figure 5.2). Roughly half spend more than 8 percent of GDP, while only a quarter of countries spend less than 5 percent, the level commonly encountered among the countries of the OECD. Cape Verde, Ethiopia, and Namibia spend well above 10 percent of their GDP on infrastructure. In the few middle-income countries of the region for which comparative information is available, the level of public spending is between 6 and 8 percent of GDP.

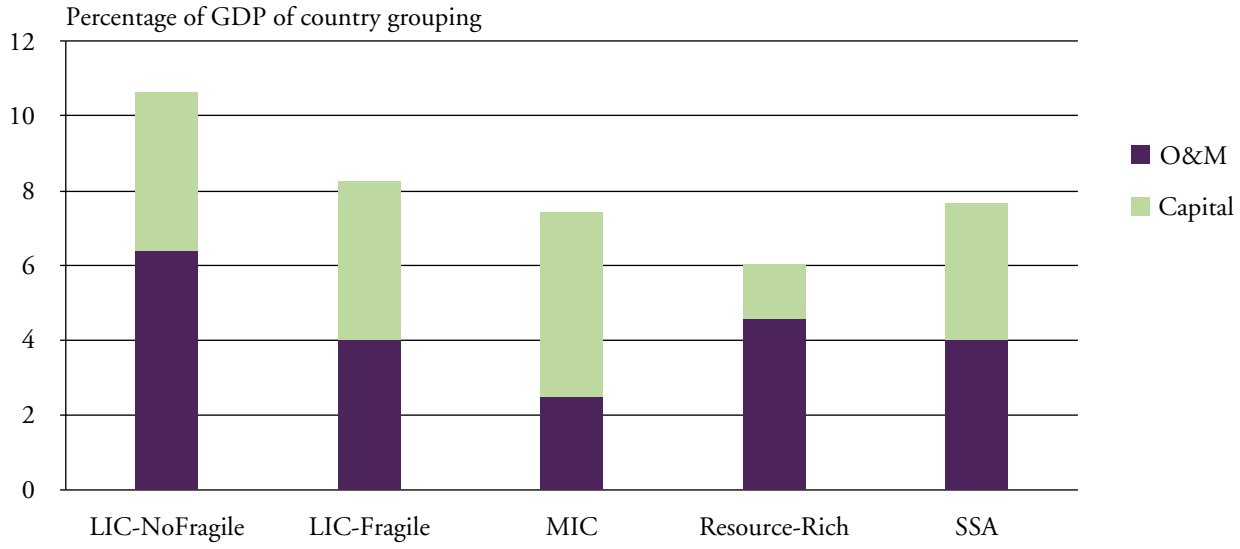
Table 5.1 Annualized overall spending flows, traced to needs

		Capital expenditures					
US$ billion per year	Public sector O&M	Public Sector	ODA	Non-OECD financiers	Private sector	Total	Total
Middle income	10.3	3.1	0.2	0.0	2.3	5.7	16.0
Resource rich	2.5	3.9	0.6	1.7	3.8	10.0	12.5
Low income—not fragile	4.4	1.7	2.6	0.6	2.1	7.0	11.4
Low income—fragile	0.7	0.3	0.4	0.3	0.5	1.4	2.2
Total, Sub-Saharan Africa	**20.4**	**9.4**	**3.6**	**2.5**	**9.4**	**24.9**	**45.3**

Source: Author's own elaboration.

Note: O&M = operations and maintenance; ODA = overseas development assistance; OECD = Organisation for Economic Co-operations and Development.

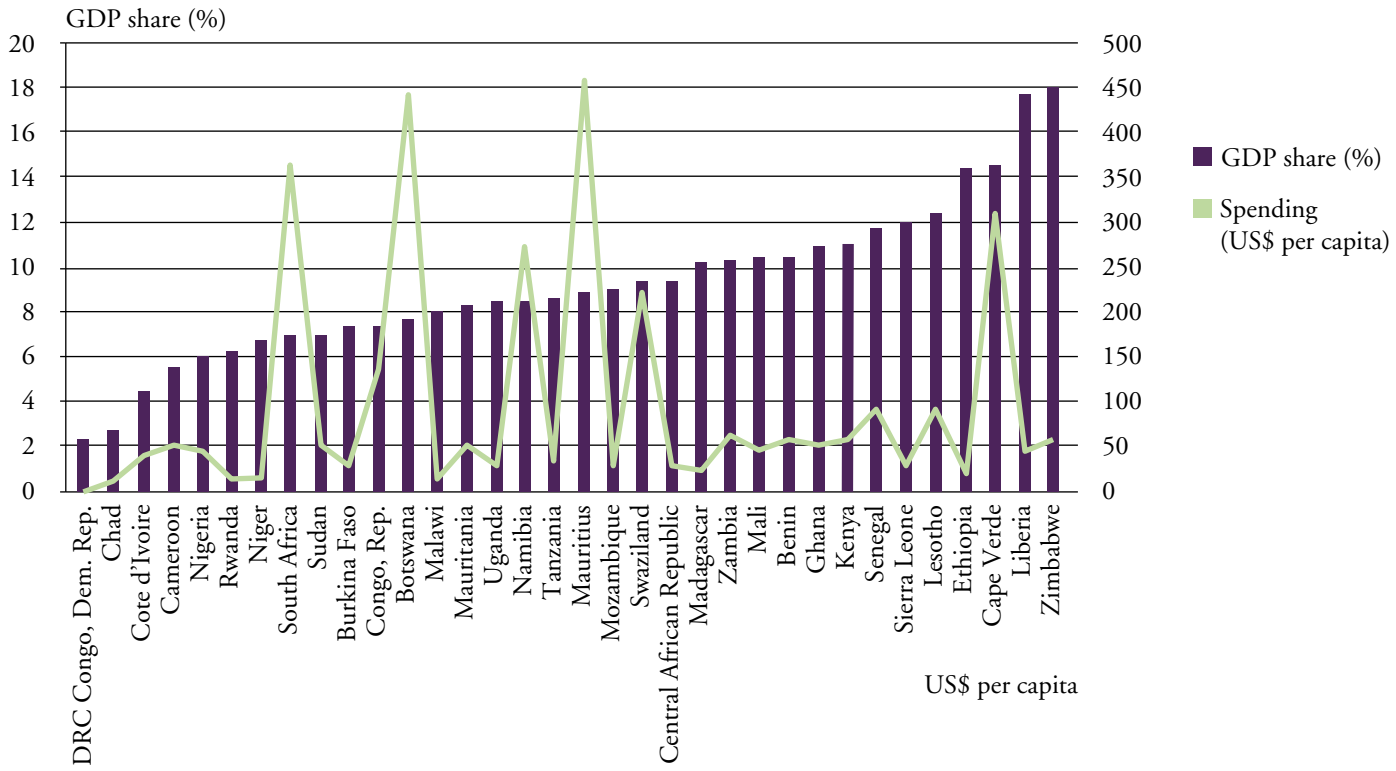
Figure 5.1 Total spending on infrastructure, capital/O&M split



Source: Author's own elaboration.

Note: GDP = gross domestic product; LIC = low-income country; MIC = middle-income country; O&M = operations and maintenance; SSA = Sub-Saharan Africa.

Figure 5.2 Fiscal flows devoted to infrastructure



Source: Africa Infrastructure Country Diagnostic Fiscal Baseline 2008.

Note: Based on annual averages for the period 2001–05.

Expressed as shares of GDP, these fiscal efforts seem larger than when put in dollar terms. Most countries of the region spend less than $600 million a year on infrastructure services; that is less than $50 per person. Among landlocked countries, whose infrastructure needs tend to be particularly high, the annual total is less than $30 per capita. These annual expenditures pale in comparison with the amounts needed. An investment budget of $100 million purchases no more than about 100 megawatts of electricity generation, or 100,000 new household connections to water and sewerage, or 300 kilometers of two-lane paved roads.

5.2 Tracking Performance

This sector synopsis serves to highlight some of the key issues facing the fiscal financing of infrastructure. In order to continue to track sector performance over time, a number of indicators are needed to shed light on each of a number of key policy themes.

While Africa's infrastructure needs are being widely debated, until recently, very little was known about the levels and composition of public expenditure, and aggregate expenditure in general, on infrastructure subsectors that would allow for financing. Most of the analysis has focused on central government accounts and is thus incomplete with respect to the coverage of infrastructure expenditure, much of which is undertaken by sub-national and para-statal entities.

This study presents a detailed and rigorous data collection methodology, with the goal of creating a standardized cross-country comparable data set on public expenditure levels and performance across African countries. The study aims at being comprehensive in its coverage of public expenditure, and as such it covers central and sub-national government expenditures, non-budgetary vehicles (such as road funds and rural infrastructure funds), state-owned enterprises (SOEs), and selected public-private partnerships (PPPs). The methodology is not specific to Africa and therefore equally relevant and applicable to any developing country.

Data are collected in such a way as to permit both classification and cross-classification by economic and functional category. That is, spending on each functional category could be decomposed according to the economic nature of the expense, and vice versa. Functional classification of the major infrastructure subsectors[7] follows as closely as possible the four-digit category or class level of the functional classification (COFOG) proposed in the International Monetary Fund (IMF) Government Financial Statistics Manual 2001 (GFSM 2001).[8] The economic classification of expenses also followed the IMF framework, permitting us to distinguish to some extent between current expenditures, capital expenditures, and various subcategories.[9] Details of these classifications and how to use them will be provided in the coming section of this study.

Broadly speaking, the methodology tracks two types of indicators: quantitative and qualitative. *The qualitative* indicators provide a schematic and, where possible, categorical description of the institutional, process, and general regulatory characteristics guiding the planning, programming, and budgeting of infrastructure services. These describe the resource allocation institutions and processes.

The quantitative indicators document spending flows from governments and publicly owned operators in support of infrastructure service provision. They also capture, to some extent, sources of funding (external funds, tariffs, and user fees). Quantitative indicators aim at covering annual spending (estimates, releases, and actual) for central and local governments, as well as public spending realized through off-budget entities (public corporations, special funds, and so on) whose golden share remains with the public sector. This kind of information can be used to quantify the relative weights of different actors in financing investment and operating assets. For example, there is a marked division of labor between SOEs and central governments. While SOEs account for the bulk of infrastructure spending in most countries, they undertake very little capital spending. Most public capital investments for infrastructure continue to be made through central government budgets, with the resulting assets often transferred to SOEs for subsequent O&M (Figure 5.3).

As shown in Figure 5.4, SOEs have a particularly large role in the middle-income countries, where they account for over 70 percent of all public infrastructure spending. In Namibia, for example, 90 percent of expenditures on infrastructure are made by SOEs. In non-oil-exporting low-income countries, the share of expenditures realized by SOEs is close to 60 percent, or just below two-thirds of total infrastructure spending.

Using the indicators for public spending, it is possible to assess the ability of governments to spend their resources. Tracking spending across the various stages of budget estimates, releases, and actuals allows us to estimate the budget variation (also referred to as budget execution) ratio.

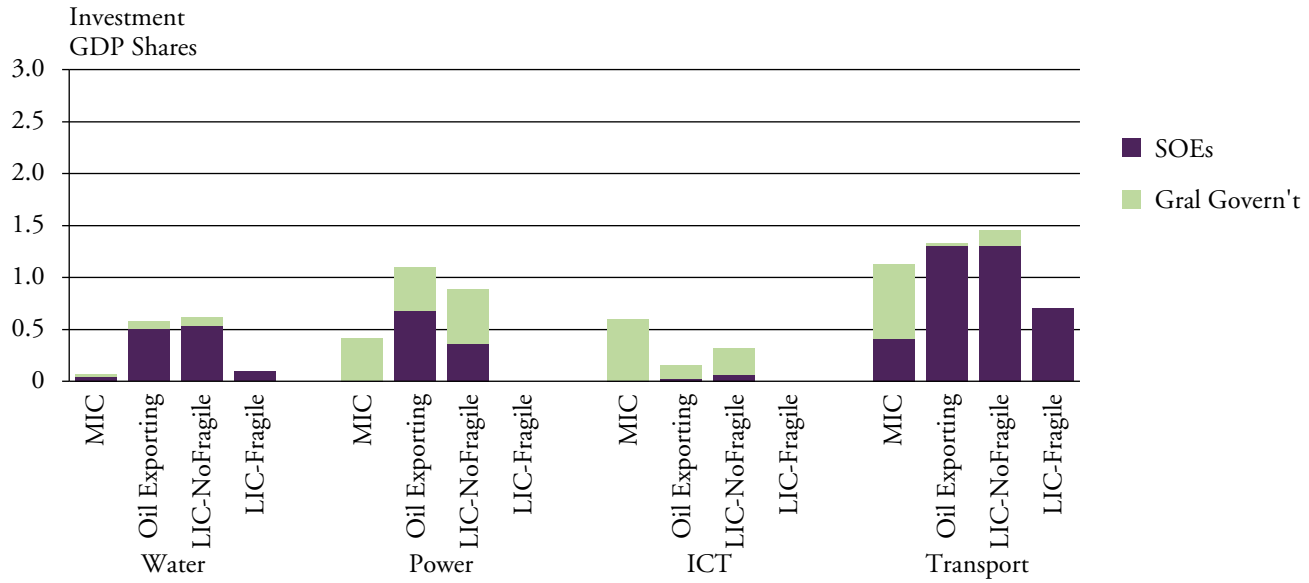
For a number of countries we were able to compare actual capital spending with the amounts originally budgeted. The capital budget execution ratio is defined as the share of actual to budgeted capital spending in each sector. The budget execution ratios that emerged ranged from 28 percent (Benin) to 89 percent (Madagascar), with the average being 66 percent. This means that capital spending in the region might be 50 percent higher if only government agencies had the capability to spend

7 The main categories covered in the study are electricity (0435), road transport (0451), water transport (0452), railway transport (0453), air transport (0454), pipeline and other transport (0455), communication (0460), wastewater management (0520), and water supply (0630). Irrigation spending is estimated as a share of agriculture (0421).

8 Definitions and explanations of the infrastructure cost elements figuring in the database can be found in Briceño-Garmendia (2007).

9 Current expenditures are broken down into compensation of employees, use of goods and services, consumption of fixed capital, interest, subsidies, grants and transfers, social benefits, and other current expenditure. Capital expenditures are broken down into buildings, structures, machinery, and equipment; other fixed assets; and other capital expenditures and transfers of capital expenditures to lower levels of government.

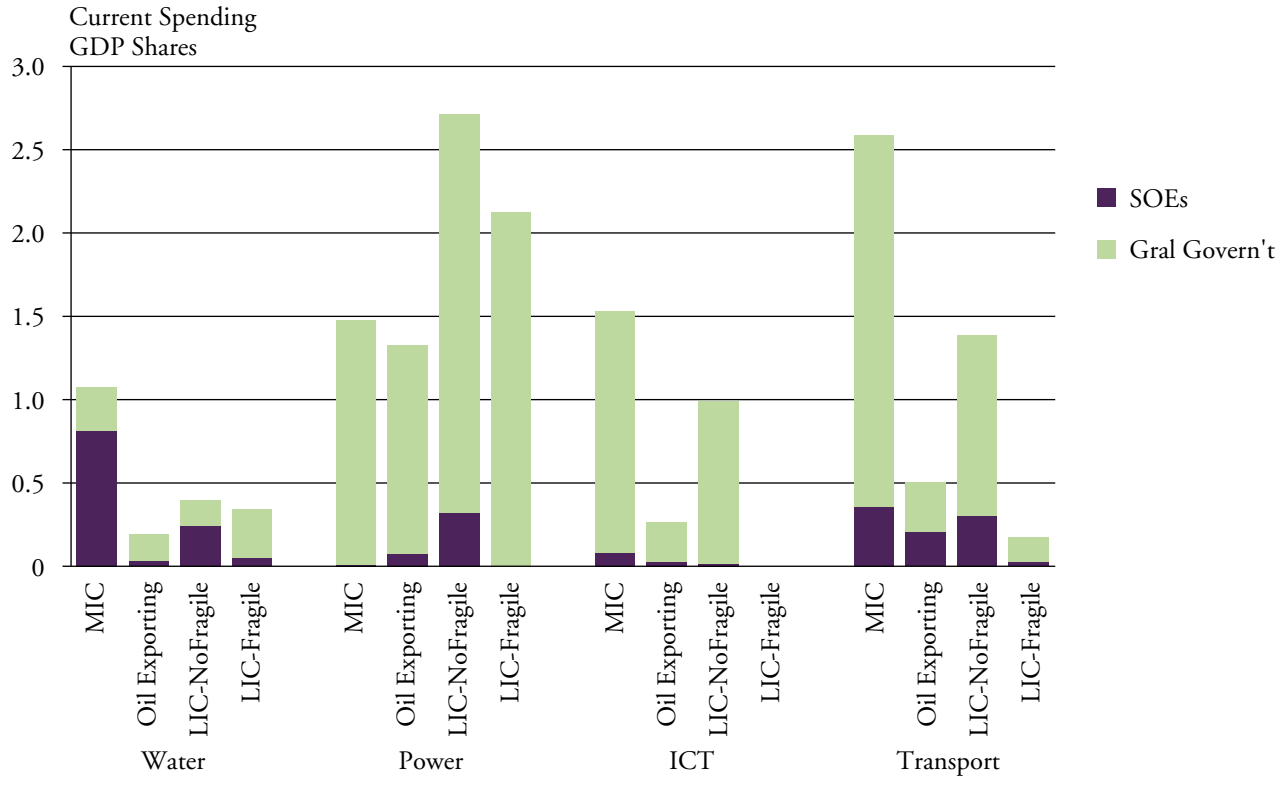
Figure 5.3 Public infrastructure investments by sector and institution



Source: AICD, fiscal baseline 2008.

Note: MIC = middle-income country; LIC = low-income country; GDP = gross domestic product; ICT = information and communication technology; SOE = state-owned enterprise. General Government = budgetary expenditure including where possible spending by sub-national authorities.

Figure 5.4 Public infrastructure-spending by sector and institution

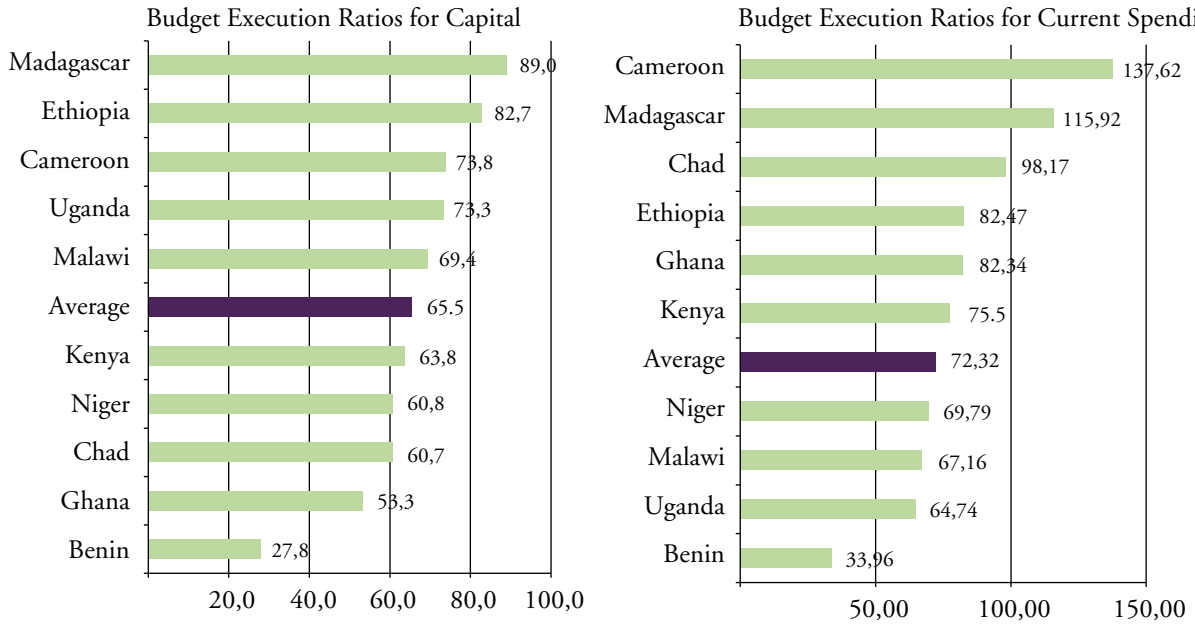


Source: Africa Infrastructure Country Diagnostic, fiscal baseline, 2008.

Note: MIC = middle-income country; LIC = low-income country; GDP = gross domestic product; ICT = information and communication technology; SOE = state-owned enterprise. General Government = budgetary expenditure including where possible spending by sub-national authorities.

all of the resources allocated to them. The problems behind the low execution rates include poor planning, deficiencies in project preparation, and delays in procurement. Budget execution ratios for current spending are, on average, a little higher

Figure 5.5 Budget-variation ratios for capital and recurrent spending



Source: Africa Infrastructure Country Diagnostic, fiscal baseline, 2008.

Note: Based on annual averages for the period 2001–05.

In the aggregate, African countries are unable to spend one-third of their capital budgets and one-fourth of their recurrent budgets (Figure 5.5). Poor timing of project appraisals and late releases of budgeted funds because of procurement problems often prevent resources from being used in the budget year. Delays of in-year fund releases are also associated with poor project preparation, leading to changes in the original terms agreed on with contractors (such as changes in deadlines, technical specifications, budget, costs, and so on). In other cases capital budgets are reallocated to current expenditures because of political or social pressures.

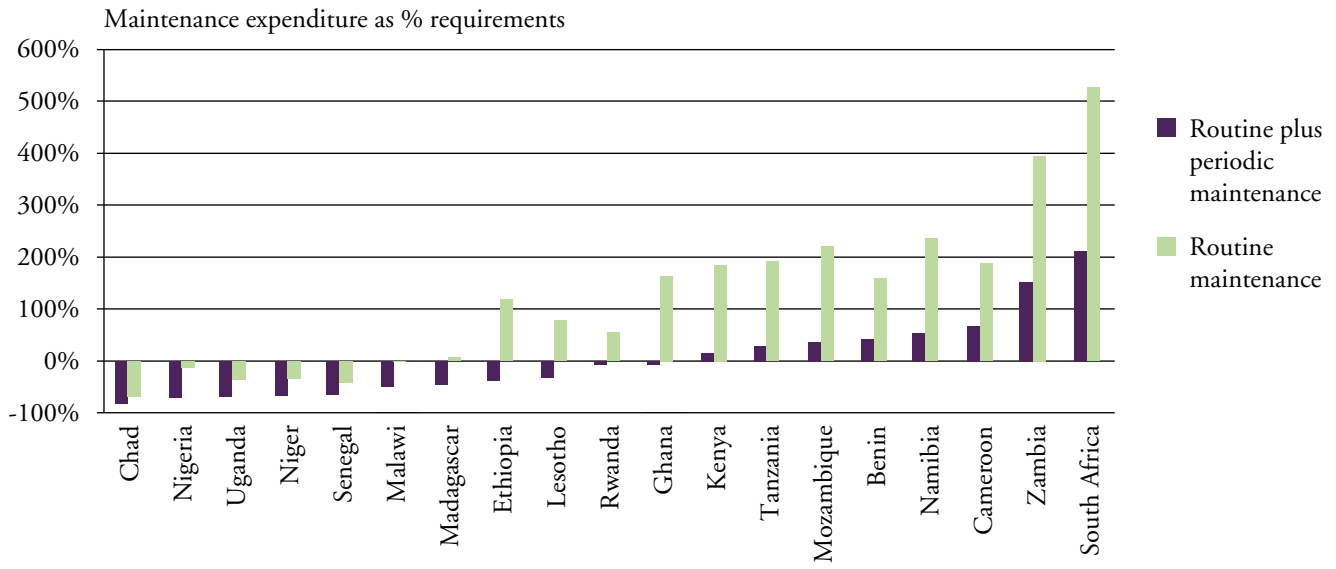
When compared to engineering norms for maintenance, existing levels of annual road maintenance fall short by 40 percent or more in half of the countries (Figure 5.6). Using an engineering model (such as RONET), it is possible to produce detailed estimates of the routine and periodic maintenance requirements for each country's road network, taking into account the current distribution of network condition. On that basis, the maintenance requirements can be compared with the current levels of maintenance expenditure to determine whether these are high enough to preserve the network in good condition. This type of calculation is illustrative, and can be tweaked to control for different scenarios of unit costs.

As alluded to earlier, while most of the capital spending on public infrastructure is done by central governments, the bulk of the fiscal resources on current spending passes through SOEs. Current spending includes spending essential to harness the economic returns of capital such as the flows going into O&M. But most recorded current spending relates to so-called nonproductive expenses, namely wages and salaries for administrative staff or overhead. High levels of recurrent spending may indicate that operational inefficiencies are diverting resources away from investment.

Beyond the efficiency of actual financial flows, SOEs carry most of the O&M of infrastructure assets. Conspicuous operational inefficiencies are not only observable but also quantifiable. Tracking operating performance in power and water utilities indicates that there is widespread operational inefficiency in Sub-Saharan Africa. On average, utilities recover only 70–90 percent of billing, lose 20–35 percent of production in distribution, are overstaffed by 50 percent or more, and recover only 60–70 percent of costs through tariffs and user fees.

Giving a dollar value to these inefficiencies allows us to track them as hidden costs, which are important to gauge. Not only do they give a sense of the scope, scale, and opportunity cost of inefficient operations, but they also help to pinpoint the sources of inefficiency, which may be policy or operational in nature. From a macro perspective, estimating hidden costs is essential for any accurate assessment of a country's budget. The majority of utilities' hidden costs are ultimately financed by subsidies, direct or indirect. In efficiency analysis, adding hidden costs to the level of public spending provides a more realistic proxy

Figure 5.6 Maintenance expenditure as a percentage of requirements



Source: Africa Infrastructure Country Diagnostic, fiscal baseline, 2008; AICD RONET Analysis 2008.

Note: Based on annual averages for the period 2001–05.

of public resource utilization for infrastructure provision, both within and across countries.

Using fiscal indicators combined with physical performance indicators, as will be described later, allows for a first-order calculation of these hidden costs. The total for the whole continent comes to $12 billion a year. Almost two-thirds of this sum ($8 billion) comes from operational inefficiencies such as distribution losses, collection losses, overstaffing, and under-maintenance. A further $4 billion is due to unrecovered costs.

In terms of the economy as a whole, hidden costs average 0.6 percent of GDP in the water sector, and 1.9 percent in the power sector. These overall aggregates mask differences across sectors and among countries (Figure 5.7).

Relative to GDP, hidden costs for power utilities are more than double those for water utilities. The smaller economic size of water utilities, together with their misaligned coverage in the sample (due to decentralization and fragmentation), partially explains the apparently smaller losses. In the water sector, hidden costs amount to no more than 1.5 percent of GDP except in the Democratic Republic of Congo (2.6 percent), while in the power sector, hidden costs are close to zero in South Africa, about 0.2 percent in Benin, and more than 4 percent in Malawi (Figure 5.8).

For more discussion and illustration of how fiscal sector indicators can be used to inform policy analysis, the reader is referred to the following publications:

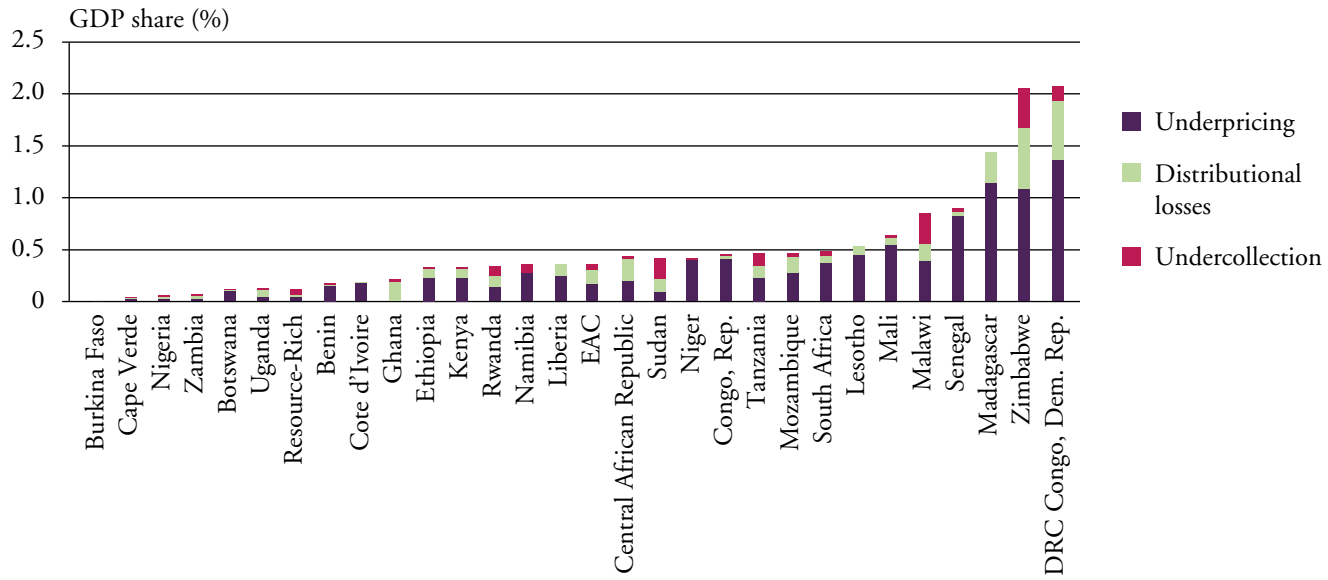
- C. Briceño-Garmendia, K. Smits, and V. Foster. 2008. "Fiscal Costs of Infrastructure in Sub-Saharan Africa." *Africa Infrastructure Country Diagnostic*. World Bank, Washington DC.
- V. Foster and C. Briceño-Garmendia. 2009. *Africa's Infrastructure: A Time for Transformation*, chapter 2, "Closing Africa's Financing Gap." World Bank, Washington DC.

5.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor fiscal spending is provided in Annex A5.1. While the full list of indicators amounts to almost two hundred items, the indicators can easily be grouped around essentially three primary indicators. A synthetic overview of these primary indicators is provided in Table 5.2. The richness of the fiscal indicators comes from their simplicity. The use of three standardized indicators (investment, O&M, and total fiscal spending) across infrastructure sectors (energy, water, ICT, transport, irrigation, sanitation), and public institutions and their grouping (central government, local government, operators, on-budget and off-budget) is a powerful tool to aggregate and to compare levels of spending and efficiency from different perspectives.

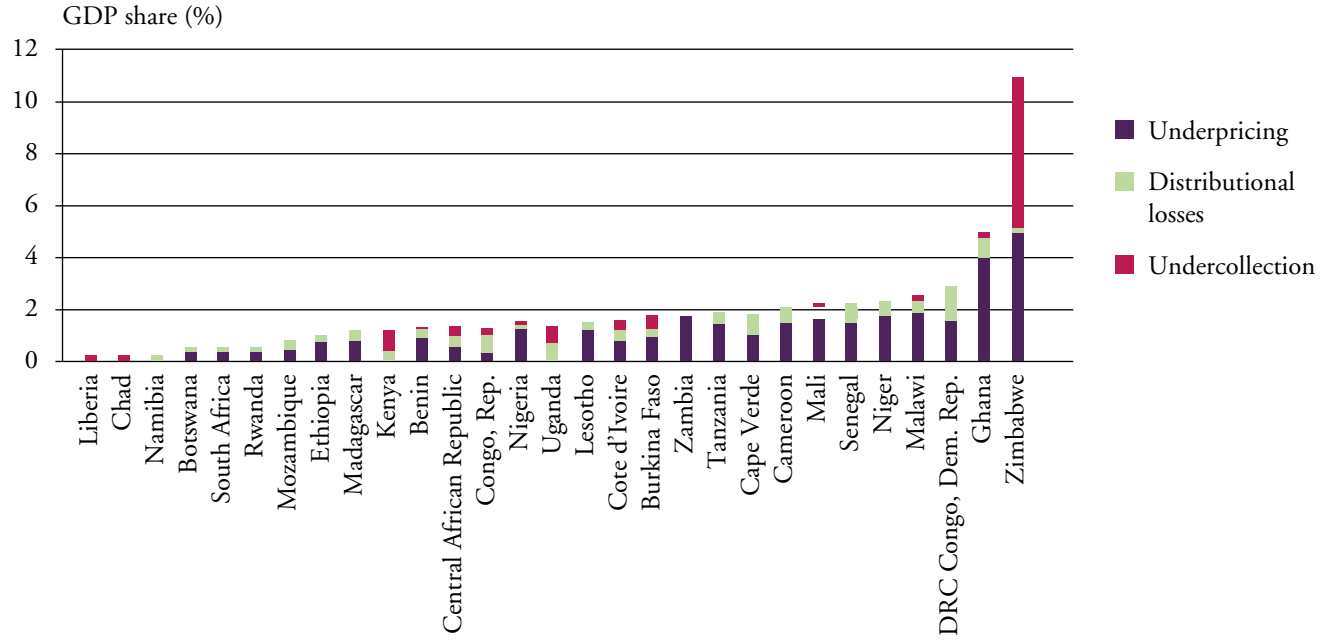
Table 5.2 clarifies how each primary indicator can be expressed in a number of different normalizations. It also indicates that each

Figure 5.7 Hidden costs for water utilities as share of GDP



Source: Authors' own calculations using data from the AICD database.

Figure 5.8 Hidden costs for power utilities as share of GDP



Source: Authors' own calculations using data from the AICD database.

indicator can originate from data collected at the government level or at the level of the operator (utility or special fund) through a process of standardization and aggregation of variables. Finally, the Table lists the suggested aggregations of the fiscal indicators, which is very relevant. Perhaps the primary importance of the fiscal indicators is that, because they are defined cross-sectorally, or rather for all sectors, in a standardized manner, their options for aggregation across sectors, within sectors, across institutions, within institutions and at the national level bring all the infrastructure pieces together into a full picture of how financing is executed and prioritized. Where relevant, benchmarks are calculated to facilitate cross-country comparisons. The fiscal module uses only the general benchmarks already discussed in the introductory chapters.

Table 5.2 Overview of primary indicators for fiscal spending

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Fiscal	Investment	A		\$ % GDP	Government type Operator	National *Institutional Aggregation* On-budget Off-budget Public sector *Sectoral Aggregation* Sector-specific	Fiscal template F Fiscal template G
	Recurrent spending (mostly O&M)	B					
	Total spending	A+B					

Source: Author's own elaboration.

Note: O&M = operations and maintenance; GDP = gross domestic product.

5.4 Data Collection

It is necessary to review the cross-cutting generic guidelines for infrastructure data collection described in Chapter 2 (summarized in the following Box) before the data collection exercise.

Target institutions

The qualitative documentation of target institutions and of their sphere of action is the first and most important step for the successful collection of fiscal data. Given the cross-sectoral nature of fiscal spending indicators, mapping institutions helps define the relationships among different providers and sources of public funds. Since the provision of infrastructure is fragmented and increasingly decentralized, relevant data and information sources are varied and fragmented as well. The fiscal data will only make sense if institutional, legal, and procedural information is clear and well understood. This is because the aggregation and generation of spending indicators require careful processing to avoid double counting while guaranteeing comprehensive (representative) coverage. Splitting expenditures between sectors in some cases, if feasible at all, is an enormous challenge (as is the case in multisector utilities responsible for both water and power, or hydropower investments that involve power and irrigation investment).

Infrastructure institutional mapping also helps in defining the scope and depth of fiscal spending data collection. It is increasingly common to find a myriad of institutions and subnational governments providing infrastructure and channeling public funds. Total spending coverage might not only be impossible, but if possible would be impractical. Establishing the scope and depth of the fiscal data collection should be based primarily on covering key institutions and services to the desired accuracy and using the resources available to carry out the fieldwork. It might be appropriate to focus on the two to three largest subnational governments (to the extent that they are involved in infrastructure service delivery), and the three largest operators for highly decentralized services (such as water).

The institutional mapping should be filled in using the fiscal templates A and B. Both templates capture information at the national level. Fiscal template A organizes all the entities providing, funding, or regulating infrastructure services according to their main source of funds (off-budget and on-budget), the jurisdiction involved (national, subnational) and their functions vis-à-vis infrastructure service provision (formulation of policy, regulation, construction, maintenance, operations). The list should include operators (SOEs, PPPs, and governmental agencies), as well as subnational bodies with responsibility in delivering infrastructure services (see Box 5.1). The template will provide a picture of the fragmentation and possible overlap and duplication of responsibilities between SOEs, the central government (CG), local governments (LGs), and agencies and departments within.

Each cell of the template should be filled with the name of the institution responsible for the particular infrastructure activity, and specify whether the activity is on- or off-budget.

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the comma-dot or dot-comma convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the national statistical offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

Note: For details refer to chapter 2 of the Handbook on Infrastructure Statistics.

Where and when policy responsibilities are shared or ambiguously allocated among institutions, all relevant institutions should be listed. An example is the road subsector where, frequently, there is a shared responsibility between two or more ministries, subnational governments, and off-budget vehicles (as with road funds and agencies). Similarly, the allocation of responsibilities in the water sector is spread among many players, jurisdictions, and on-/off- budget vehicles. In both cases, spending on construction, maintenance, and the operation of assets is spread among many stakeholders and difficult to track. In contrast, policy and regulatory oversights are frequently delegated to one institution.

Operators with mixed public-private ownership generally fall in the off-budget category, and require clarifications in the comments sections regarding their ownership structure and golden-share situations. Policy formulation includes the setting of the legal framework as well as the framework for sector/subsector policy planning, and, in the case of on-budget entities,

Box 5.1 On-budget versus off-budget entities

- On-budget entities are those whose spending patterns and allocations follow regular budget processes of planning, programming, allocation, approval, monitoring, and audit (when applicable). Generally, their financing comes predominantly from taxes or revenues recorded in the public budget. These agencies are under the authority of central, federal, and/or local governments. Examples of these on-budget agencies are the national directorates or departments within line ministries.
- Off-budget entities make their spending decisions following their own planning processes even if they are fully or partially funded through a governmental budget transfer. Off-budget entities commonly have their own financing sources. Traditional funding sources for off-budget vehicles are user charges, tariffs, levies, special revenues of state corporations, donor grants, and so on. State-owned enterprises and operators with public-private capital are examples of entities within this category. So are the so-called special budgetary funds that get most of their resources from user levies and fees. Off-budget vehicles are critical for infrastructure services delivery but tend to be overlooked at the time of tracking spending. But their spending patterns and operational (in)-efficiencies might have fiscal implications (such as contingent liabilities and quasi-fiscal costs) mainly derived from the role of the central government as their main (or even sole) stakeholder and lender of last resort.

programming. Following the general guidelines, if a particular infrastructure function is not applicable to the country or if information is not available, the cell should be filled with "nav" (not available) or "nap" (not appropriate), as relevant; there should be no cell left empty.

Fiscal template B lists special funds channeled to infrastructure. All the special funds listed in fiscal template B should have already appeared in fiscal template A. But template B is necessary to capture some of the institutional nuances existing around these sometimes controversial funds. *Special funds* refer to funds with managerial autonomy, even if partially or fully funded by the government budget. Special funds may be subject to different systems of cash management, control, and reporting than the budget itself; set up under separate legislation; tap into commodity aid and levies; and include revenues earmarked for specific purposes. Such funds are very common for roads, rural infrastructure services, and support to special tariff regimes.

Fiscal template B captures *soft* information that helps characterize and interpret data on institutional arrangements in political and socially sensitive areas. Issues of interest for accurate interpretation include:

- Administrating authorities, which for these funds are multiple and include government representatives, independent boards, and/or third-party administrators
- Funding sources, which may be a combination of user fees, budgetary transfers, and donor contributions
- Fund objectives, which vary depending on the political economy of the country and may range from supporting rural infrastructure to providing emergency infrastructure interventions to supplying maintenance funds

Data templates

The data collection process for the fiscal component divides into a number of parts.

- National level. Two templates, fiscal templates C and D, support the collection of fiscal-related institutional data variables at the national level.
- *Government level*: Two templates, fiscal templates E and F, also support the collection of fiscal-related data at the government level. Fiscal data template E captures quantitative variables related to the overall budget and therefore filled in for the central government only. The best sources for this information are the ministry of finance, ministry of planning, and the budget offices of the parliament. Fiscal data template F collects budgetary flows for the central government and local governments separately and for each sector. This template should also be filled in separately for the different stages of the budget (budget estimates, budget releases, and actual expenses) and, in the case of dual budgets, for each of the budgets (usually development and recurrent). For example, in Uganda, whose central government operates a dual budget, this template should be put together six times for each sector: development budget estimates, development budget releases, development budget actuals, recurrent budget estimates, recurrent budget releases, and recurrent budget actuals. The best sources for this information are the ministries of planning and finance, the parliament, and the published budget laws.
- *Operator level*. Fiscal data template G captures financial variables from SOEs, public corporations or parastatals, and special funds. The best source for this information is the public operator itself, be it a corporation or a special fund.

Fiscal data templates at the national level

Fiscal template C includes factors defining the overall strategic framework, and characterizing the strategic phase of the budget process. It is organized in two blocks:

- *Medium-term expenditure framework, MTEF*. This includes basic questions pertaining to the inception of the framework.
- *Budget*. This characterizes the budget of the country. For a unitary budget the country prepares one and only one document characterizing all the year's spending by functional and economy category. But many countries operate under a dual-budget system, in which the budget is split in two and usually prepared and managed by separates entities within the government. Dual-budget systems generally comprise: (i) a recurrent budget (RB); and (ii) a development budget (DB). In Africa, DBs were convenient mechanisms in the first two decades of independence, when governments were expanding beyond the provision of law and order. DBs were largely about public capital investment such as power supplies, public housing, roads and bridges, schools and universities, and hospital and clinics—although even then they contained activities that were recurrent rather than capital projects, for example, malaria eradication and crop research. Donors were willing to finance this expansion, and separate budgets facilitated the coordination of aid.

  Unlike RBs, DBs historically covered individual projects. Donors preferred DBs since they could closely monitor the projects being financed and identify future projects. The RB, which was financed by domestic revenues, had tight ceilings; the development budget was open ended. The size of the DB was determined by the availability of aid, at the margin an add-on exercise.

  In recent years, the composition of the DB has gradually changed due to the growing inability of domestic budgets to shoulder recurrent costs and the increased ring-fencing of donor-aided projects. Recurrent expenditures go into the DB because they are aid-financed, not because they are capital investments. This blurs the capital/recurrent distinction. Nowadays, projects frequently contain three types of expenditures: (i) new investment; (ii) rehabilitation of poorly maintained past investments (often aid financed); and (iii) recurrent funding.[10]

Fiscal template D covers the budget cycle. The budget cycle diagram provides a chronological scheme of the government budget cycle and approval instances. In the case of a dual-budget system, the separate decision paths for the recurrent and development budgets should be well understood. If easily available, the decision path for SOEs and parastatals should also be understood and documented. Fiscal template D identifies and organizes the following activities in the correct chronological order, and identifies the agency responsible for each step:

- Budget circular drafting
- Budget circular approval
- Budget call
- Current budget guide distribution
- Investment budget criteria distribution
- Current budget proposal
- Current budget negotiations
- Investment budget proposal
- Aggregated budget allocations
- Budget allocations endorsement
- Annual program/investment financing decree
- Budget approval
- Budget law

Fiscal template D: (i) includes the actual names of local institutions; (ii) distinguishes between different types of budgets (recurrent and development, if existent); and (iii) includes a flow diagram, with boxes to represent activities and the responsible institutions. The structure of the process is country specific, and the number of boxes varies by country.

If the medium-term expenditure framework (MTEF) is sufficiently developed so as to be considered an integral part of the budgetary process (as in South Africa and Uganda, for example), the budgetary cycle diagram should be extended to include the calendar and responsibilities for MTEF preparation prior to the issuing of the budget circular.

Fiscal data templates at the government level

The collection of fiscal spending data is one of the most complex components of infrastructure statistics. The standardized collection of spending data demands a potentially elaborate budget recoding of national budgets that is specific to each country and varies in complexity. It also demands a careful expenditure reclassification of financial information for nonfinancial public institutions to guarantee the comparability and consistency of spending categories across operators, sectors, and countries. All the spending concepts need to apply in a standardized manner

10 Excerpts from World Bank (1999), p. 53.

across all fiscal templates, and so taking time to understand key definitions is a prerequisite for filling fiscal templates E and F.

Key definitions

The Functional Classification of Expenditures, or COFOG[11]

The Functional Classification of Expenditures, also known as the Classification of Functions of Government (COFOG), is a detailed classification of the functions, or socioeconomic objectives, that general government units aim to achieve through various kinds of outlays. It is one of a family of four classifications referred to as classifications of expenditure according to purpose.[12]

COFOG provides a classification pertaining to outlays by governments on functions of general interest and amenable to a wide variety of analytic applications. Statistics on health, education, social protection, and environmental protection, for example, can be used to study the effectiveness of government programs in those areas.

The classification codes of COFOG are somewhat different from the structure of other GFS classification codes. The functions are classified using a three-level scheme.[13]

- There are ten first-level or two-digit categories, referred to as divisions. Examples are health (Division 07) and social protection (Division 10).
- Within each division, there are several groups, or three-digit categories, such as hospital services (073) and sickness and disability (101).
- Within each group, there are one or more classes, or four-digit categories, such as nursing and convalescent home services (0734) and disability (1012).

  All outlays for a particular function are collected in one category of COFOG regardless of how the outlays are implemented. That is, cash transfer payments designed to be used for a particular function, the purchase of goods and services from a market producer that are transferred to households for the same function, the production of goods and services by a general government unit, or the acquisition of an asset for that same function are all in the same category. The economic classification of the expense, that is, whether an outlay is used for rehabilitation of existing assets or payment of salaries, and so on, will be given by an additional attribute in the budget item coding.

COFOG permits trends in government outlays on particular functions or purposes to be examined over time. Conventional government accounts are not usually suitable for this purpose because they reflect the organizational structures of governments. Not only might time series be distorted by organizational changes, but at a specific time some organizations may be responsible for more than one function, and responsibility for one function might be divided among several organizations. For example, if a government establishes a new department that brings together some of the functions previously administered by several departments or at several levels of government, it will not usually be possible to use conventional government accounts to compare outlays for these purposes over time.

COFOG is also used for making international comparisons of the extent to which governments are involved in economic and social functions. Just as COFOG avoids the problems of organizational changes in a single government, so too does it avoid the problems of organizational differences among countries. For example, in one country all functions connected with water supply may be undertaken by a single government agency, while in another country they may be distributed among departments dealing with the environment, housing, and industrial development.

The items classified should, in principle, be individual transactions. Each purchase of goods and services, wage payment, transfer, or other outlay should be assigned a COFOG code according to the function that the transaction serves. It is likely that consumption of fixed capital will be difficult to allocate by function, especially if only aggregated figures for total government capital stock and consumption of fixed capital are compiled. In these circumstances, approximations will have to be used. One possibility may be to distribute consumption of fixed capital according to which the assets were acquired. Thus, COFOG statistics should be cross-classified at least with total expense and acquisitions of nonfinancial assets. If administrative outlays overlap two or more classes, an attempt should be made to apportion outlays between the classes concerned. If this approach is not feasible, the total should be allocated to that class that accounts for the largest part of the total outlay.

11 This section includes excerpts from chapter 6 of International Monetary Fund Government Finance Statistics Manual 2001 (GFSM2001).

12 COFOG was produced by the Organisation for Economic Co-operation and Development and was published together with the other three classifications in United Nations, Classifications of Expenditure According to Purpose (New York 2000). Original material of the GFSM2001 regarding COFOG is adapted from that publication.

13 All three classification levels and detailed descriptions of the contents of each class are reproduced in Annex A5.1 as discussed in chapter 6 in IMF's GFSM 2001.

Defining infrastructure outlays using COFOG

The definition of infrastructure sectors for this exercise is limited to infrastructure services supporting economic activities and the services included in the water and sanitation MDG. Annex A5.3a lists the COFOG classes that correspond to that definition. Definitions are provided only for the lowest functional category, that is, a 4-digit category, being used for data collection (Box 5.2). Note that irrigation is the only infrastructure subsector not unambiguously captured by COFOG. Irrigation expenses will be understood as the combination of two cost elements: (i) expenses in irrigation systems, out of the class 70421 (Agriculture), and (ii) 70474 Multipurpose Development Projects.

Economic classification of expenses

The economic classification provides the desirable breakdown of outlays in order to differentiate between the nature of the expenditures (annexes A5.3b and 5.3c).

In terms of the benefits of monitoring infrastructure spending, the GFSM2001 economic classification (COFOG) allows, at the very least, for a very rough distinction between current expenses and capital expenditures. This distinction, even if basic, is extremely important when analyzing infrastructure costs and planning infrastructure needs. The systematic lack of reporting of the capital-maintenance split might well be a government excuse for not provisioning for the maintenance of new investments and existing infrastructure assets in budget papers.

It is also critical to try to capture external financing that can be traced to specific activities. In this regard, two additional categories have been added to the capital expenditure categories so as to single out infrastructure capital spending that has been financed through the budget using external funding.

Description of templates

The data for *fiscal template E* should be gathered from the government. It must be kept in mind that even if definitions used by government are different from the standardized definitions suggested in this Handbook, a proxy for infrastructure spending based on institutions providing services rather than infrastructure services provided by institutions can always be attained. This back-of-the-envelope estimation will guide the user in positioning infrastructure within the overall fiscal framework.

Fiscal template F consolidates the core of the budgetary data and follows definitions and classification of expenditures as presented here and largely based on the Government Financial

Box 5.2 Why are we using the GFSM 2001's economic and functional classification?

Using the GFSM2001 as the starting point for this exercise provides a methodological platform well used and known across countries. It certainly has very important substantive advantages. One of the main advantages is that the GFSM2001 functional classification allows for examining expenditure trends over time regardless of country-specific institutional arrangements or restructuring. Another advantage is the unambiguous definition of the sectoral scope.

The GFSM2001's economic classification, when cross-checked with the functional classification, becomes an enormously powerful tool. But it is important to keep in mind that the GFSM2001 makes it difficult to record expenditures at the microeconomic and sector-specific level

For instance, the IMF economic classification does not provide a definition of rehabilitation. A given country, however, might have its own. The user should flag if the country does not have a clear definition of rehabilitation. In these cases the user should be guided by the following principles in deciding whether a particular expenditure item should be classified as rehabilitation. The line ministries should be in the best position to advise how to best identify rehabilitation activities; in addition, apply these principles:

- Look at the description of the budget line to see whether words such as rehabilitation or refurbishment appear.
- Look for expenditures that relate to major repair and the restoration of degraded existing assets to their original condition without resulting in any upgrading or expansion of capacity.
- Look for large maintenance activities that span more than a one-year duration.

Also, the IMF economic classification does not provide a definition of maintenance, nor does it provide a breakdown good enough to tailor an accurate derived estimation. Given this structural constrain on the reporting format and therefore the way the data are collected, a proxy for maintenance—as good as any other—is to use the category "use of goods and services," which essentially comprises all current expenses excluding wages and salaries, transfers, depreciation, and subsidies. Despite this drawback, using the GFSM2001 facilitates the sustainability of the exercise and cross-country comparison.

Statistics Manual 2001 (GFSM2001).[14] Spending reporting will be done using a cash-based approach.[15] Filling fiscal template F is a very labor-intensive process that involves three steps (i) code-mapping the budget, (ii) extraction of budget lines from budget documents, and, (iii) actual consolidation of data in fiscal template F.

Fiscal template F should be prepared for each sector within the four-digit COFOG sector categories (irrigation, electricity, road transport, oil pipeline, communication, wastewater management and water supply) as well as for each budget type and budget stage.

1. Code mapping the budget

Reporting infrastructure expenses using standardized functional and economic classifications involves a remapping of the country-specific budget classification into the GFSM2001 format. The code mapping has two components: the functional code mapping and the economic code mapping. There is no other phase in the entire infrastructure data collection process where the data collector and the relevant technical people in the country should work as closely together as in the code mapping. The ministry of finance is usually the most relevant partner for the code mapping exercise.

Functional code mapping: The actual functional coding system in use needs to be identified as a starting point. Provided the country uses the GFSM2001, the government expenditure data can be used directly; however, a functional code mapping exercise should be undertaken when the country is not utilizing GFSM2001 (for example when the country utilizes GFS86, United Nations 93, or any other) or for reported years that are previous to the GFMS2001 reporting.

Economic code mapping: There are numerous ways of generating budget lines and/or recording expenses according to their use. For filling fiscal data template F, the data collector needs to group (and in some cases desegregate) expenditures in order to map them into the GFSM2001 economic categories.

During the functional and economic reclassification of expenses, the principle of indivisibility of items applies; the data collector should not split a spending item across multiple categories. In all cases, the collector should reclassify the item in the category that best captures the nature of the item, and properly document the criteria used when performing this code mapping.

2. Extracting budget lines from budget documents

The second step is to identify, in the budget book, all functional codes and list them in a spreadsheet including the economic nature of the expenditure. Then list budget data in a spreadsheet by functional classification. That is, based on the functional code mapping, remove/ignore all the functions from the budget that are NOT relevant to infrastructure (for example, Affaires étrangères, Services concernant le sport, Enseignement Sécondaire and so on). The spreadsheet should only contain infrastructure-related functions and the corresponding data and figures for each.

3. Consolidating data in fiscal template F

After the relevant budget lines have been extracted, and all functional and economic codes mapped to the relevant COFOG categories, it is then necessary to calculate the totals for each economic classification (by function) and input them into the corresponding cell of fiscal template F.

Fiscal data templates at the operator level

Fiscal template G consists of three parts: the income statement, the cash flow statement, and the balance sheet. Fiscal template G should be prepared for each public operator and/or special fund with clear responsibilities in the delivery (or funding) of activities within the 4-digit COFOG sector categories: irrigation, electricity, road transport, oil pipeline, communication, wastewater management, and water supply. Enter all figures in the income statement, the cash flow, and the balance sheet as positive figures, unless there is a loss.

Supporting documents

Fiscal data documents are generally collected from central ministries (finance and economic planning) as well as from key line infrastructure ministries, autonomous agencies, parastatals, and nongovernmental organizations (NGOs). Therefore, involvement of key official and technical personnel is critical. The best guidance for which institutions to target for document search is the updated institutional mapping presented in the fiscal template A.

In a number of cases, a country has one or more central coordinating agencies that constitute a single data source, thus saving time and increasing the consistency of data and documentation. The identification of this type of coordinating agency is to be done by the statistical office and is country specific. For instance, in some countries the auditor general's office compiles

14 Government Finance Statistics Manual 2001 (GFSM2001), International Monetary Fund, www.imf.org/external/pubs/ft/gfs/manual/.

15 In the GFSM2001 framework, transactions should be recorded on an accrual basis (flows are recorded at the time economic value is created, transformed, exchanged, transferred, or extinguished) in contrast to a cash basis (flows are recorded when the money is received, which means that nonmonetary transactiona might not be fully integrated in the accounting system). It suffices for this work to use the GFSM2001 reporting. Even for countries that have adopted the GFMS2001, use it exclusively for transaction reporting rather than transaction *recording*.

Table 5.3 Indicative checklist of data sources and documents

Source	Key Documents
Ministry of Finance or equivalent (MoF), the Central Planning Unit or equivalent	Central Government Budgets (including approved budget, release and actual) and Budget Speech
Central Planning Unit or Local Governments	Local Government Budgets (either consolidated total or three largest authorities)
MoF, Central Planning Unit, SOEs and/or Line Ministry	Annual Reports of SOEs and Special or Extra Budgetary Funds (income statement, balance sheet, cash flow statement)
MoF, Central Planning Unit, SOEs and/or Line Ministry	List of ongoing investment projects in infrastructure (current)
MoF and/or Central Planning Unit	Medium Term Expenditure Framework Document
MoF	Relevant acts or laws relating to public financial management;
World Bank	Country Financial Accountability Assessment (CFAA)
International Monetary Fund	Fiscal Transparency—Report on Observation of Standards and Codes
International Monetary Fund	Recent Economic Developments

SOE financial accounts; the bureau of statistics is another good source of financial data in some countries.

There are essentially five types of documents to collect:

- *Approved budgets*. The budget law as approved by the parliament. These are final budget estimates that have been authorized by parliament, consisting of original estimates and supplementary budgets.
- *Actual budgets*. The funds actually spent (compared against the authorized budget), as recorded in the financial report.
- *Annual reports/financial accounts*. The end-of-the year document published or internally made available for SOEs and special funds, reporting their annual performance and financial accounts.
- *Audited budgets and annual reports*. The final actual budgets and annual reports after the auditing process. These might not be available for all countries. A document is considered audited when it has been revised and approved using a comprehensive set of audit policies and standards. These should be based upon the best international practices, such as the auditing standards published by the International Organization of Supreme Audit Institutions (INTOSAI) and prepared by the International Auditing Practices Committee of the International Federation of Accountants (IFAC).
- *Medium-term expenditure framework document*. This is a framework for integrating fiscal policy and budgeting over the medium term by linking a system of aggregate fiscal forecasting to a disciplined process of maintaining detailed medium-term budget estimates by ministries reflecting existing government policies. Forward estimates of expenditures become the basis of budget negotiations in the years following the budget, and the forward estimates are reconciled with final outcomes in fiscal outcome reports.

Table 5.3 provides a tentative list of the national and international institutions from which to gather fiscal documents. These are the target institutions that need to be approached for data collection in this sector.

Data from secondary sources

Most of the data needed to produce the indicators are collected from the field. Nevertheless there are also a number of variables that are taken directly from secondary sources. These variables and their corresponding sources relate to macroeconomic variables used for normalization, and nonpublic investment data (see Table 5.4).

5.5 Data Processing

The very detailed results of the data collection process are aggregated, keeping the data collected from government budgets and operators' financial accounts separate. They are then organized into primary indicators.

Table 5.4 List of fiscal complementary data variables and sources

Policy Code	Variable	Source
Noninfra-structure	GDP	African Development Bank Data Portal http://www.afdb.org/en/knowledge/statistics/data-portal/
	Average exchange rate	
	Population	
Financial	Investment—ODA	Organization for Economic Cooperation and Development (OECD) http://stats.oecd.org/WBOS/Index.aspx?DatasetCode=CRSNEW
	Investment—PPI	World Bank http://ppi.worldbank.org/
	Investment—non-OECD	*Building Bridges: China's Growing Role as Infrastructure Financier for Sub-Saharan Africa* (Foster, V., W. Butterfield, C. Chen, and N. Pushak, 2008) World Bank, Washington DC

Note: ODA = overseas development assistance; OECD = Organisation for Economic Co-operations and Development; PPI = Private Participation in Infrastructure

In the case of government spending (either central or local), the study uses fiscal template F to collect raw data, in local currency, based on the economic and functional recoding of the budget books. The variables there become components of the primary indicators in a standard way (Table 5.5).

In the case of operators, understood as utilities and special funds, the study uses fiscal template G to collect raw data, in local currency units, following as much as possible the international standards for financial reporting of nonfinancial public institutions. The variables collected there become components of the primary indicators in a standard way (Table 5.6). While the estimate for current expenditures is a straightforward summation, for investment the AICD experience has shown that data are sketchy at best. The suggested approach in this case is to use investment flows when they are available from cash flow statements; otherwise use the changes in asset value over time from the balance sheet.

Table 5.5 Creating primary fiscal indicators from fiscal template F

Primary Indicators	Components
Investment	Buildings, structures, machinery & equipment Rehabilitation Other fixed assets Other capital expenditures Transfers of capital expenditures to lower levels of governments External funding: earmarked for projects
Recurrent spending (mostly O&M)	Wages & salaries Social contributions Use of goods and services: maintenance Use of goods and services: other Consumption of fixed capital Interest Subsidies to public corporations Subsidies to private enterprises Grants and transfers (current) Other current expenditure

Table 5.6 Creating primary fiscal indicators from fiscal template G

Primary Indicators	Components
Investment	*If both available use* Capitalized rehabilitation costs (increase in the period) Purchase of property, plant, and equipment *Otherwise* Gross value of capitalized rehabilitation costs Gross value of property, plant, and equipment Book value of fixed assets sold
Recurrent spending (mostly O&M)	Total employee compensation Purchase of goods and services directly used in production Fuel cost Power purchase agreement (PPA) fees Other purchase of goods and services Rent Depreciation & amortization Misc. taxes/fees (property and so on) Other operating expenditures

The aggregation of the fiscal primary indicators along two dimensions, institutional and functional, allows for the analysis of fiscal spending by sector, whether it is carried out through on- or off-budget channels and in any relevant institutional-sectoral combination. It also allows for calculating fiscal spending at the national level, bringing together all the infrastructure sectors and institutions into aggregates of spending that ultimately facilitate planning for and assessing funding gaps and characterizing the potential sources of additional financing.

Finally, from an institutional perspective, spending by central and local governments can be aggregated into on-budget spending, and spending by operators can be aggregated into off-budget spending. These aggregations are performed for all operators within a sector or all operators in a country (Table 5.7).

Table 5.7 Aggregation of primary fiscal indicators

Public Sector	On-Budget	*Central Government*
		Local Governments
	Off-Budget	Operator (SOEs)
		Operator (Special Fund)

A5. Annexes to Chapter 5: Fiscal spending

Annex A5.1 Comprehensive list of indicators and definitions: Fiscal

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F001**	Total spending – public sector (US$)	Sum of capital and recurrent spending for government and SOEs across the country. (US$)	National	Derived	=F002+F003
	F002	Investment – public sector (US$)	Sum of capital spending for government and SOEs across the country. (US$)	National	Derived	= sum of F011 across sectors
	F003	Recurrent spending (mostly O&M) – public sector (US$)	Sum of recurrent spending for government and SOEs across the country. (US$)	National	Derived	= sum of F012 across sectors
	F004	Total spending – on-budget (US$)	Sum of capital and recurrent spending for government across the country. (US$)	National	Derived	=F005+F006
	F005	Investment – on-budget (US$)	Sum of capital spending for government across the country. (US$)	National	Derived	= sum of F014 across sectors
	F006	Recurrent spending (mostly O&M) – on-budget (US$)	Sum of recurrent spending for government across the country. (US$)	National	Derived	= sum of F015 across sectors
	F007	Total spending – off-budget (US$)	Sum of capital and recurrent spending for SOEs across the country. (US$)	National	Derived	=F008+F009
	F008	Investment – off-budget (US$)	Sum of capital spending for SOEs across the country. (US$)	National	Derived	= sum of F017 across sectors
	F009	Recurrent spending (mostly O&M) – off-budget (US$)	Sum of recurrent spending for SOEs across the country. (US$)	National	Derived	= sum of F018 across sectors
	F010	Total spending – public sector (US$)	Sum of capital and recurrent spending for government and SOEs for the sector. (US$)	Sector	Derived	=F011+F012 within sector
	F011	Investment – public sector (US$)	Sum of capital spending for government and SOEs for the sector. (US$)	Sector	Derived	=F014+F017 within sector
	F012	Recurrent spending (mostly O&M) – public sector (US$)	Sum of recurrent spending for government and SOEs for the sector. (US$)	Sector	Derived	=F015+F018 within sector
	F013	Total spending – on-budget (US$)	Sum of capital and recurrent spending for government for the sector. (US$)	Sector	Derived	=F014+F015 within sector
	F014	Investment – on-budget (US$)	Sum of capital spending for government for the sector. (US$)	Sector	Derived	=F019+F021 within sector
	F015	Recurrent spending (mostly O&M) – on-budget (US$)	Sum of recurrent spending for government for the sector. (US$)	Sector	Derived	=F020+F022 within sector

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F016**	Total spending – off-budget (US$)	Sum of capital and recurrent spending for SOEs for the sector. (US$)	Sector	Derived	=F017+F018 within sector
	F017	Investment – off-budget (US$)	Sum of capital spending for SOEs for the sector. (US$)	Sector	Derived	= sum F045 across operators within sector
	F018	Recurrent spending (mostly O&M) – off-budget (US$)	Sum of recurrent spending for SOEs for the sector. (US$)	Sector	Derived	= sum F046 across operators within sector
	F019	Investment – CG (US$)	Capital expenditure of central government for the sector. (US$)	Sector-Government type	Derived	If F023 is different from #N/A, then F023 otherwise if F025 is different from #N/A, then F025 otherwise if F027 is different from #N/A, then F027
	F020	Recurrent spending (mostly O&M) – CG (US$)	Recurrent expenditure of central government for the sector. (US$)	Sector-Government type	Derived	If F024 is different from #N/A, then F024 otherwise if F026 is different from #N/A, then F026 otherwise if F028 is different from #N/A, then F028
	F021	Investment – LG (US$)	Capital expenditure of local government for the sector. (US$)	Sector-Government type	Derived	If F029 is different from #N/A, then F029 otherwise if F031 is different from #N/A, then F031 otherwise if F033 is different from #N/A, then F033
	F022	Recurrent spending (mostly O&M) – LG (US$)	Recurrent expenditure of local government for the sector. (US$)	Sector-Government type	Derived	If F030 is different from #N/A, then F030 otherwise if F032 is different from #N/A, then F032 otherwise if F034 is different from #N/A, then F034
	F023	Investment – CG-Actual (US$)	Capital expenditure of central government for the sector – Actual. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F042 for CG-A-Dev <> #N/A) and (F042 for CG-A-Rec <> #N/A) then sum (F042 for CG-A-Dev) and (F042 for CG-A-Rec) otherwise (F042 for CG-A-Rec)
	F024	Recurrent spending (mostly O&M) – CG-Actual (US$)	Recurrent expenditure of central government for the sector ¬Actual. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F043 for CG-A-Dev <> #N/A) and (F043 for CG-A-Rec <> #N/A) then sum (F043 for CG-A-Dev) and (F043 for CG-A-Rec) otherwise (F043 for CG-A-Rec)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F025**	Investment – CG-Release (US$)	Capital expenditure of central government for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F042 for CG-R-Dev <> #N/A) and (F042 for CG-R-Rec <> #N/A) then sum (F042 for CG-R-Dev) and (F042 for CG-R-Rec) otherwise (F042 for CG-R-Rec)
	F026	Recurrent spending (mostly O&M) – CG-Release (US$)	Recurrent expenditure of central government for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F043 for CG-R-Dev <> #N/A) and (F043 for CG-R-Rec <> #N/A) then sum (F043 for CG-R-Dev) and (F043 for CG-R-Rec) otherwise (F043 for CG-R-Rec)
	F027	Investment – CG-Estimate (US$)	Capital expenditure of central government for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F042 for CG-E-Dev <> #N/A) and (F042 for CG-E-Rec <> #N/A) then sum (F042 for CG-E-Dev) and (F042 for CG-E-Rec) otherwise (F042 for CG-E-Rec)
	F028	Recurrent spending (mostly O&M) – CG-Estimate (US$)	Recurrent expenditure of central government for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	For government = CG if (F043 for CG-E-Dev <> #N/A) and (F043 for CG-E-Rec <> #N/A) then sum (F043 for CG-E-Dev) and (F043 for CG-E-Rec) otherwise (F043 for CG-E-Rec)
	F029	Investment – LG-Actual (US$)	Capital expenditure of local government(s) for the sector – Actual. (US$)	Sector-Government type-Budget stage	Derived	sum F035 across LGi
	F030	Recurrent spending (mostly O&M) – LG-Actual (US$)	Recurrent expenditure of local government(s) for the sector – Actual. (US$)	Sector-Government type-Budget stage	Derived	sum F036 across LGi
	F031	Investment – LG-Release (US$)	Capital expenditure of local government(s) for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	sum F037 across LGi
	F032	Recurrent spending (mostly O&M) – LG-Release (US$)	Recurrent expenditure of local government(s) for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	sum F038 across LGi
	F033	Investment – LG-Estimate (US$)	Capital expenditure of local government(s) for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	sum F039 across LGi

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F034**	Recurrent spending (mostly O&M) – LG-Estimate (US$)	Recurrent expenditure of local government(s) for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	sum F040 across LGi
	F035	Investment – LGi-Actual (US$)	Capital expenditure of local government for the sector – Actual. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F042 for LGi-A-Dev <> #N/A) and (F042 for LGi-A-Rec <> #N/A) then sum (F042 for LGi-A-Dev) and (F042 for LGi-A-Rec) otherwise (F042 for LGi-A-Rec)
	F036	Recurrent spending (mostly O&M) – LGi-Actual (US$)	Recurrent expenditure of local government for the sector- Actual. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F043 for LGi-A-Dev <> #N/A) and (F043 for LGi-A-Rec <> #N/A) then sum (F043 for LGi-A-Dev) and (F043 for LGi-A-Rec) otherwise (F043 for LGi-A-Rec)
	F037	Investment – LGi-Release (US$)	Capital expenditure of local government for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F042 for LGi-R-Dev <> #N/A) and (F042 for LGi-R-Rec <> #N/A) then sum (F042 for LGi-R-Dev) and (F042 for LGi-R-Rec) otherwise (F042 for LGi-R-Rec)
	F038	Recurrent spending (mostly O&M) – LGi-Release (US$)	Recurrent expenditure of local government for the sector – Release. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F043 for LGi-R-Dev <> #N/A) and (F043 for LGi-R-Rec <> #N/A) then sum (F043 for LGi-R-Dev) and (F043 for LGi-R-Rec) otherwise (F043 for LGi-R-Rec)
	F039	Investment – LGi-Estimate (US$)	Capital expenditure of local government for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F042 for LGi-E-Dev <> #N/A) and (F042 for LGi-E-Rec <> #N/A) then sum (F042 for LGi-E-Dev) and (F042 for LGi-E-Rec) otherwise (F042 for LGi-E-Rec)
	F040	Recurrent spending (mostly O&M) – LGi-Estimate (US$)	Recurrent expenditure of local government for the sector – Estimate. (US$)	Sector-Government type-Budget stage	Derived	For each LGi government if (F043 for LGi-E-Dev <> #N/A) and (F043 for LGi-E-Rec <> #N/A) then sum (F043 for LGi-E-Dev) and (F043 for LGi-E-Rec) otherwise (F043 for LGi-E-Rec)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F041**	Total spending – government (US$)	Sum of capital and recurrent spending for government and SOEs across the country. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F042+F043
	F042	Investment – government (US$)	Sum of capital spending for government and SOEs across the country. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F075 +F077+F078+F079-F080-F081
	F043	Recurrent spending (mostly O&M) – government (US$)	Sum of recurrent spending for government and SOEs across the country. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F65+F67+F68+F69+F71+F72+F73+F74
	F044	Total spending – operator (US$)	Sum of capital and recurrent spending for government across the country. (US$)	Sector-Operator	Derived	=F045+F046
	F045	Investment – operator (US$)	Sum of capital spending for government across the country. (US$)	Sector-Operator	Derived	If both F101 and F100 are available then = F101+F100 , if only F101 is available then =F101 , otherwise = F107(t)-F107(t-1)+F106(t)-F106(t-1)+F098
	F046	Recurrent spending (mostly O&M) – operator (US$)	Sum of recurrent spending for government across the country. (US$)	Sector-Operator	Derived	=F083 +F084 +F087+F088+F090+F091
	F047	total spending – public sector (% of GDP)	Sum of capital and recurrent spending for government and SOEs across the country. (% of GDP)	National	Derived	=F001*100/x002
	F048	Investment – public sector (% of GDP)	Sum of capital spending for government and SOEs across the country. (% of GDP)	National	Derived	=F002*100/x002
	F049	Recurrent spending (mostly O&M) – public sector (% of GDP)	Sum of recurrent spending for government and SOEs across the country. (% of GDP)	National	Derived	=F003*100/x002
	F050	total spending – on-budget (% of GDP)	Sum of capital and recurrent spending for government across the country. (% of GDP)	National	Derived	=F004*100/x002
	F051	Investment – on-budget (% of GDP)	Sum of capital spending for government across the country. (% of GDP)	National	Derived	=F005*100/x002
	F052	Recurrent spending (mostly O&M) – on-budget (% of GDP)	Sum of recurrent spending for government across the country. (% of GDP)	National	Derived	=F006*100/x002
	F053	total spending – off-budget (% of GDP)	Sum of capital and recurrent spending for SOEs across the country. (% of GDP)	National	Derived	=F007*100/x002

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F054**	Investment – off-budget (% of GDP)	Sum of capital spending for SOEs across the country. (% of GDP)	National	Derived	=F008*100/x002
	F055	Recurrent spending (mostly O&M) – off-budget (% of GDP)	Sum of recurrent spending for SOEs across the country. (% of GDP)	National	Derived	=F009*100/x002
	F056	total spending – public sector (% of GDP)	Sum of capital and recurrent spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	=F010*100/x002
	F057	Investment – public sector (% of GDP)	Sum of capital spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	=F011*100/x002
	F058	Recurrent spending (mostly O&M) – public sector (% of GDP)	Sum of recurrent spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	=F012*100/x002
	F059	total spending – on-budget (% of GDP)	Sum of capital and recurrent spending for government for the sector. (% of GDP)	Sector	Derived	=F013*100/x002
	F060	Investment – on-budget (% of GDP)	Sum of capital spending for government for the sector. (% of GDP)	Sector	Derived	=F014*100/x002
	F061	Recurrent spending (mostly O&M) – on-budget (% of GDP)	Sum of recurrent spending for government for the sector. (% of GDP)	Sector	Derived	=F015*100/x002
	F062	total spending – off-budget (% of GDP)	Sum of capital and recurrent spending for SOEs for the sector. (% of GDP)	Sector	Derived	=F016*100/x002
	F063	Investment – off-budget (% of GDP)	Sum of capital spending for SOEs for the sector. (% of GDP)	Sector	Derived	=F017*100/x002
	F064	Recurrent spending (mostly O&M) – off-budget (% of GDP)	Sum of recurrent spending for SOEs for the sector (% of GDP)	Sector	Derived	=F018*100/x002
	F065	Compensation of Employees (US$)	Consists of all compensation of government employees including social contributions by employers. It includes pay in cash or in kind. Social contributions paid by deduction from employees' wages and salaries are included in this category. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F113/x003
	F067	Use of Goods and Services: Maintenance (US$)	Routine and periodic spending in order to keep the value of the asset and its functioning. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F115/x003

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F068**	Use of Goods and Services: Other (US$)	All other expenditure on goods and services. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F116/x003
	F069	Consumption of Fixed Capital (US$)	Consumption of fixed capital is the decline in the value of the stock of fixed assets during the accounting period as a result of physical deterioration, normal obsolescence, and normal accidental damage. Consumption of fixed capital related to fixed assets used in own account capital formation is excluded from this category and included as part of the value of the asset produced. It is always a noncash expense. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F117/x003
	F071	Subsidies to Public Corporations (US$)	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to public corporations that are intended to compensate for operating losses. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F119/x003
	F072	Subsidies to Private Enterprises (US$)	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to private enterprises that are intended to compensate for operating losses. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F120/x003
	F073	Grants and Transfers (Current) (US$)	This category captures transfers of conditional grants for financing current spending to lower levels of local government. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F121/x003
	F074	Other Current Expenditure (US$)	Other current expenditure. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F122/x003
	F075	CAPEX: Buildings, Structures, Machinery & Equipment (US$)	Explicit spending flows allocated to capital investment during the period recorded. Includes flows into new assets and rehabilitation of existing ones. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F123/x003

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F076**	Rehabilitation (US$)	If the government does not classify rehabilitation expenditures, it will be useful to state the approximate amount used for rehabilitation. This can be done by estimating capital expenditures on new fixed assets and then deducting that from total capital expenditures. Alternatively the split between new and rehabilitation expenditures can be allocated on a project-by-project basis. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F124/x003
	F077	CAPEX: Other Fixed Assets (US$)	Other fixed assets consist of cultivated assets and intangible fixed assets. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F125/x003
	F078	Other Capital Expenditures (US$)	Includes capital expenses not elsewhere classified for example capital tax and compensation for damages caused by natural disasters. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F126/x003
	F079	Transfers of Capital Expenditures to Lower Levels of Governments (US$)	This category captures transfers of conditional grants for capital financing to lower levels of local government. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F127/x003
	F080	External Funding: Budget Support (US$)	External funding that enters the budget with no earmarking but that can be traced to infrastructure sectors. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F128/x003
	F081	External Funding: Earmarked for Projects (US$)	External funding earmarked for specific projects. (US$)	Sector-Government type-Budget stage-Budget type	Derived	=F129/x003
	F082	Revenues from Sales (US$)	The total revenue the public corporation has received from the sales of the services produced. In the case of special funds revenues may include levies, sector-specific taxes, and so on. (US$)	Sector-Operator	Derived	=F130/x003
	F083	total Employee Compensation (US$)	total wages and social contributions paid to the workers and others for delivering the services. (US$)	Sector-Operator	Derived	=F131/x003
	F084	Purchase of Goods and Services Directly Used in Production (US$)	The corporation's purchase of goods and services necessary to produce the services delivered. (US$)	Sector-Operator	Derived	=F132/x003
	F085	Fuel Cost (US$)	Expenditures by the public corporation on the purchase of electricity, oil, or other fuel inputs. (US$)	Sector-Operator	Derived	=F133/x003

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F086**	Power Purchase Agreement (PPA) Fees (US$)	Expenditures on power purchase agreements (PPAs). (US$)	Sector-Operator	Derived	=F134/x003
	F087	Other Purchase of Goods and Services (US$)	The corporation's purchase of goods and services other than those necessary to produce the services delivered. (US$)	Sector-Operator	Derived	=F135/x003
	F088	Rent (US$)	The rent paid to the owner of assets enabling the public corporation to produce the services. (US$)	Sector-Operator	Derived	=F136/x003
	F089	Depreciation & Amortization (US$)	The amount of depreciation and amortization that the public corporation has deducted for the year. Depreciation and amortization are the terms used for the systematic allocation of the capitalized cost of an asset to income over its useful life. Strictly speaking, depreciation represents the allocation of the cost of tangible fixed assets, amortization refers to the cost of intangible assets. (US$)	Sector-Operator	Derived	=F137/x003
	F090	Misc. Taxes/Fees (Property Etc.) (US$)	Various taxes (other than corporate profit taxes) which the public corporation has to pay. (US$)	Sector-Operator	Derived	=F138/x003
	F091	Other Operating Expenditures (US$)	Other expenditures that the public corporation has incurred and that are not captured above, if any. (US$)	Sector-Operator	Derived	=F139/x003
	F092	Direct Foreign Grants (US$)	Foreign grants which the public corporation has received but which have not been posted on the central government budget or local government budget. (US$)	Sector-Operator	Derived	=F144/x003
	F093	Transfers/Subsidies from Government (US$)	The subsidies that the public corporation has received from the local or general government for supporting service delivery. (US$)	Sector-Operator	Derived	=F145/x003
	F094	Revenue from Irregular Activities (US$)	Revenue produced by activities that are not part of the regular company operations. (US$)	Sector-Operator	Derived	=F146/x003
	F095	Fixed Assets Selling Price (US$)	Revenue received from the sale of property, plant, and equipment, if any. (US$)	Sector-Operator	Derived	=F147/x003
	F096	Other Nonoperating Revenue (US$)	Other nonoperating revenue that the public corporation has earned but that is not included above. (US$)	Sector-Operator	Derived	=F148/x003
	F097	Irregular Activities Expenditures (US$)	Expenses incurred because of activities that are not part of the regular company operations. (US$)	Sector-Operator	Derived	=F149/x003
	F098	Book Value of Fixed Assets Sold (US$)	Book value of property, plant, and equipment sold, if any. (US$)	Sector-Operator	Derived	=F150/x003

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F099**	Other Nonoperating Expenditures (US$)	Other nonoperating expenses that the public corporation has incurred but that are not included above. (US$)	Sector-Operator	Derived	=F151/x003
	F100	Capitalized Rehabilitation Costs (Increase in the Period) (US$)	Defined as capitalized rehabilitation costs. This cost is depreciated over the life of the rehabilitated asset instead of being expensed immediately. As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (US$)	Sector-Operator	Derived	=F158/x003
	F101	Purchase of Property, Plant, and Equipment (US$)	Cash outflows for purchase of tangible assets (that is, property, plant, and equipment). As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (US$)	Sector-Operator	Derived	=F160/x003
	F102	Replacement of Property, Plant and Equipment (US$)	Cash outflows used for replacement of existing tangible assets (subset of the entry above), if available. As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (US$)	Sector-Operator	Derived	=F161/x003
	F103	Sales of Property, Plant, and Equipment (US$)	Cash inflows from the sale of property, plant, and equipment. As an inflow, this item must be entered with a negative sign into the statement of cash flows template. (US$)	Sector-Operator	Derived	=F162/x003
	F104	Current Assets (US$)	The current assets of the public corporation. The current assets are the cash deposits, trade receivables, inventories, accounts receivable, and so on. (US$)	Sector-Operator	Derived	=F169/x003
	F105	Noncurrent Assets (US$)	The fixed and other assets that the public corporation has acquired at the cost price. (US$)	Sector-Operator	Derived	=F170/x003
	F106	Gross Value of Capitalized Rehabilitation Costs (US$)	Capitalized or deferred rehabilitation costs. (US$)	Sector-Operator	Derived	=F171/x003
	F107	Gross Value of Propery, Plant, and Equipment (US$)	Gross value of property, plant, and equipment (that is, before any depreciation expenditure). (US$)	Sector-Operator	Derived	=F173/x003
	F108	total Assets (US$)	Sum of current and noncurrent assets. (US$)	Sector-Operator	Derived	=F175/x003
	F109	Current Liabilities (US$)	The public corporation's current liabilities, which is the sum of the accounts payable, deferred taxation, and so on. (US$)	Sector-Operator	Derived	=F176/x003
	F110	Long-term Liabilities (US$)	The public corporation's long-term liabilities, i.e., the long-term debt of the public corporation. (US$)	Sector-Operator	Derived	=F178/x003

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F111**	Equity and Reserves (US$)	The public corporation's equity and reserves. (US$)	Sector-Operator	Derived	=F180/x003
	F112	total Liabilities and Equity (US$)	Sum of liabilities and equity. (US$)	Sector-Operator	Derived	=F182/x003
	F113	Compensation of Employees (LCU per year)	Consists of all compensation of government employees including social contributions by employers. It includes pay in cash or in kind. Social contributions paid by deduction from employees' wages and salaries are included in this category. (LCU)	Sector-Government type-Budget stage-Budget type	Raw	
	F115	Use of Goods and Services: Maintenance (LCU per year)	Routine and periodic spending in order to keep the value of the asset and its functioning. (LCU)	Sector-Government type-Budget stage-Budget type	Raw	
	F116	Use of Goods and Services: Other (LCU per year)	All other expenditure on goods and services. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F117	Consumption of Fixed Capital (LCU per year)	Consumption of fixed capital is the decline in the value of the stock of fixed assets during the accounting period as a result of physical deterioration, normal obsolescence, and normal accidental damage. Consumption of fixed capital related to fixed assets used in own account capital formation is excluded from this category and included as part of the value of the asset produced. It is always a noncash expense. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F119	Subsidies to Public Corporations (LCU per year)	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to public corporations that are intended to compensate for operating losses. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F120**	Subsidies to Private Enterprises (LCU per year)	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to private enterprises that are intended to compensate for operating losses. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F121	Grants and Transfers (Current) (LCU per year)	This category captures transfers of conditional grants for financing current spending to lower levels of local government. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F122	Other Current Expenditure (LCU per year)	Other current expenditure (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F123	Buildings, Structures, Machinery & Equipment (LCU per year)	Explicit spending flows allocated to capital investment during the period recorded. Includes flows into new assets and rehabilitation of existing ones. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F124	Rehabilitation (LCU per year)	If the government does not classify rehabilitation expenditures, it will be useful to state the approximate amount used for rehabilitation. This can be done by estimating capital expenditures on new fixed assets and then deducting that from total capital expenditures. Alternatively the split between new and rehabilitation expenditures can be allocated on a project-by-project basis. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F125	Other Fixed Assets (LCU per year)	Other fixed assets consist of cultivated assets and intangible fixed assets. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F126	Other Capital Expenditures (LCU per year)	Includes capital expenses not elsewhere classified for example capital tax and compensation for damages caused by natural disasters.(LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F127	Transfers of Capital Expenditures to Lower Levels of Governments (LCU per year)	This category captures transfers of conditional grants for capital financing to lower levels of local government .(LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F128**	External Funding: Budget Support (LCU per year)	External funding that enters the budget with no earmarking but that can be traced to infrastructure sectors. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F129	External Funding: Earmarked for Projects (LCU per year)	External funding earmarked for specific projects. (LCU per year)	Sector-Government type-Budget stage-Budget type	Raw	
	F130	Revenues from Sales (LCU per year)	The total revenue the public corporation has received from the sales of the services produced. In the case of special funds, revenues may include levies, sector-specific taxes, and so on. (LCU per year)	Sector-Operator	Raw	
	F131	total Employee Compensation (LCU per year)	total wages and social contributions paid to the workers and others for delivering services. (LCU per year)	Sector-Operator	Raw	
	F132	Purchase of Goods and Services Directly Used in Production (LCU per year)	A corporation's purchase of goods and services necessary to produce the services delivered. (LCU per year)	Sector-Operator	Raw	
	F133	Fuel Cost (LCU per year)	Expenditures by the public corporation on the purchase of electricity, oil, or other fuel inputs (LCU per year)	Sector-Operator	Raw	
	F134	Power Purchase Agreement (PPA) Fees (LCU per year)	Expenditures on power purchase agreements (PPAs). (LCU per year)	Sector-Operator	Raw	
	F135	Other Purchase of Goods and Services (LCU per year)	A corporation's purchase of goods and services other than those necessary to produce the services delivered. (LCU per year)	Sector-Operator	Raw	
	F136	Rent (LCU per year)	The rent paid to the owner of assets enabling the public corporation to produce the services. (LCU per year)	Sector-Operator	Raw	
	F137	Depreciation & Amortization (LCU per year)	The amount of depreciation and amortization that the public corporation has deducted for the year. Depreciation and amortization are the terms used for the systematic allocation of the capitalized cost of an asset to income over its useful life. Strictly speaking, depreciation represents the allocation of the cost of tangible fixed assets, while amortization refers to the cost of intangible assets. (LCU per year)	Sector-Operator	Raw	
	F138	Misc. Taxes/Fees (Property and so on) (LCU per year)	Various taxes (though not on profits) that the public corporation has to pay. (LCU per year)	Sector-Operator	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F139**	Other Operating Expenditures (LCU per year)	Other expenditures that the public corporation has incurred and that are not captured above, if any. (LCU per year)	Sector-Operator	Raw	
	F140	Income (Loss) from Operations (LCU per year)	Income or loss from operations as reported in the financial statement. (LCU per year)	Sector-Operator	Raw	
	F141	Interest Paid (LCU per year)	Interest (on both domestic and foreign debt) that the public corporation has to pay on its debt. (LCU per year)	Sector-Operator	Raw	
	F142	Foreign Interest Paid (LCU per year)	Interest (on foreign debt) that the public corporation has to pay on its debt. (LCU per year)	Sector-Operator	Raw	
	F143	Interest Earned (LCU per year)	The interest that the public corporation has received during the year on either its financial investments or its cash balance. (LCU per year)	Sector-Operator	Raw	
	F144	Direct Foreign Grants (LCU per year)	Foreign grants that the public corporation has received but which have not been posted on the central government budget or local government budget. (LCU per year)	Sector-Operator	Raw	
	F145	Transfers/Subsidies from Government (LCU per year)	The subsidies that the public corporation has received from the local or general government for supporting service delivery. (LCU per year)	Sector-Operator	Raw	
	F146	Revenue from Irregular Activities (LCU per year)	Revenue produced by activities that are not part of the regular company operations. (LCU per year)	Sector-Operator	Raw	
	F147	Fixed Assets Selling Price (LCU per year)	Revenue received from the sale of property, plant, and equipment, if any (LCU per year)	Sector-Operator	Raw	
	F148	Other Nonoperating Revenue (LCU per year)	Other nonoperating revenue that the public corporation has earned but that is not included above. (LCU per year)	Sector-Operator	Raw	
	F149	Irregular Activities Expenditures (LCU per year)	Expenses incurred because of activities that are not part of regular company operations. (LCU per year)	Sector-Operator	Raw	
	F150	Book Value of Fixed Assets Sold (LCU per year)	Book value of property, plant, and equipment sold, if any. (LCU per year)	Sector-Operator	Raw	
	F151	Other Nonoperating Expenditures (LCU per year)	Other nonoperating expenses which the public corporation has incurred but which are not included above. (LCU per year)	Sector-Operator	Raw	
	F152	Profit (Loss) Before Tax (LCU per year)	The profit or loss before income tax calculated as difference between total revenues and total expenditures. (LCU per year)	Sector-Operator	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F153**	Corporate Income Tax (LCU per year)	The corporate income tax or profit tax. (LCU per year)	Sector-Operator	Raw	
	F154	Tax Exemptions (LCU per year)	Income tax exemptions, if any. (LCU per year)	Sector-Operator	Raw	
	F155	Net Income (LCU per year)	The net profit or net earnings (profit after tax) of the public corporation for the accounting period, as reported in the financial statement. (LCU per year)	Sector-Operator	Raw	
	F156	Net Cash from Operating Activities (LCU per year)	Defined as the net amount of cash provided from operating activities. Operating activities include the company's day-to-day activities that create revenues, such as selling inventory and providing services. Cash inflows result from cash sales and from collection of accounts receivable. Examples include cash receipts from the provision of services and other revenue. Cash outflows result from cash payments for inventory, salaries, taxes, and other operating-related expenses and from paying accounts payable. (LCU per year)	Sector-Operator	Raw	
	F157	Net Cash Flow from Investing Activities (LCU per year)	Defined as the net amount of cash provided from investing activities. Investing activities include purchase and selling investments. Investments include property, plant and equipment; intangible assets; other long-term assets; and both long-term and short-term investments in the equity and debt (bonds and loans) issued by other companies. Cash flows in the investing category include cash receipts from the sale of nontrading securities, property, plant, and equipment; intangibles or other long-term assets. Cash outflows include cash payments for the purchase of these assets. (LCU per year)	Sector-Operator	Raw	
	F158	Capitalized Rehabilitation Costs (Increase in the Period) (LCU per year)	Defined as capitalized rehabilitation costs. This cost is depreciated over the life of the rehabilitated asset instead of being expensed immediately. As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (LCU per year)	Sector-Operator	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F159**	Purchase of Intangible Assets (LCU per year)	Cash payments for the purchase of intangible assets. Intangible assets are not physical in nature. They include corporate intellectual property (patents, trademarks, copyrights, business methodologies), goodwill, and brand recognition. In the case of utilities and telecommunications service providers, intangible assets also include billing data, contextual information and analytics, credit history, and social networking interests. (LCU per year)	Sector-Operator	Raw	
	F160	Purchase of Property, Plant, and Equipment (LCU per year)	Cash outflows for purchase of tangible assets (i.e. property, plant and equipment). As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (LCU per year)	Sector-Operator	Raw	
	F161	Replacement of Property, Plant and Equipment (LCU per year)	Cash outflows used for replacement of existing tangible assets (subset of the entry above), if available. As an outflow, this item must be entered with a positive sign into the statement of cash flows template. (LCU per year)	Sector-Operator	Raw	
	F162	Sales of Property, Plant, and Equipment (LCU per year)	Cash inflows from the sale of property, plant, and equipment. As an inflow, this item must be entered with a negative sign into the statement of cash flows template. (LCU per year)	Sector-Operator	Raw	
	F163	Purchase of Financial Investing Assets (LCU per year)	Cash payments for the purchase of long-term and short-term investments in the equity and debt (bonds and loans) issued by other companies. (LCU per year)	Sector-Operator	Raw	
	F164	Net Cash Flow from Financing Activities (LCU per year)	Defined as net amount of cash provided from financing activities. Financing activities include obtaining or repaying capital, such as equity and long-term debt. The two primary sources of capital are shareholders and creditors. Cash inflows in this category include cash receipts from issuing stock or bonds and cash receipts from borrowing. Cash outflows include cash payments to repurchase stock, to pay dividends, and to repay bonds and other borrowings. (LCU per year)	Sector-Operator	Raw	
	F165	Dividends Paid (LCU per year)	Cash paid in dividends to the company shareholders. Could be inflow or outflow, depending whether dividends were paid or retained. (LCU per year)	Sector-Operator	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F166**	Dividends Paid to Government (LCU per year)	Dividends paid to government. (LCU per year)	Sector-Operator	Raw	
	F167	Investment Grants Received (LCU per year)	Includes resources obtained to finance new investments: grants from government, foreign grants, foreign and domestic loans, issuance of new shares and bonds. As an inflow, this item must be entered with a negative sign into the statement of cash flows template. (LCU per year)	Sector-Operator	Raw	
	F168	New Loans (LCU per year)	New loans received. (LCU per year)	Sector-Operator	Raw	
	F169	Current Assets (LCU per year)	The current assets of the public corporation. The current assets are the cash deposits, trade receivables, inventories, accounts receivable, etc. (LCU per year)	Sector-Operator	Raw	
	F170	Noncurrent Assets (LCU per year)	The fixed and other assets that the public corporation has acquired at the cost price. (LCU per year)	Sector-Operator	Raw	
	F171	Gross Value of Capitalized Rehabilitation Costs (LCU per year)	Capitalized or deferred rehabilitation costs. (LCU per year)	Sector-Operator	Raw	
	F172	Depreciation & Amortization Accumulated On Deferred Rehabilitation Costs (LCU per year)	The accumulated depreciation on capitalized rehabilitation costs. (LCU per year)	Sector-Operator	Raw	
	F173	Gross Value of Propery, Plant, and Equipment (LCU per year)	Gross value of property, plant, and equipment (i.e., before any depreciation expenditure). (LCU per year)	Sector-Operator	Raw	
	F174	Depreciation & Amortization Accumulated on Property, Plant, and Equipment (LCU per year)	The accumulated depreciation on property, plant, and equipment. (LCU per year)	Sector-Operator	Raw	
	F175	Total Assets (LCU per year)	Sum of current and noncurrent assets. (LCU per year)	Sector-Operator	Raw	
	F176	Current Liabilities (LCU per year)	The public corporation's current liabilities, which is the sum of the accounts payable, deferred taxation, etc. (LCU per year)	Sector-Operator	Raw	
	F177	Foreign Current Liabilities (LCU per year)	This specifies if any of the public corporation's current liabilities are to be paid to entities abroad. (LCU per year)	Sector-Operator	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	**F178**	Long-term Liabilities (LCU per year)	The public corporation's long term liabilities, i.e. the long-term debt of the public corporation. (LCU per year)	Sector-Operator	Raw	
	F179	Foreign Long-term Liabilities (LCU per year)	The portion of the long-term debt that is foreign debt. (LCU per year)	Sector-Operator	Raw	
	F180	Equity and Reserves (LCU per year)	The public corporation's equity and reserves. (LCU per year)	Sector-Operator	Raw	
	F181	Retained Earnings (Retained Deficit) For The Period (LCU per year)	Cumulative earnings retained in the company. (LCU per year)	Sector-Operator	Raw	
	F182	Total Liabilities and Equity (LCU per year)	Sum of liabilities and equity. (LCU per year)	Sector-Operator	Raw	
	F197	Total Budget (LCU per year)	Total budget of the central government. (LCU)	Government	Raw	
	F198	Infrastructure Budget (LCU per year)	total budget of the central government allocated to infrastructure. (LCU)	Government	Raw	
	F199	Education Budget (LCU per year)	Total budget of the central government allocated to education. (LCU)	Government	Raw	
	F200	Health Budget (LCU per year)	total budget of the central government allocated to health. (LCU)	Government	Raw	
	F201	Other Sectors Budget (LCU per year)	Total budget of the central government allocated to other sectors. (LCU)	Government	Raw	
Institutional	**F183**	Fiscal: MTEF (1=yes, 0 =no)	Medium-term expenditure framework (MTEF) process.	National	Raw	
	F184	Fiscal: MTEF-Budget (1=yes, 0 =no)	MTEF an integral part of the budgetary process.	National	Raw	
	F185	Fiscal: MTEF-Time (number)	MTEF's time horizon.	National	Raw	
	F186	Fiscal: Recent MTEF (year)	Date of the most recent MTEF.	National	Raw	
	F187	Fiscal: Unitary Budget (1=yes, 0 =no)	Unitary budget (investment and recurrent spending are integrated in a unique budget bill).	National	Raw	
	F188	Fiscal: Development Budget (1=yes, 0 =no)	Separate budget for investments.	National	Raw	
	F189	Fiscal: Development Budget Coordination (0=min. finance, 1=min. planning, 2=other)	Agency coordinating preparation of development budget.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	**F190**	Fiscal: External Budget (1=yes, 0 =no)	Separate budget for externally funded budgets.	National	Raw	
	F191	Fiscal: External Budget – Coordination (1=yes, 0 =no)	Agency coordinating preparation of externally funded budgets	National	Raw	
	F192	Fiscal: Recurrent Budget (1=yes, 0 =no)	Separate budget for recurrent spending	National	Raw	
	F193	Fiscal: Recurrent Budget-Coordination (0=Min Finance, 1=Min Planning, 2=Other)	Agency coordinating preparation of recurrent spending.	National	Raw	
	F194	Fiscal: Sequence Budget Ceiling (1=yes, 0 =no)	Budget framework paper prepared prior to budget preparation to guide sectoral budget proposals.	National	Raw	
	F195	Fiscal: Individual Strategic Budgets (1=yes, 0 =no)	Sectoral ministries prepare individual strategic expenditure plans (or their equivalent).	National	Raw	
	F196	Fiscal: Investment Portfolio (1=yes, 0 =no)	In case there is a project investment portfolio or an equivalent repository of bankable projects specific to individual sectors.	National	Raw	

Note: LCU = local currency unit; SOEs = state-owned enterprises; O&M = operations and maintenance; LG = local government; LGi = local government investment; CG = central government; GDP = gross domestic product; MTEF = medium-term expenditure framework.

Annex A5.2 Data collection templates

Fiscal template A. Jurisdictional responsibilities in infrastructure service delivery

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Sectors	Activity	Agency responsible at national level		Agency responsible at subnational level		Comments
		On-budget	Off-budget	On-budget	Off-budget	
Irrigation	Formulation of irrigation policy					
	Regulation of irrigation sector					
	Construction of irrigation systems					
	Maintenance/rehabilitation of irrigation systems					
	Operation of assets and service provision					
	Other (please specify)					
Energy	Formulation of energy policy					
	Regulation of energy sector					
	Construction of energy infrastructure (e.g., hydropower plants, etc.)					
	Maintenance/rehabilitation of energy infrastructure					
	Generation of electricity					
	Transmission of electricity					
	Distribution of electricity					
	Operation of assets and service provision					
	Other (please specify)					
Transport-Air	Formulation of aviation policy					
	Regulation of aviation sector					
	Construction of aviation infrastructure (e.g., airports)					
	Maintenance/Rehabilitation of aviation infrastructure					
	Air transportation					
	Airports operation					
	Other (please specify)					

Sectors	Activity	Agency responsible at national level		Agency responsible at subnational level		Comments
		On-budget	Off-budget	On-budget	Off-budget	
Transport—Maritime	Formulation of maritime policy					
	Regulation of maritime sector					
	Construction of maritime infrastructure (e.g., ports)					
	Maintenance/rehabilitation of maritime infrastructure (e.g., ports)					
	Maritime transportation					
	Ports operation					
	Other (please specify					
Transport—Rail	Formulation of rail policy					
	Regulation of rail sector					
	Construction of rail infrastructure					
	Maintenance/Rehabilitation of rail infrastructure					
	Rail transportation					
	Railway operation					
	Other (please specify					
Transport—Roads	Formulation of road policy					
	Regulation of road sector					
	Construction of intercity roads					
	Maintenance of intercity roads					
	Construction of urban (intracity) roads					
	Maintenance of urban (intracity) roads					
	Construction of village/rural roads					
	Maintenance of village/rural roads					
	Building and operating passenger/freight terminals					
	Public transportation					
	Other (please specify					
Communications	Formulation of communications policy					
	Regulation of communications sector					
	Construction of communications infrastructure					
	Maintenance of communications infrastructure					
	Management of International gateway					
	Provision of fixed telephony services					
	Provision of cellular telephone services					
	Provision of postal services					
	Other (please specify)					

Sectors	Activity	Agency responsible at national level		Agency responsible at subnational level		Comments
		On-budget	Off-budget	On-budget	Off-budget	
Water supply	Formulation of water policy					
	Regulation of water sector					
	Urban water supply and treatment					
	Rural water supply and treatment					
	Construction of water sector infrastructure					
	Maintenance of water sector infrastructure					
	Operation of assets and service provision					
	Other (please specify)					
Wastewater management	Formulation of wastewater policy					
	Regulation of wastewater sector					
	Urban wastewater disposal/treatment					
	Rural wastewater disposal/treatment					
	Construction of wastewater infrastructure					
	Maintenance of wastewater infrastructure					
	Operation of assets and service provision					
	Other (please specify)					

Fiscal template B. Special funds financing infrastructure service delivery

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Fund	Administering	Funding sources	Objectives

Fiscal template C. Basic budgetary institutional variables, national level

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

	Series Code	Variable	Definition	New		History		
				2012	2011	2010	2009	2008
Institutional	F183	Fiscal: MTEF (1=yes, 0 =no)	Medium-term Expenditure Framework (MTEF) process					
	F184	Fiscal: MTEF – Budget (1=yes, 0 =no)	MTEF an integral part of the budgetary process					
	F185	Fiscal: MTEF – Time (number)	MTEF's time horizon					
	F186	Fiscal: Recent MTEF (year)	Date of the most recent MTEF					
	F187	Fiscal: Unitary Budget (1=yes, 0 =no)	Unitary budget (investment and recurrent spending are integrated in a unique budget bill)					
	F188	Fiscal: Development Budget (1=yes, 0 =no)	Separate budget for investments					
	F189	Fiscal: Development Budget Coordination (0=min. finance, 1=min. planning, 2=other)	Agency coordinating preparation of development budget					
	F190	Fiscal: External Budget (1=yes, 0 =no)	Separate budget for externally funded budgets					
	F191	Fiscal: External Budget – Coordination (1=yes, 0 =no)	Agency coordinating preparation of externally funded budgets					
	F192	Fiscal: Recurrent Budget (1=yes, 0 =no)	Separate budget for recurrent spending					
	F193	Fiscal: Recurrent Budget – Coordination (0=min. finance, 1=min. planning, 2=other)	Agency coordinating preparation of recurrent spending					
	F194	Fiscal: Sequence Budget Ceiling (1=yes, 0 =no)	Budget framework paper prepared prior to budget preparation to guide sectoral budget proposals					
	F195	Fiscal: Individual Strategic Budgets (1=yes, 0 =no)	Sector ministries prepare individual strategic expenditure plans (or their equivalent)					
	F196	Fiscal: Investment Portfolio (1=yes, 0 =no)	There is a project investment portfolio or an equivalent repository of bankable projects specific for individual sectors					

Fiscal template D. Budgetary cycle, national level

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Number of month in cycle	Month	First or second activity of the month	Budget activity	If other, describe here	Responsible agency	Comments
	January	First activity of the month				
		Second activity of the month				
	February	First activity of the month				
		Second activity of the month				
	March	First activity of the month				
		Second activity of the month				
	April	First activity of the month				
		Second activity of the month				
	May	First activity of the month				
		Second activity of the month				
	June	First activity of the month				
		Second activity of the month				
	July	First activity of the month				
		Second activity of the month				
	August	First activity of the month				
		Second activity of the month				
	September	First activity of the month				
		Second activity of the month				
	October	First activity of the month				
		Second activity of the month				
	November	First activity of the month				
		Second activity of the month				
	December	First activity of the month				
		Second activity of the month				

Fiscal template E. Macroeconomic parameters for budgetary context of infrastructure spending

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Code	Variable	New		History		
			2012	2011	2010	2009	2008
Fiscal	F197	Total Budget (LCU per year)					
	F198	Infrastructure Budget (LCU per year)					
	F199	Education Budget (LCU per year)					
	F200	Health Budget (LCU per year)					
	F201	Other Sectors Budget (LCU per year)					

Fiscal template F. Functional and economic classification of government spending

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Code	Variable	New		History		
			2012	2011	2010	2009	2008
Fiscal	**F113**	Compensation of Employees (LCU per year)					
	F115	Use of Goods and Services: Maintenance (LCU per year)					
	F116	Use of Goods and Services: Other (LCU per year)					
	F117	Consumption of Fixed Capital (LCU per year)					
	F119	Subsidies to Public Corporations (LCU per year)					
	F120	Subsidies to Private Enterprises (LCU per year)					
	F121	Grants and Transfers (Current) (LCU per year)					
	F122	Other Current Expenditure (LCU per year)					
	F123	Buildings, Structures, Machinery & Equipment (LCU per year)					
	F124	Rehabilitation (LCU per year)					
	F125	Other Fixed Assets (LCU per year)					
	F126	Other Capital Expenditures (LCU per year)					
	F127	Transfers of Capital Expenditures to Lower Levels of Governments (LCU per year)					
	F128	External Funding: Budget Support (LCU per year)					
	F129	External Funding: Earmarked for Projects (LCU per year)					

Fiscal template G. Public operators' financial data

Country:
Sector: All
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Code	Variable	New		History		
			2012	2011	2010	2009	2008
Fiscal	**F130**	Revenues from Sales (LCU per year)					
	F131	Total Employee Compensation (LCU per year)					
	F132	Purchase of Goods and Services Directly Used In Production (LCU per year)					
	F133	Fuel Cost (LCU per year)					
	F134	Power Purchase Agreement (PPA) Fees (LCU per year)					
	F135	Other Purchase of Goods and Services (LCU per year)					
	F136	Rent (LCU per year)					
	F137	Depreciation & Amortization (LCU per year)					
	F138	Misc. Taxes/Fees (Property Etc.) (LCU per year)					
	F139	Other Operating Expenditures (LCU per year)					
	F140	Income (Loss) from Operations (LCU per year)					
	F141	Interest Paid (LCU per year)					
	F142	Foreign Interest Paid (LCU per year)					
	F143	Interest Earned (LCU per year)					
	F144	Direct Foreign Grants (LCU per year)					
	F145	Transfers/Subsidies from Government (LCU per year)					
	F146	Revenue from Irregular Activities (LCU per year)					
	F147	Fixed Assets Selling Price (LCU per year)					
	F148	Other Non-Operating Revenue (LCU per year)					
	F149	Irregular Activities Expenditures (LCU per year)					
	F150	Book Value of Fixed Assets Sold (LCU per year)					
	F151	Other Non-Operating Expenditures (LCU per year)					
	F152	Profit (Loss) Before Tax (LCU per year)					
	F153	Corporate Income Tax (LCU per year)					
	F154	Tax Exemptions (LCU per year)					
	F155	Net Income (LCU per year)					

Policy Category	Code	Variable	New		History		
			2012	2011	2010	2009	2008
Fiscal	**F156**	Net Cash from Operating Activities (LCU per year)					
	F157	Net Cash Flow from Investing Activities (LCU per year)					
	F158	Capitalized Rehabilitation Costs (Increase In The Period) (LCU per year)					
	F159	Purchase of Intangible Assets (LCU per year)					
	F160	Purchase of Property, Plant, and Equipment (LCU per year)					
	F161	Replacement of Property, Plant and Equipment) (LCU per year)					
	F162	Sales of Property, Plant, and Equipment (LCU per year)					
	F163	Purchase of Financial Investing Assets (LCU per year)					
	F164	Net Cash Flow from Financing Activities (LCU per year)					
	F165	Dividends Paid (LCU per year)					
	F166	Dividends Paid to Government (LCU per year)					
	F167	Investment Grants Received (LCU per year)					
	F168	New Loans (LCU per year)					
	F169	Current Assets (LCU per year)					
	F170	Noncurrent Assets (LCU per year)					
	F171	Gross Value of Capitalized Rehabilitation Costs (LCU per year)					
	F172	Depreciation & Amortization Accumulated On Deferred Rehabilitation Costs (LCU per year)					
	F173	Gross Value of Propery, Plant, and Equipment (LCU per year)					
	F174	Depreciation & Amortization Accumulated On Property, Plant, and Equipment (LCU per year)					
	F175	Total Assets (LCU per year)					
	F176	Current Liabilities (LCU per year)					
	F177	Foreign Current Liabilities (LCU per year)					
	F178	Long-term Liabilities (LCU per year)					
	F179	Foreign Long-term Liabilities (LCU per year)					
	F180	Equity and Reserves (LCU per year)					
	F181	Retained Earnings (Retained Deficit) for the Period (LCU per year)					
	F182	Total Liabilities and Equity (LCU per year)					

Annex A5.3 Key concepts

Annex A5.3a. COFOG codes capturing infrastructure cost elements

Code	Division/Group/Class	GFSM 2001 Definition
704	**Economic affairs**	
7042	Agriculture, Forestry, Fishing and Hunting	
	Irrigation Systems (a share out of class 70421 Agriculture)	Administration, construction, maintenance and/ or operation of flood control, irrigation and drainage systems, including grants, loans or subsidies for such works.
7047	**Other Industries**	
70474	Multipurpose development projects	Administration, construction, maintenance and/ or multipurpose development projects typically consist of integrated facilities for generation of power, flood control, irrigation, navigation and recreation.
7043	**Fuel & energy**	
70434	Other fuels	Administration, construction, maintenance and/ or operation of affairs and services involving fuels such as alcohol, wood and wood wastes, bagasse, and other noncommercial fuels.
70435	Electricity	Administration, construction, maintenance and/ or operation of traditional sources of electricity such as thermal or hydro supplies and newer sources such as wind or solar heat.
70436	Non-electric energy	Administration, construction, maintenance and/ or operation of non-electric energy affairs and services which chiefly concern the production, distribution and utilization of heat in the form of steam, hot water or hot air. Includes: geothermal resources; non-electric energy produced by wind or solar heat.
7045	**Transport**	
70451	Road transport	Administration of affairs and services concerning operation, use, construction and maintenance of road transport systems and facilities (roads, bridges, tunnels, parking facilities, bus terminals, etc.).
70452	Water transport	Administration of affairs and services concerning operation, use, construction and maintenance of inland, coastal and ocean water transport systems and facilities (harbors, docks, navigation aids and equipment, canals, bridges, tunnels, channels, breakwaters, piers, wharves, terminals, etc.); as well as of water transport facilities.
70453	Railway transport	Administration of affairs and services concerning operation, use, construction and maintenance of railway transport systems and facilities (railway roadbeds, terminals, tunnels, bridges, embankments, cuttings, etc.).
70454	Air transport	Administration of affairs and services concerning operation, use, construction and maintenance of air transport systems and facilities (airports, runways, terminals, hangars, navigation aids and equipment, air control amenities, etc.).
7046	**Communication**	
70460	Communication	Administration of affairs and services concerning construction, extension, improvement, operation and maintenance of communication systems (postal, telephone, telegraph, wireless and satellite communication systems).
705	**Environmental protection**	
7052	**Wastewater management**	
70520	Wastewater management	Administration, supervision, inspection, operation, or support of sewage systems and wastewater treatment.
706	**Housing and community amenities**	
7063	**Water supply**	
70630	Water supply	Administration of water supply affairs; supervision and regulation of all facets of potable water supply including water purity, price, and quantity controls.

Annex A5.3b Economic classification of government expenses—Current expenditures

Category/Subcategory	Definitions (adapted from IMF)
Compensation of employees	This consists of all compensation of government employees including social contributions by employers. It includes pay in cash or in kind. Social contributions paid by deduction from employees' wages and salaries are included in this category.
Use of goods and services (maintenance)	Routine and periodic spending in order to keep the value of the asset and its functioning.
Other use of goods and services	All other expenditure on goods and services.
Consumption of fixed capital	Consumption of fixed capital is the decline in the value of the stock of fixed assets during the accounting period as a result of physical deterioration, normal obsolescence, and normal accidental damage. Consumption of fixed capital related to fixed assets used in own account capital formation is excluded from this category and included as part of the value of the asset produced. It is always a noncash expense.
Subsidies to public corporations	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to public corporations that are intended to compensate for operating losses.
Subsidies to private enterprises	Subsidies are current transfers that government units pay to enterprises either on the basis of the levels of their production activities or on the basis of the quantities or values of the goods or services that they produce, sell, or import. Included are transfers to private enterprises that are intended to compensate for operating losses.
Grants and transfers	This category captures transfers of conditional grants for financing current spending to lower levels of local government. Grants are noncompulsory transfers, in cash or in kind, paid to another general government unit or an international organization
Other current expenditures	Other expenses include all expense transactions not elsewhere classified. Transactions recorded here include property expense, interest, taxes, fines and penalties imposed by one government unit on another, current transfers to nonprofit institutions serving households, capital transfers other than capital grants, social benefits and non-life insurance premiums and claims.

Annex A5.3c Economic classification of government expenses—Capital expenses

Category/Sub-category	Definitions (adapted from IMF)
Buildings, structures, machinery & equipment	Explicit spending flows allocated to capital investment during the period recorded. Includes flows into new assets and rehabilitation of existing ones
of which rehabilitation	If the government does not classify rehabilitation expenditures, it will be useful to state the approximate amount used for rehabilitation. This can be done by estimating capital expenditures on new fixed assets and then deducting that from total capital expenditures. Alternatively, the split between new and rehabilitation expenditures can be allocated on a project-by-project basis.
of which external funded capital—Budget support	External funding that enters the budget with no earmarking but that can be traced to infrastructure sectors.
of which external funded capital—earmarked projects	External funding earmarked for specific projects.
Other fixed assets	Other fixed assets consist of cultivated assets and intangible fixed assets.
Other capital expenditure	Includes capital expenses not elsewhere classified for example capital tax and compensation for damages caused by natural disasters.
Capital transfers	This category captures transfers of conditional grants for capital financing to lower levels of local government.

Section 3

Utility Infrastructure

6. Electricity

6.1 Motivation

The power or electricity sector represents Africa's greatest infrastructure challenge.[16] Electricity access in Sub-Saharan Africa is only 25 percent, compared with 50 percent in South Asia, and 80 percent in Latin America.[17] At present rates of electrification, most African countries will fail to reach universal access to electricity even by 2050. Outside of the North African countries and South Africa, Sub-Saharan Africa's power consumption, at 120 kilowatt-hours (kWh) per person per year, is barely adequate to power one light bulb per person for two hours each day.

Even for the few that have power, the available supply is expensive and highly unreliable. Some 30 African countries are experiencing chronic power outages. In the worst affected countries, the economic costs of power cuts can be as high as 5 percent of gross domestic product (GDP). Firms struggle to cope by installing their own back-up generators, which cost $0.40 per kWh, several times the price of grid electricity. And the limited power available is very expensive; the average power tariff in Sub-Saharan Africa stands at around $0.12 per kWh, about double the power tariffs found in other developing regions. Nevertheless, even these relatively high tariffs fall well short of the $0.18 per kWh that it costs to deliver electricity service in Sub-Saharan Africa, on average. The prevalence of inefficient, small-scale oil-based generators in many of the continent's smaller countries is responsible for these high costs.

Massive investments are needed to expand generation capacity. Africa will need to install some 7,000 megawatts (MW) of new generation capacity per year, a staggering amount when compared to the past decade's expansion of less than 1,000 MW per year. The total spending requirements for the African power sector amount to $40 billion per year, almost three times current expenditure. The most cost-effective way of expanding Africa's power generation portfolio is through regional trade that pools the most attractive primary energy resources across national frontiers, leading to annualized energy cost savings of around $2 billion per year.

But mobilizing the necessary investments is difficult, given the fact that Sub-Saharan Africa's power utilities are in a very weak financial condition, with an aggregate revenue shortfall estimated at $8 billion annually. About half of this shortfall comes from the under-pricing of power services, noted earlier. The other half comes from a number of serious operational inefficiencies. Some 24 percent of power, on average, is lost on the distribution system, compared with the 12 percent considered a best practice among developing country utilities. Around 88 percent of revenues billed are collected, compared with the 100 percent best practice for developing country utilities. Power utilities also tend to employ more staff than is warranted by the number of connections serviced.

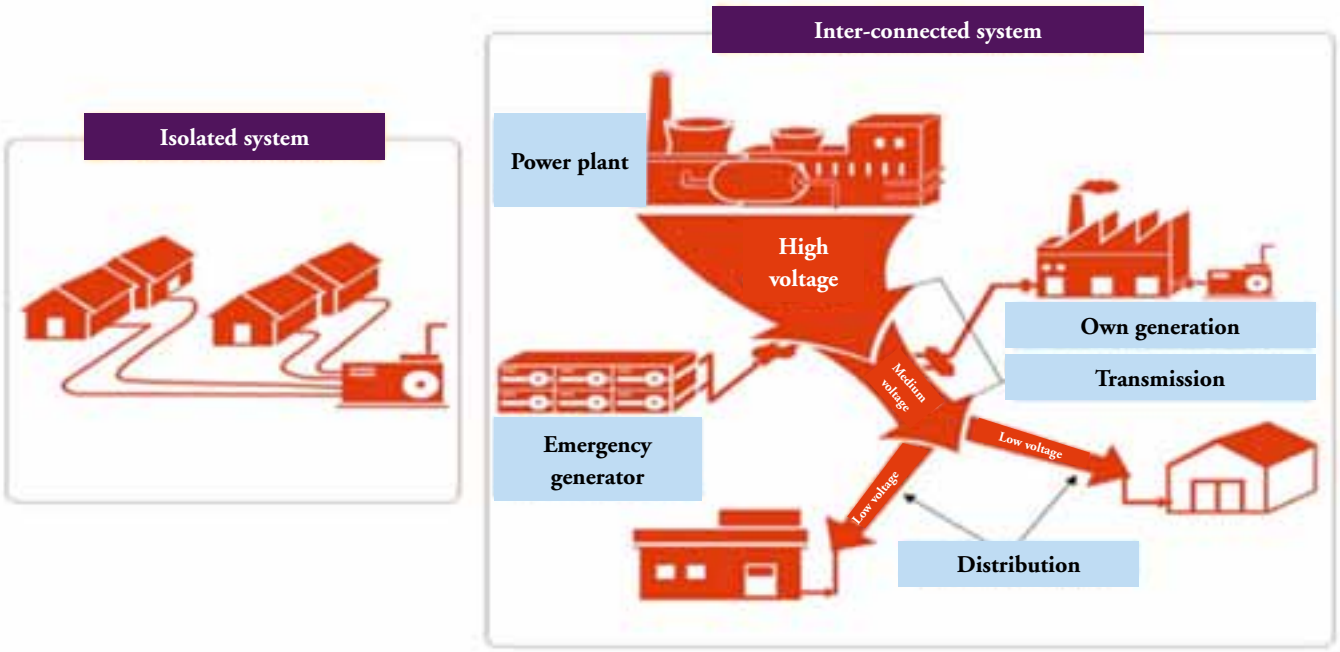
16 This chapter predominantly deals with electricity provision. But given the importance of other sources of energy for household cooking and the availability in the household surveys as a steady and reliable data source for monitoring access to non-electricity energy, this Handbook includes in its list of indicators those pertaining to the use of modern (electricity/liquid petroleum gas, LPG) or traditional (kerosene, charcoal/wood, residual/dung/other) fuels for cooking. The Handbook also promotes monitoring of household spending not only on electricity but on energy in general.

17 Tito Yepes, Justin Pierce, and Vivien Foster, 2009, "Making Sense of Sub-Saharan Africa's Infrastructure Endowment: A Benchmarking Approach," AICD WP 01.

6.2 Tracking Performance

The sector synopsis helps to highlight some of the key policy issues facing the power sector. In order to continue to track sector performance over time, a number of indicators are needed to shed light on each of a number of key policy themes. Figure 6.1 illustrates the overall architecture of the national power system. This typically consists of one major interconnected system that links a number of major power plants through a high- and medium-voltage transmission network into a low-voltage distribution network. Emergency generation and industrial back-up generation may also be present in the system. In addition, there may be a number of smaller isolated grids in rural areas that are geographically remote from the interconnected system.

Figure 6.1 Illustration of overall power system architecture



Institutional: The institutional indicators capture the extent to which the power sector in any given country has undergone the reform measures to modernize the sector, provide regulatory oversight, and improve enterprise governance. These indicators were discussed in some detail in Chapter 4 and so need not be repeated here.

Access: Since access to electricity in Africa is so low, it becomes critical to track access trends over time. In this Handbook, three different concepts are used for this purpose. Access refers to people living in communities or clusters where electricity is available regardless of the level of consumption, if any. Population take-up refers to that segment of the population that lives in communities or clusters where electricity is available and actually is connected, and where the service is actually used. Finally, the concept of usage defines the actual intensity of use by customers of the service.

There are two ways in which household access to electricity can be tracked:

- The first way is through household surveys. Individual households directly report whether or not they are connected to electricity. Given that access to electricity is very low in many countries, it is also of interest to use household surveys to track access to other types of household energy such as kerosene, liquid petroleum gas (LPG) or charcoal. Refer to Chapter 13 for an extensive discussion of household surveys as sources of data on household access to different types of energy, and the many ways to analyze such data.
- The second way is through utility data. Utilities report the number of connections that they serve. Multiplying the number of residential connections by the typical household size and dividing by the population provides an alternate to the access rate derived from the utility data.

It is important to note that these two methods should not be expected to give consistent answers. Typically, access rates from household surveys will be higher than those based on utility data. The reason is that household surveys will pick up clandestine and informal connections of various kinds that are not reported in the utility data. In addition, household surveys will pick up households outside the utility service area that have access to power, either because they own their own generator or because they are serviced by an isolated local grid.

Beyond the household sector, it is also relevant to consider access to power by firms. Although utilities provide data on the number of nonresidential connections, there is usually no census of firms and institutions that can be used to convert this into an access rate. The best source of information on nonresidential access to power therefore is an enterprise survey, which provides a picture of firms' reliance on their own generators and the extent to which they experience outages and find power to be a constraint on their business.

Affordability: Due to the high costs of power in Africa and the relatively low income of households, the affordability of power services is a key policy issue. Affordability is typically measured by the share of the household's budget dedicated to the purchase of power. This information comes directly from household surveys and is covered in Chapter 13.

Pricing: Power utilities typically apply highly complex tariff schedules that allow tariffs to vary across different categories of customers, different volumes of consumption, different loads on the system, different locations, and even different times of day. For that reason, there is no single easily measurable "price" of power. Nevertheless, utilities are typically able to report their average effective tariff, and this is the reference variable that will be used for price. The average effective tariff is the total amount billed, divided by the total volume of power sold.

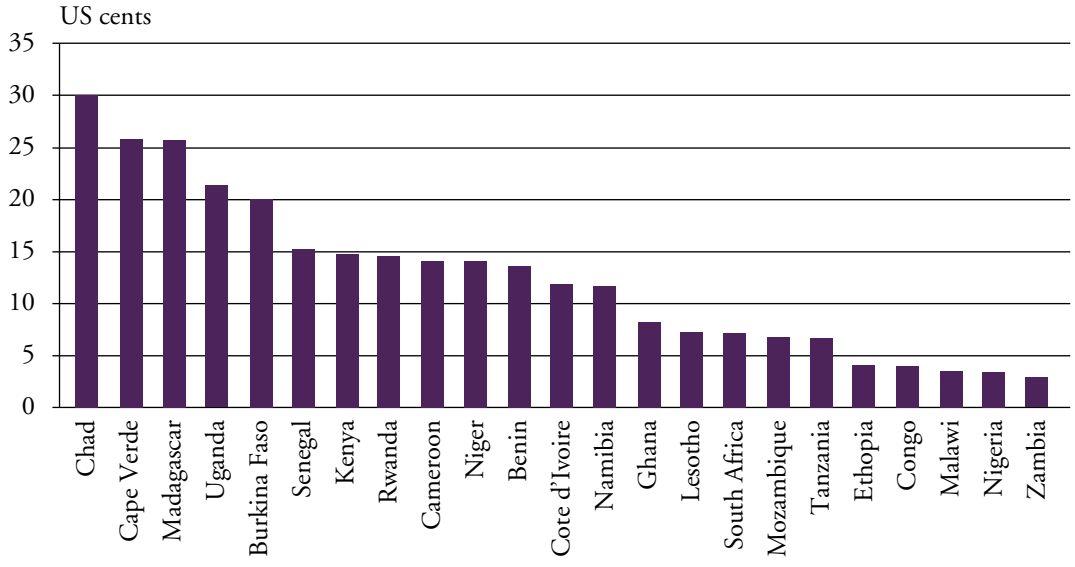
This kind of information can be very useful in order to allow countries to benchmark their power tariffs against one another. For example, in Sub-Saharan Africa as of 2006 there was a huge range of power tariffs in application, ranging from $0.03 per kWh in Zambia to $0.30 per kWh in Chad (Figure 6.2).

Financial: African utilities often present themselves as being in a weak financial position, and so it is important to track the utilities' financial ratios. The financial accounts of utilities provide detailed information on the structure of costs and revenues.

- Costs are typically broken down between operating costs (including labor costs, fuel costs, maintenance costs, and so on) and capital costs. The key financial ratio on the cost side is the average operating cost, which can be used to evaluate whether power tariffs are high enough to cover the recurrent costs of the business. Capital costs are not typically reliably measured in utility financial accounts, due to deficient or heterogeneous accounting norms. Where capital costs are needed, for example, to understand the extent to which tariffs may fall short of cost-recovery levels, these are best estimated based on the replacement costs of the utilities' main physical assets (generation capacity, kilometers of transmission grid, thousands of customer connections, and so on).
- Revenues are sometimes broken down by customer category. There are two key financial ratios on the revenue side. The first is the collection ratio, which shows total revenue collected as a percentage of the total sum billed to customers. Since the underpayment of bills is a major issue among African utilities, this ratio is often well below 100 percent. The second is the average revenue per unit of power sold. Due to the problem of under-collection of bills, the average revenue is typically lower than the average effective tariff.

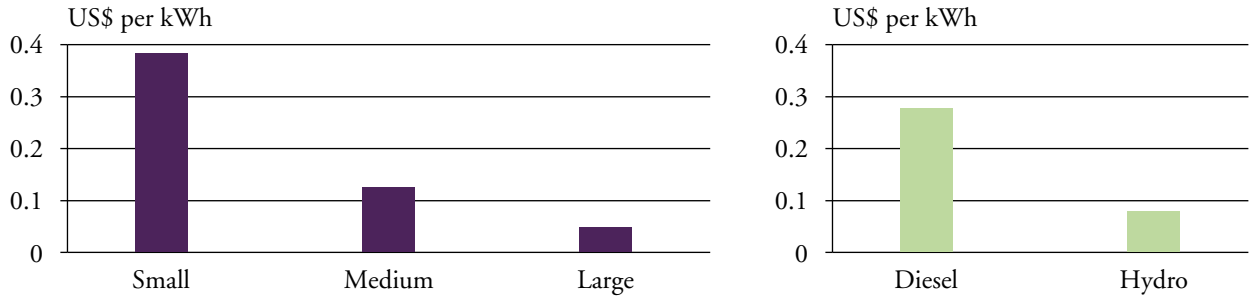
This kind of information can be used to try and understand the cost structure of the power sector. For example, by cross-tabulating the average operating cost against the scale of the national power system, a strong scale effect was found, an evi-

Figure 6.2 African power tariffs span a wide range



Source: Africa Infrastructure Country Diagnostic 2009.

Figure 6.3 Average operating costs of African power systems depend critically on scale and technology



Source: Africa Infrastructure Country Diagnostic 2009.

dence that larger power systems benefit from lower operating costs (Figure 6.3). Similarly, diesel-based power systems were found to have average operating costs three times higher than those associated with hydropower systems.

Technical: Technical indicators are helpful both in documenting a country's overall power infrastructure endowment and in highlighting the performance of power utilities in terms of the efficiency and quality of their operations.

- Given Africa's huge deficit in power infrastructure, it is critical to track the evolution of this stock over time. Generation capacity captures the amount of plant available to generate electricity in a country. In addition to knowing the total capacity available, it is relevant to understand whether the capacity is in operational condition, as well as its composition, signaling dependency on different primary energy sources. The electricity generated captures the volume of power that is actually produced from the generation capacity. Because of the significance of regional power trade, it is also relevant to track the volume of power that is imported and exported.
- A number of operational ratios are critical in identifying the relative efficiency with which utilities are being managed. System losses capture the percentage of power produced that is lost on the distribution network on its way to the final consumer. Some of this power is lost due to deficiencies in the transmission or distribution infrastructure, while some of it is simply stolen from the network by consumers (Figure 6.4). Labor productivity looks at the relationship between the number of personnel and the overall output of the utility, usually measured in terms of customers connected to the service.
- The most critical quality parameter for the power sector concerns the volume of load shed, which captures the extent of interruptions to public supply in terms of the amount of unserved demand. But this information is not always readily obtainable from utilities.

Figure 6.4 Illustration of different types of system losses

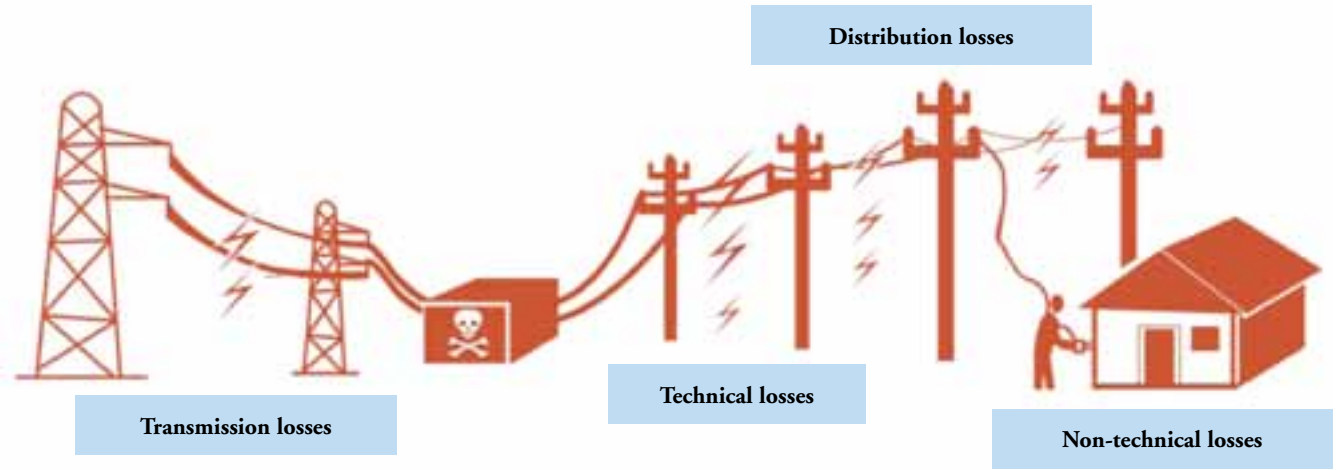
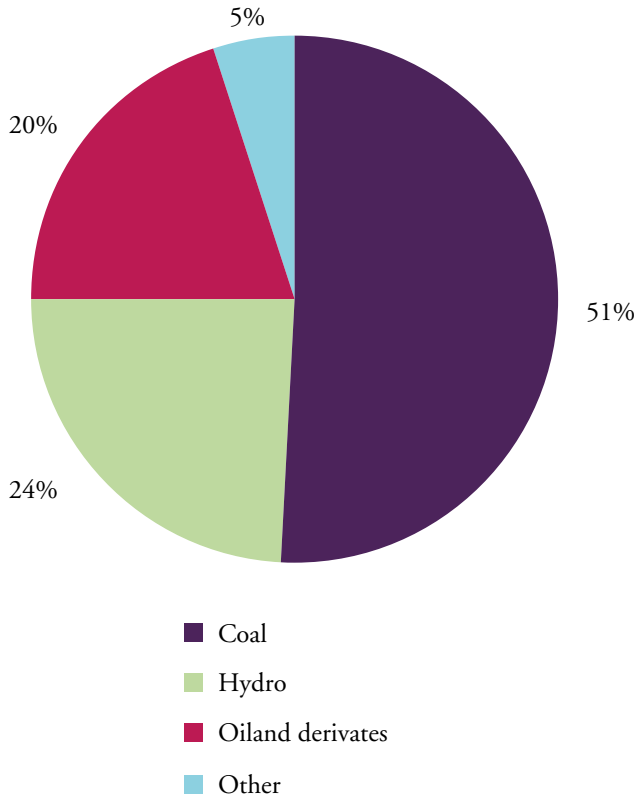


Figure 6.5 Sub-Saharan Africa's power generation portfolio



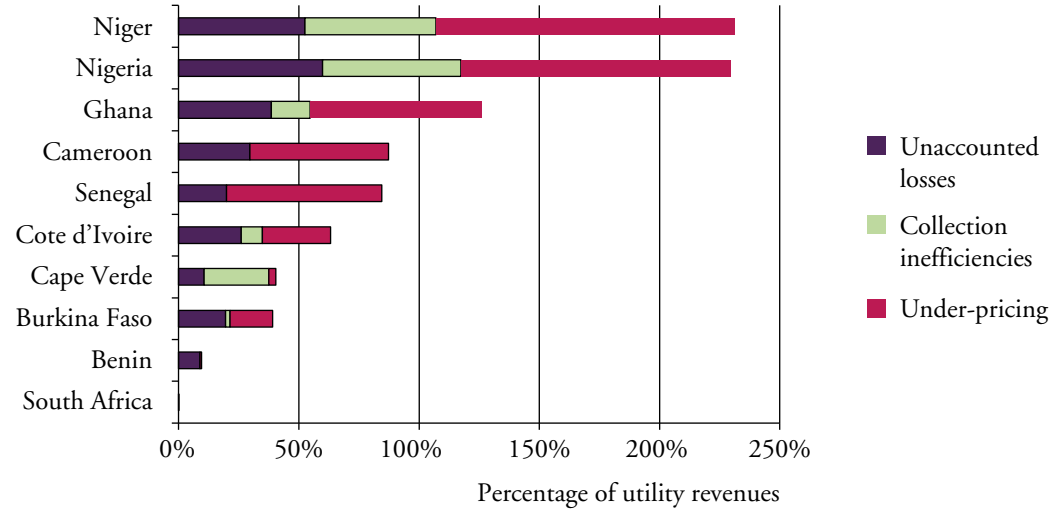
Source: Africa Infrastructure Country Diagnostic 2009.

This kind of information can be used to measure the extent to which a country's power supply portfolio is diversified, by calculating the shares of power generation capacity that depend on various primary energy sources. For example, in the case of Sub-Saharan Africa as a whole, as of 2006 coal accounted for just over half of the regional power generation portfolio, while hydropower amounted to just one quarter (Figure 6.5).

Finally, by bringing different types of indicators together it is possible to do more complex analysis of critical policy questions. For example, by bringing together data on average effective tariffs, system losses, and collection rates, and comparing these against best practice norms, it is possible to estimate the total hidden costs of under-pricing and operational inefficiencies. Figure 6.6 illustrates that these hidden costs can be very large, amounting to as much as 200 percent of utility revenues in the most egregious cases. On the other hand, a number of African utilities are managing to perform at a much higher efficiency standard, with hidden costs amounting to barely 10 percent of utility revenues. For more discussion and illustration of how power sector indicators can be used to inform policy analysis, refer to the following publication:

- Eberhard and others. 2011. *Africa's Power Infrastructure*, World Bank, Washington DC.

Figure 6.6 Hidden costs vary widely across African power utilities



Source: Africa Infrastructure Country Diagnostic 2009.

Box 6.1 provides an outline of the methodology involved in the calculation of hidden costs in the power sector.

Box 6.1. Hidden costs in utilities

A monetary value can be attributed to observable operational inefficiencies—mispricing, unaccounted-for losses, and the under-collection of bills, to mention three of the most conspicuous operational inefficiencies—by using the opportunity costs of operational inefficiencies: tariffs for uncollected bills and production costs for mispricing and unaccounted-for losses. These costs are considered hidden since they are not explicitly captured by the financial flows of the operator. Hidden costs are calculated by comparing a specific inefficiency against the value of that operational parameter in a well-functioning utility (or the respective engineering norm) and multiplying the difference by the opportunity costs of that operational inefficiency.

The methodology for calculating the four main inefficiencies are described below:

- Collection inefficiencies = [(Volume of electricity billed)* (Average effective tariffs)] / [(100 - Collection Ratio)/100]
- Under-pricing= Volume of electricity billed *(Normative cost recovery tariff - Average effective tariff)

Where normative cost recovery tariff is the average unit cost of each kWh produced (historical unit operating cost + annualized unit capital cost)

- Unaccounted-for losses= (Volume of electricity produced * Normative cost recovery tariff * (System losses - normative system losses) /(100)

Where normative system losses are assumed to be 10 percent, based on the engineering norms of technical and nontechnical losses for a well-functioning electricity network.

Source: Adapted from Briceño-Garmendia and others, 2009, "Financing Public Infrastructure in Sub-Saharan Africa: Patterns and Emerging Issues," AICD Background Paper 15.

6.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor power sector trends, together with their corresponding technical definitions, is provided in Annex A6.1. While the full list of indicators amounts to several hundred items, the indicators can easily be grouped around a smaller number of some 50 primary indicators. A synthetic overview of these primary indicators is provided in Table 6.1.

Table 6.1 clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators that are related to the primary ones. It also indicates whether the indicator originates at the national level or at the level of the utility operator, and in the latter case whether it is desirable to aggregate the variable across utilities to provide a national picture. Finally, the Table gives the source of the data, whether a sector template or a secondary source, such as household or enterprise surveys. The process for obtaining data from both of these sources is now described in greater detail.

For example, the technical indicator "generation capacity" can be broken down into numerous subcategories by technology ("generation capacity conventional thermal," "generation capacity hydroelectric," and so on) or by status ("generation capacity operational"). Although all of these variables are typically expressed in terms of megawatts, they can all be normalized according to two different approaches. For example, to make meaningful cross-country comparisons of generation capacity, it is generally necessary to normalize to per capita terms. Thus, South Africa has 865 MW per million people, compared with only 9.8 MW per million people in Ethiopia. Furthermore, to understand a country's generation, it is helpful to normalize each subcategory of generation as a share of the total. Thus, in the Democratic Republic of Congo only 41 percent of the country's installed generation capacity is in operational order.

Table 6.1 Overview of primary indicators for electricity

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Access	Population access to electricity		Urban/rural Quintiles 1-5	% population	National		Household surveys
	Usage of modern fuels for cooking		Urban/rural Quintiles 1-5 Electricity Gas Kerosene				
	Usage of traditional fuels for cooking		Urban/rural Quintiles 1-5 Wood/charcoal Other fuels				
	Population take-up of electricity		Urban/Rural				Derived
	Customers	A	Actual/potential Non residential/residential High voltage Medium voltage Low voltage Metered Prepayment meters		Utility	National	Power template C
	Electricity connection rate	= A÷ Population		% population	National		Derived
Affordability	Household spending on electricity		Urban/rural Quintiles 1-5	$ per month % HH spending	National		Household surveys
	Household spending on energy		Urban/rural Quintiles 1-5 Electricity Gas Kerosene Wood/charcoal Other fuels				Derived
Financial	Asset value			$	Utility		Power template C

	Costs		Fuel costs
			Labor costs
			Maintenance costs
			Operational costs
			Rehabilitation costs
			Investment costs
				$ per year
				$ per kWh
				% costs
						National	

	Revenue			$ per year $ per kWh		National	
	Billing of electricity	B		$ per year			
	Collected bills	C					
	Collection ratio	= C ÷ B		% billing		National	Derived

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Financial	Hidden costs	See Box 6.1	Distribution losses Undercollection Underpricing	$ % revenue % GDP	Utility	National	Derived
Fiscal	Investment	D	On/off-budget	$ % GDP	National		Fiscal data
	Recurrent spending	E					
	Total spending	= D + E					
Institutional	Reform Electricity Specific Index			Base 100	National		Power template A
	Reform Decentralization Subindex		Urban utility responsibilities Accountability for rural electrification				
	Reform Market Structure Subindex		Single-buyer model Wholesale competition Retail competition Number of operators (gen/dist) Monopolistic (gen/dist) Duopolistic (gen/dist) Competitive (gen/dist) Community providers in rural areas				
	Reform Restructuring Subindex		Unbundling gen & dist (de jure/facto) Unbundling gen & tran (de jure/facto) Unbundling tran & dist (de jure/facto)				
	Reform Tools Subindex		Tariff regulation methodology				
	Regulation Electricity Specific Index						
	Regulation Environment Subindex		Incentives for renewable energy				
	Regulation Cost Recovery Subindex		Cost-recovery of rural fund				
	Regulation Tool Subindex		Cut-off possibility Minimum quality standards Penalties for noncompliance Regulation of large customers Third-party access to network Transmission tariff regulation method				

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Pricing	Connection charge		Non/residential	$ per connection	Utility		Power template C
	Average effective tariff			$ per kWh			
Technical	Electricity generated	F	Thermal Hydroelectric Nuclear Renewable Other Interconnected system Emergency generation Self generation	Per capita	National		Power template B
	Electricity sold			GWh per year			
	Load served on interconnected system						
	Load shed on interconnected system						
	Power purchased from IPPs			% electricity generated			
	Generation capacity	G	Thermal Hydroelectric Nuclear Renewable Other Operational	% total Per million people			
	Emergency generation capacity			% operational capacity			
	Self-generation capacity						
	Length of transmission lines		High/medium/low voltage In need of rehabilitation				
	Peak demand on interconnected system	H					
	Trade, imports	I					
	Trade, exports	J					
	Trade, net	= I—J					Derived
	Peak demand factor	= H ÷ G		%			
	Load factor	= F ÷ (H x 8,760)		%			
	Capacity utilization factor						

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Technical	Employees	K			Utility		Power template C
	Labor productivity	= K ÷ A				National	Derived
	Losses		Transmission system	% electricity generated			
	Delay in obtaining a connection				National		Investment Climate Surveys
	Firms with own generator			% firms			
	Firms find power a constraint on business			% firms			
	Power outages per year			% firms			
	Value of sales lost from outages			% sales			

Where relevant, benchmarks are calculated to facilitate cross-country comparisons. In addition to the general benchmarks introduced in the chapter on data processing above, there are a number of sector-specific benchmarks that can be used for the power sector. Annex A6.2 provides a table clarifying which countries belong to each of the benchmark groups for power. In particular, different benchmarks are calculated for countries with predominantly thermal-based power systems and those with predominantly hydro-based power systems, due to the contrasting geographic, economic, and technical characteristics

Table 6.2 Example of benchmarking power indicators for Kenya

	Unit	LIC	Kenya	MIC
Generation capacity	MW/million people	24.4	**33**	796.2
Electricity generated	kWh/capita	99.5	**146**	4,473
Power outages	Day/year	40.6	**53**	5.6
Firms with own generator	% consumption	17.7	**15**	0.5
Firms' value lost due to power outages	% sales	6.1	**3**	0.8
Access to electricity	% population	15.4	**18**	59.9
Access to electricity, urban	% population	71	**51**	83.7
Access to electricity, rural	% population	12	**4**	33.4
Access to electricity, annual gain	% population/year	1.4	**1**	1.8
Collection losses	% billings	88.2	**98.7**	99.9
Losses, transmission and distribution	% production	22.1	**18.1**	15.7
Cost recovery	% total cost	90.0	**108.0**	125.7
Hidden costs	% revenue	121.2	**15**	3.5

U.S. cents	**Kenya**	Predominantly hydro generation	Other developing regions
Power tariff (residential at 75 kWh)	**12.7**	10.27	5.0—10.0
Power tariff (commercial at 900 kWh)	**21.7**	11.73	
Power tariff (industrial at 50,000 kWh)	**19.0**	11.39	

Source: Eberhard and others 2009, derived from AICD electricity database, downloadable from www.infrastructureafrica.org/aicd/tools/data.

of these two systems. Finally, by way of reference, annex A6.3 also provides a list of standard conversions between commonly used technical indicators in the power sector, as well as a list of some of the key technical parameters used in the calculation of the indicators. The parameters that were used in the calculations were mainly the unit cost estimates for power generation of various technology types (hydropower, thermal, and other).

Finally, Table 6.2, which compares Kenya's power sector to African low- and middle-income country benchmarks, provides an example of how indicators can be used to inform power sector policy analysis. The analysis shows that while Kenya's power sector compares reasonably well to those of other low-income countries in Africa, it is still very far from the level of middle-income countries in Africa. Kenya's greatest strength lies in its relatively efficient power utilities, but the country still has a long way to go on electrification and needs to expand generation capacity to improve reliability.

6.4 Data Collection

The cross-cutting generic guidelines and procedures for infrastructure data collection discussed in Chapter 2 are summarized in the following Box, and it is important to spend some time to review and understand them before the actual data collection exercise begins.

Target institutions

This section identifies the power sector data that are to be collected in order to create the indicators presented above. Annex A6.4 provides a comprehensive list of the power sector institutions in Sub-Saharan Africa. These are the target institutions that need to be approached for data collection in this sector. The list is accurate as of March 2011; however, it is important to note that the sector is in a constant state of flux, and changes may take place over time. For all of these reasons, the list provided is only intended as general guidance, and should be reviewed and updated, in consultation with sector specialists, as a starting point in any future data collection exercise.

The target institutions can essentially be divided into four categories:

- *Line ministries* refer to the government ministries responsible for overseeing the power sector. They may be a useful source of national-level data on the power sector, though they many not necessarily have detailed information at the operator level.
- *Regulators*. Many African countries have established independent regulators and restructured the sector to promote competition in generation and private sector participation. *Where they exist, regulators are typically the best single source of information about power services at the national level, and may even be able to provide operator level data.*
- *Power utilities* refer to the main operator generating, transmitting, and distributing electricity either at the national or at the sub-national level. A number of countries, most notably those with larger markets, have unbundled their national power utility so as to separate the functions of generation, transmission, and distribution across individual operators. When this is the case, these operators individually become target institutions. They are the main source of operator-level information on power provision that cannot be found elsewhere.

Rural electrification agencies: Many countries have created rural electrification agencies to face the challenge of extending power provision to the most remote and seemingly vulnerable areas. If such an agency exists, this is potentially one of the best sources of information on rural electricity issues.

Data templates

Annex A6.5 provides a complete set of data collection templates for the power sector. The data collection process for the power sector divides into a number of parts, each with its corresponding template.

- *National level*: Institutional and quantitative variables are collected at the national level following power templates A and B. The best source for this information is the regulator, followed by the line ministry.
    - *Power template A* asks detailed institutional questions that complement the more general institutional questions on the power institutional framework that were defined earlier. They are implicitly grouped so as to capture reform (restructuring, decentralization, market structure) and regulatory (tools, cost recovery, environment) aspects of the sector.
    - *Power template B* collects data variables relating to characteristics of the national power system, grouped by whether they relate to generation capacity or power transmission network.

- *Operator level*. Operational and financial performance variables are collected from the utilities in each of the

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   - o Indicate whether the comma-dot or dot-comma convention will be followed.
   - o Indicate the country, sector, name of utility (if applicable), name of data collector, period of data collection, source institution, and name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

Note: For details refer to chapter 2 of the Handbook on Infrastructure Statistics.

three main service segments (generation, transmission, distribution) following power template C. This template collects variables relating to access, technical details, and quality. The best source for this information is the utility.

Definitions of technical terms provided throughout are consistent with those defined by the Energy Information Administration (see www.eia.doe.gov/glossary/index.html).

Turning to power template A, in detail, there are two blocks of questions covering each of the two sector-specific institutional indices.

- *Reform*: The reform index is composed of the following series of subindices, each of which is based on a specific set of questions.
  - o *Decentralization*: The power sector in Africa is typically organized as a single national utility. Nev-

ertheless, the national utility is sometimes only responsible for (larger) urban areas, with other entities taking on service provision in rural areas. Rural service provision is sometimes taken on by a national rural electrification agency, or delegated to sub-national entities. In determining the extent of decentralization, it is therefore important to establish how far the urban utility responsibilities extend, as well as which players are *accountable for rural electrification.*

- *Market structure*: The power industry is organized according to a wide array of market structures, with often multiple players involved in generation, transmission, and distribution activities, and varying degrees of competition involved. In the African context, national utilities dominate and competition is limited or nonexistent. The market structure can be gauged by examining the *number of operators* active in generation, transmission, and distribution activities. If there is only one operator, the activity is considered monopolistic; if two, *duopolistic*; and if three or more, *competitive*. Although some countries have licensed private independent power producers, in most cases these operate under a *single-buyer model* whereby the national utility is the only entity purchasing this power for onward sale to consumers. Alternatives rarely found in Africa would allow for different generators to be able to engage in *wholesale competition* for large customers, or even in *retail competition* for domestic customers.
- *Restructuring*: Most power utilities in Africa are vertically integrated, with generation, transmission, and distribution activities conducted within a single corporation. In some countries, the power sector has been unbundled to separate out these different activities into different companies. This *unbundling* may be *de jure* (allowed by law even if not yet implemented) or *de facto* (implemented).

- *Regulation*: The regulation index is composed of the following series of subindices, each of which is based on a specific set of questions.
  - *Environment*: Assess whether there are formal incentives for renewable energy, for instance, in the form of subsidies for cleaner technologies or penalization of dirty technologies.
  - *Cost-recovery*: Cost-recovery is a key principle that ensures the sustainability of services but that is not always practiced due to the social sensitivity of the sector. This subindex focuses on rural electrification, where the issue of cost recovery is particularly challenging.
  - *Tools*: This subindex examines to what extent the regulatory framework contains all the administrative tools needed to regulate effectively. These include the legal power to *cut-off* services as a sanction for nonpayment, the setting of *minimum quality standards* to govern service delivery, as well as the establishment of *penalties for noncompliance* with these standards. Particularly critical is the existence of regulations allowing *third-party* access to the transmission and distribution network that allows other independent power producers, and large industrial customers with potential surpluses of own-generated power, to supply power over the grid. Finally, the existence of a sound methodology for the *regulation of transmission tariffs* is an important component of the regulatory framework where third-party access exists.

Turning to power template B in detail, this covers all of the standard utility performance variables. The first block of indicators in power template B relates to access issues and provides a utility-driven perspective to complement the access story from the household survey data.

- *Customers*: This refers to the total number of customers reported by the utility as being formally connected to power service.
  - *Customer type*. It is helpful to distinguish between *actual customers* who are already connected, and *potential customers* who are those resident in the utility service area by may not yet be connected to the service.
  - *Voltage type*. It is also relevant to distinguish between customers according to the type of electricity they use: *high voltage* (typically large industrial customers), *medium voltage* (typically smaller industrial or commercial customers), and *low voltage* (typically small commercial and domestic customers). The cost and complexity of serving these different customer groups varies considerably. High-voltage customers are the cheapest to serve because they take power directly from the transmission grid and because they tend to have a steady demand for power. Low-voltage customers, on the other hand, not only require much additional distribution infrastructure (with all its associated losses) but tend to have fluctuating demand that requires a large amount of capacity to be kept available relative to the limited energy served.

- *Meter type*. Finally, it is relevant to distinguish between customers according to whether they are metered, whether those meters are operational, and whether prepayment meters are installed. *Meters* are the preferred mode for charging for power service, although they are not always available or not always operational even when they exist. A growing trend in Africa and elsewhere is to install *prepayment meters* that allow customers to pay directly by means of a smart card or device, and circumvent all the problems traditionally associated with revenue collection.

- *Electricity connection rate*: An electricity connection rate can be calculated based on the customer data reported by the utility. This is calculated as the ratio of actual customers to actual plus potential customers. This connection rate is typically lower than the power access rates found in household surveys for the comparable geographic area, the reason being that household surveys capture clandestine connections that are not registered by the utility.

The second block of indicators in power template B relates to the financial aspects of the utility.

- *Costs*: The company accounts should provide a clear picture of the various kinds of operating costs that the water utility faces. These include the following: *fuel*, the cost of the energy source needed to power generators; *labor*, the cost of wages and salaries paid to employees; *maintenance*, the costs of keeping assets in good condition; operational, the costs of running the system; *rehabilitation*, the costs of restoring deteriorated assets to good condition; and *investment*, the cost of creating new assets.
- *Billing*: Billing is the process of communicating to customers the amount of money that they owe the company. This is usually done by sending out a monthly bill. Billings are the total value of the bills that are sent out to customers over a yearly period.
- *Collection*: Collection is the process whereby the money that customers owe through the billing process is actually collected by the company. Collection may either be through door-to-door visits or at established payment centers at banks or other public facilities. In most developing country environments, collection of revenue is far from guaranteed, and often public institutions are the worst culprits. *Collected bills* are the amount that is actually collected out of the total amount that was originally billed. The collection ratio is the ratio of the power billed and collected to the power originally billed. Ideally, this ratio should come to 100 percent, or close to 100 percent. In the African context, however, it is not unusual for utilities to collection only 80 to 90 percent of billings, and sometimes significantly less than that.
- *Revenues*: A company's income is from various sources. The main source is likely to be power billed and collected from customers, but there may be others.
- *Asset value*: Company accounts may sometimes provide an estimate of the gross fixed value of assets for the utility. If so, this number is recorded. In practice, these data are not always very useful because there is a wide range of accounting practices in place across African utilities, and so it is very difficult to compare asset value estimates across utilities. In particular, assets are often valued at the historic prices at which they were built, and these values are not updated to reflect the often much higher prices that would be associated with replacing the assets.
- *Hidden costs*: Hidden costs, described earlier in Box 6.1, are essentially a way of estimating the monetary value of various kinds of utility inefficiencies, in particular underpricing of services, undercollection of revenues, and losses on the distribution network. The magnitude of these hidden costs is estimated by looking at the difference between the revenues the utility captures and the revenues that it would capture if it was fully efficient in terms of pricing, collection, and distribution. Hidden costs can be disaggregated to examine the relative importance of each of these three different sources of inefficiency. It is also useful to normalize them as a percentage of utility revenues to see how much of a burden they represent for the utility, and as a percentage of GDP to see how much of a burden they represent for the economy. It is not unusual to find that hidden costs absorb more than 100 percent of utility revenues, and represent as much as 1 percent of GDP, or even more in some cases.

The third block of indicators in power template B relates to the pricing of utility services.

- *Connection charge*: This is the charge that new customers must pay in order to be connected to the system. At least in principle, it is intended to cover the costs associated with connecting the distribution line in the street to the inside of a customer's dwelling, and the installation of the associated meter. Connection charges are an important policy issue, since they are often set so high as to be prohibitive for low-income households, effectively excluding them from access to the network.
- *Average effective tariff*: This is the average amount that the utility charges for a kilowatt-hour of electricity, looking

across all different customer groups and tariff charges. In some cases, the utility will be able to report this value directly. In other cases, it can be estimated by taking the total value of billings and dividing by the total volume of power sold.

The fourth block of indicators in power template B relates to various technical aspects of the utility service.

- *Generation capacity*: This is the amount of plant available to generate electricity, measured in megawatts.
  - *Technology*. This can be broken down according to the technology, which could be *thermal, hydroelectric, nuclear*, or *renewable.*
  - *Operational plant*. It is also relevant to capture how much of this generation capacity is actually operational, and thus able to deliver power into the network. A number of African countries have significant generation capacity that is in damaged or dilapidated condition and unable to function normally.
  - *Emergency plant*. Another relevant subcategory is the amount of power generated by relatively high-cost diesel emergency generation plants. These plants are leased for a period of one or two years from the private sector and operate on the public system as a stop-gap for power shortages.
  - *Interconnected system*. Electricity generated can also be broken down according to whether the power is generated on the interconnected system for public consumption, or *self-generated* by households and enterprises for their own use.

- Electricity generated: This is the volume of electricity that is generated in the country. As before, this can be broken down according to the technology used to generate the electricity, and whether emergency plant is involved. It can also be disaggregated according to whether it is generated on the interconnected system or by self-generation. Another category of interest is the amount of electricity that has been purchased from independent power producers.
- *Trade*: A number of African countries trade power across international borders with neighboring countries, and this trend is likely to keep growing. Net trade is the difference between electricity imports minus electricity exports, and captures the amount of energy that is flowing into the country.
- *Load served*. Load served is the total amount of power demand on the interconnected system that is being satisfied, measured in gigawatt-hours per year.
- *Load shed*. Load shed is the total amount of power demand on the interconnected system that is going unmet due to insufficient power, leading to blackouts. Again, it is measured in gigawatt-hours per year.
- *Peak demand on interconnected system*. This is the amount of capacity needed to service the period of time where demand on the system is at its highest point of the entire year. It is measured in megawatts.
- *Peak demand factor*. This is the ratio of (i) peak demand on the interconnected system to (ii) the generation capacity of the interconnected system. This ratio captures the extent to which the system is capable of meeting peak demand. Ideally, the ratio should be less than one, so that there is some spare capacity. But due to shortage of power in Africa, peak demand factors tend to be quite high.
- *Load factor*. This is the ratio of the electricity generated on the interconnected system to the maximum amount of electricity that could be generated from the generation capacity on the interconnected system if it were operated 24 hours per day and 365 days per year. This ratio captures the extent to which a country's generation capacity is being fully utilized. In practice, load factors are rarely higher than about 70 percent due to the fluctuating nature of demand. Load factors below this level may suggest that a generation plant is not being efficiently used, for example, if the plant is out of action due to delays in maintenance activities.
- *Electricity sold*: This is the amount of electricity that is sold to customers connected to the public system. This is usually measured as the sum of all the individual meter readings of all the customers in gigawatt-hours per year. If metering is not universal, or if meters are not in good working order, then it can be difficult to measure this variable precisely.
- *Losses*: En route from the generation plant to the final customer, a significant volume of power is lost in transmission and distribution. Part of it is simply lost in the physical process of moving power across wires, and the lower the voltage level, the higher these inevitable losses. Another part may actually be stolen from the distribution network by clandestine customers who hook up to the network with their own cables. Thus, system losses are the difference between the electricity going into the interconnected system (which is electricity generated, net of trade) minus electricity sold. Losses are typically expressed as a percentage of electricity produced. Even a well-performing power utility can lose around 12 percent of power generated on the transmission and distribution system. In Africa, it is not unusual for losses to be significantly above this level; values of 20 and even 30 percent are not unheard of.

- *Length of transmission lines*: This is the total length in kilometers of the transmission network. The transmission network is comprised of those lines that have a voltage in excess of 166 kilovolts.
- *Employees*: This is the total number of staff employed by the main national power utility.
- *Labor productivity*: This is the ratio of the number of utility customers to the number of employees.

Supporting documents

One of the most important source documents for the completion of the templates will be the annual report of the national (or sub-national) power utility (utilities). It is therefore valuable to collect and archive these annual reports as supporting documentation for the templates themselves.

In addition to filling out these templates, it is critical to collect two additional documents that support a more detailed analysis of the tariff practices in the sector.

- *Published tariff schedules*. The tariff schedule explains the rules by which a customer's bill is determined according to different customer categories. There is a tremendous variation in the types of tariff schedules applied across utilities, and it is therefore difficult to provide a single standardized template for recording tariff schedules/regimes. Depending on the complexity of tariffs in any given country, the tariff schedule can vary in length from a page to a booklet of 20 pages. This important document should be available directly from the operator, and is always a public document since it is used to provide tariff information to customers.
- *Most recent tariff revision document*. From time to time, regulators or ministries adjust the overall tariff levels for service, without necessarily changing the tariff structures. For example, the government may decide to increase all water charges by 10 percent. The tariff revision document is the place where this tariff adjustment is promulgated. The nature of the document will vary from country to country. In some cases, it will be a regulatory edict, in others a ministerial decree. Since tariffs are not necessarily adjusted every year, the objective is to collect the most recent tariff revision document available, which may date back several years.

Data from secondary sources

Most of the data needed to produce the indicators are collected directly from the field. Nevertheless, there are also a number of variables that are taken directly from secondary sources. These variables and their corresponding sources are identified in Table 6.3. They relate to household and enterprise surveys and provide a consumer perspective on the service that is an important complement to data reported directly by the utility. We now provide a more extensive description of these variables.

The first block of indicators relate to access and are derived from household surveys regularly conducted by governments. In particular, the Demographic and Health Survey (DHS) is a standardized suite of surveys sponsored by USAID and used for the global tracking of health trends. It sometimes contains information about the linkage between household energy use and respiratory health; it also contains detailed information on the extent to which households have access to different kinds of energy, including power. Where the DHS is not available, a number of other surveys of household conditions, including the Multiple Indicator Cluster Surveys (MICS), provide similar information.

Table 6.3 List of complementary data variables and sources for the power sector

Policy Code	Variable	Source
Access	Population access to electricity	Demographic and Health Surveys (Multiple Indicator Cluster Surveys) [http://www.measuredhs.com]
	Usage of modern fuels for cooking	
	Usage of traditional fuels for cooking	
Affordability	Household spending on electricity	Living Standards Measurement Survey (Household Budget Surveys) [http://iresearch.worldbank.org/lsms/lsmssurveyFinder.htm]
	Household spending on energy	
Technical	Delay in obtaining a connection (days)	World Bank Investment Climate Assessment Surveys [http://www.enterprisesurveys.org]
	Firms that find power a constraint for business (% firms)	
	Firms that own a generator (% firms)	
	Power outages (days per year)	

- *Population with access to electricity*: This is the percentage of the population with an actual household connection to the electricity service. This connection may be an official connection with the utility or a clandestine connection; what matters here is simply that the electricity reaches the house.
- *Household usage of modern/traditional energy*: This is the percentage of the population using modern or traditional sources of energy for cooking. Modern energy includes electricity, liquid petroleum gas (LPG) cylinders, and kerosene. Traditional energy includes wood, charcoal or some other form of biomass (for example, dung).
- *Availability of service*: This is the percentage of the urban population that live within reach of the power network, irrespective of whether or not they are actually connected to the network. Survey sampling practice is based on geographical clusters, which in urban areas represent a group of people that live relatively close together for example on the same city block. If at least one household in each cluster has a connection to power, then it follows that the other households could potentially have connections because they are located physically close to the infrastructure. Thus, the service is available to them.
- *Take-up of service*: This is the percentage of the population that has power service available to them and who actually make a connection to the service. For example, if there are 20 households in a cluster but only 5 of them connect, the take-up rate would be 25 percent. There are many reasons why households may not take up a service even when it is available to them; for example, they may not be able to afford the service, or they may not have tenure rights over their dwelling and therefore be unable to invest in improving their own living conditions.

The second block of indicators relates to the affordability of power and energy services and is derived from another set of surveys regularly conducted by the government. The prototype of these surveys is the Living Standards Measurement Survey (LSMS), which includes a detailed itemization of how households spend their budgets. Where the LSMS is not available, a number of other surveys of household conditions, including the Household Expenditure Surveys (HES), provide similar information.

- *Household spending*: This is the amount that households spend on power and other forms of energy each month. This indicator is typically normalized against the overall household budget to obtain a power or energy expenditure share that is helpful in gauging the affordability of these services.

The third block of indicators relates to the quality of power service as perceived by nonresidential (or business) customers. These indicators are derived from the Investment Climate Surveys regularly performed by the World Bank Group to monitor the business climate of countries around the world. Alongside numerous questions about red tape and business regulations, these surveys also include a significant number of questions about how firms perceive infrastructure services.

- *Delay in obtaining a connection*: This is the average number of days that businesses report they have to wait for a power connection once they have requested it from the utility.
- *Firms that find power a constraint on business*: This is the percentage of businesses reporting that the inadequacies of the local power supply actually present a serious impediment to their operations.
- *Firms that own a generator*: This is the percentage of firms owning generators as a back up in order to insulate themselves from the problems caused by unreliable supply of power.
- *Power outages*: This is the number of days per year that firms report as having interruptions to their power supply.

A6. Annexes to Chapter 6: Electricity

Annex A6.1 Comprehensive list of indicators and definitions—Electricity[18]

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a251	Population access to electricity —Capital city (% of population)	Population in the capital city that has access to electricity, including connection to the main grid and local grid as a share of total population in the capital city.	National	Raw	
	a001	Population access to electricity —National (% of population)	Share of the population living in communities or clusters where electricity is available.	National	Raw	
	a252	Population access to electricity —Quintile 1 (% of population)	Population in the first (poorest) budget quintile that has access to electricity, including connection to the main grid and local grid as a share of population in that budget quintile.	National	Raw	
	a253	Population access to electricity —Quintile 2 (% of population)	Population in the second budget quintile that has access to electricity, including connection to the main grid and local grid as a share of population in that budget quintile.	National	Raw	
	a254	Population access to electricity —Quintile 3 (% of population)	Population in the third budget quintile that has access to electricity, including connection to the main grid and local grid as a share of population in that budget quintile.	National	Raw	
	a255	Population access to electricity —Quintile 4 (% of population)	Population in the fourth budget quintile that has access to electricity, including connection to the main grid and local grid as a share of population in that budget quintile.	National	Raw	
	a256	Population access to electricity —Quintile 5 (% of population)	Population in the fifth (richest) budget quintile that has access to electricity, including connection to the main grid and local grid as a share of population in that budget quintile.	National	Raw	
	a002	Population access to electricity —Rural (% of population)	Share of the rural population living in communities or clusters where electricity is available.	National	Raw	
	a003	Population access to electricity —Urban (% of population)	Share of the urban population living in communities or clusters where electricity is available.	National	Raw	
	a094	Usage of electricity for cooking—National (% of population)	Percentage of population in the country that uses electricity for cooking.	National	Raw	
	a097	Usage of electricity for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	

18 This chapter predominantly deals with electricity provision. But given the importance of other sources of energy for household cooking and the availability of the household surveys as a steady and reliable data source for monitoring access to non-electricity energy, this Handbook includes in its list of indicators those pertaining to the use of modern (electricity or liquid petroleum gas [LPG]) or traditional (kerosene, charcoal/wood, residual/dung/other) fuels for cooking. The Handbook also promotes the monitoring of household spending on not only electricity but also energy in general.

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a098	Usage of electricity for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a099	Usage of electricity for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a100	Usage of electricity for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a101	Usage of electricity for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a096	Usage of electricity for cooking—Rural (% of population)	Percentage of population in rural areas that uses electricity for cooking.	National	Raw	
	a095	Usage of electricity for cooking—Urban (% of population)	Percentage of population in urban areas that uses electricity for cooking.	National	Raw	
	a118	Usage of charcoal/wood for cooking—National (% of population)	Percentage of population that uses charcoal/wood for cooking.	National	Raw	
	a121	Usage of charcoal/wood for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a122	Usage of charcoal/wood for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a123	Usage of charcoal/wood for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a124	Usage of charcoal/wood for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a125	Usage of charcoal/wood for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a120	Usage of charcoal/wood for cooking—Rural (% of population)	Percentage of population in rural areas that uses charcoal/wood for cooking.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a119	Usage of charcoal/wood for cooking—Urban (% of population)	Percentage of population in urban areas that uses charcoal/wood for cooking.	National	Raw	
	a110	Usage of kerosene/gasoline/gasoil/paraffin for cooking—National (% of population)	Percentage of population that uses kerosene/gasoline/gasoil/paraffin for cooking.	National	Raw	
	a113	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses kerosene/gasoline/gas oil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a114	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses kerosene/gasoline/gas oil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a115	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses kerosene/gasoline/gas oil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a116	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses kerosene/gasoline/gas oil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a117	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses kerosene/gasoline/gas oil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a112	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Rural (% of population)	Percentage of population in rural areas that uses kerosene/gasoline/gas oil/paraffin for cooking.	National	Raw	
	a111	Usage of kerosene/gasoline/gasoil/paraffin for cooking—Urban (% of population)	Percentage of population in urban areas that uses kerosene/gasoline/gas oil/paraffin for cooking.	National	Raw	
	a102	Usage of LPG for cooking—National (% of population)	Percentage of population that uses LPG for cooking.	National	Raw	
	a104	Usage of LPG for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a105	Usage of LPG for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a106	Usage of LPG for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a107	Usage of LPG for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a108	Usage of LPG for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a103	Usage of LPG for cooking—Rural (% of population)	Percentage of population in rural areas that uses LPG for cooking.	National	Raw	
	a109	Usage of LPG for cooking—Urban (% of population)	Percentage of population in urban areas that uses LPG for cooking.	National	Raw	
	a079	Usage of modern fuels for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses electricity or LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a097,a104)
	a080	Usage of modern fuels for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses electricity or LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a098,a105)
	a082	Usage of modern fuels for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses electricity or LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a100,a107)
	a083	Usage of modern fuels for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses electricity or LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a101,a108)
	a078	Usage of modern fuels for cooking—Rural (% of population)	Percentage of population in the rural areas that uses electricity or LPG for cooking as a share of total population.	National	Derived	SUM (a096,a103)
	a076	Usage of modern fuels for cooking—National (% of population)	Percentage of population in the country that uses electricity or LPG for cooking as a share of total population.	National	Derived	SUM(a094, a102)
	a081	Usage of modern fuels for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses electricity or LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a099,a106)
	a077	Usage of modern fuels for cooking—Urban (% of population)	Percentage of population in the urban areas that uses electricity or LPG for cooking as a share of total population.	National	Derived	SUM (a095,a109)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a126	Usage of residual/dung/ other fuel for cook-ing—National (% of population)	Percentage of population that uses residual/dung/ other fuel for cooking.	National	Raw	
	a129	Usage of residual/dung/ other fuel for cook-ing—Quintile 1 (% of population)	Population in the first budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quin-tile: poorest; fifth budget quintile: richest).	National	Raw	
	a130	Usage of residual/dung/ other fuel for cook-ing—Quintile 2 (% of population)	Population in the second budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quin-tile: poorest; fifth budget quintile: richest).	National	Raw	
	a131	Usage of residual/dung/ other fuel for cook-ing—Quintile 3 (% of population)	Population in the third budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quin-tile: poorest; fifth budget quintile: richest).	National	Raw	
	a132	Usage of residual/dung/ other fuel for cook-ing—Quintile 4 (% of population)	Population in the fourth budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quin-tile: poorest; fifth budget quintile: richest).	National	Raw	
	a133	Usage of residual/dung/ other fuel for cook-ing—Quintile 5 (% of population)	Population in the fifth budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quin-tile: poorest; fifth budget quintile: richest).	National	Raw	
	a128	Usage of residual/dung/ other fuel for cooking—Rural (% of population)	Percentage of population in rural areas that uses residual/dung/other fuel for cooking.	National	Raw	
	a127	Usage of residual/dung/ other fuel for cooking—Urban(% of population)	Percentage of population in urban areas that uses residual/dung/other fuel for cooking.	National	Raw	
	a084	Usage of traditional fuels for cooking—National (% of population)	Percentage of population in the country that uses kerosene, charcoal/wood, residual/dung/other fuel for cooking as a share of total population.	National	Derived	SUM (a110, a118,a126)
	a086	Usage of traditional fuels for cooking—Quintile 1 (% of population)	Population in the first budget quintile population that uses kerosene, charcoal/wood, residual/dung/ other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a113, a121,a129)
	a087	Usage of traditional fuels for cooking—Quintile 2 (% of population)	Population in the second budget quintile population that uses kerosene, charcoal/wood, residual/dung/ other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a114, a122,a130)
	a088	Usage of traditional fuels for cooking—Quintile 3 (% of population)	Population in the third budget quintile population that uses kerosene, charcoal/wood, residual/dung/ other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a115, a123,a131)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	a089	Usage of traditional fuels for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile population that uses kerosene, charcoal/wood, residual/dung/ other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a116, a124,a132)
	a091	Usage of traditional fuels for cooking—Rural (% of population)	Percentage of population in the rural areas that uses kerosene, charcoal/wood, residual/dung/other fuel for cooking as a share of total population.	National	Derived	SUM (a112, a120,a128)
	a085	Usage of traditional fuels for cooking—Urban (% of population)	Percentage of population in the urban areas that uses kerosene, charcoal/wood, residual/dung/other fuel for cooking as a share of total population.	National	Derived	SUM (a111, a119,a127)
	a090	Usage of traditional fuels for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile population that uses kerosene, charcoal/wood, residual/dung/ other fuel for cooking as a share of population in that budget quintile first budget quintile: poorest; fifth budget quintile: richest).	National	Derived	SUM (a117, a125,a133)
	a005	Population take-up of electricity—National (% of population)	Share of the population living in communities or clusters where electricity is available that actually is connected and uses the service.	National	Raw	
	a007	Population take-up of electricity—Rural (% of population)	Share of the rural population living in communities or clusters where electricity is available that actually is connected and uses the service.	National	Raw	
	a006	Population take-up of electricity—Urban (% of population)	Share of the urban population living in communities or clusters where electricity is available that actually is connected and uses the service.	National	Raw	
	a212	Customers (number)	Total customer in utility area who are connected to power.	National	Derived	if a192 available sum(a192, across utilities) otherwise if SU M (a198 +a196)
	a192	Customers (number)	Total customers in utility service area who are connected to power.	Utility	Raw	
	b048x	Customers with installed meters (% of customers)	Share of customers with installed meters across the country relative to the total customers covered by utilities in the country.	Utility	Derived	DIVIDE (b048,a192)
	b048x-d	Customers with installed meters (% of customers)	Share of customers with installed meters relative to the total customers covered by the utility.	National	Derived	W-average 048x,a192, UTILITIES)
	b048	Customers with installed meters (number)	Number of residential customers with installed meters for a given utility.	Utility	Raw	
	b048-d	Customers with installed meters (number)	Number of residential customers with installed meters in the country.	National	Derived	Sum(b049, UTILITES)
	b176	Customers with operational meters (% of customers)	Customers with operational meters as share of customers with installed meters for the utility.	Utility	Derived	DIVIDE (b049,a192)
	b176-d	Customers with operational meters (% of customers)	Customers with operational meters at the country-level as share of customers with installed meters for the country.	National	Derived	W-average b176,a192, UTILITIES)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	b049	Customers with operational meters (number)	Number of residential customers with installed and operating meters.	Utility	Raw	
	a199	Customers, commercial (number)	Total commercial customers in the utility area who are connected to power.	Utility	Raw	
	a207	Customers, high voltage (number)	Total high voltage customers in the utility area who are connected to power.	Utility	Raw	
	a201	Customers, industrial (number)	Total industrial customers in the utility area who are connected to power.	Utility	Raw	
	a203	Customers, low voltage (number)	Total low voltage customers in the utility area who are connected to power.	Utility	Raw	
	a205	Customers, medium voltage (number)	Total medium voltage customers in the utility area who are connected to power.	Utility	Raw	
	a197	Customers, nonresidential (number)	Total nonresidential customers in the utility area who are connected to power.	Utility	Raw	
	a198	Customers, nonresidential (number)	Total residential customers across the country who are connected to power.	National	Derived	If a197 available then SUM(a197, across all utilities) otherwise sum (a205+a207, across all utilities)
	a214-d	Customers, potential (number)	Total potential customers in the country who are not connected to power but with the technical possibility to be connected.	National	Derived	SUM(a214, across all utilities)
	a214	Customers, potential (number)	Total potential customers in the utility service area who are not connected to power but with the technical possibility to be connected.	Utility	Raw	
	a262-d	Customers, potential nonresidential (number)	Total potential nonresidential customers in the country who are not connected to power but with the technical possibility to be connected.	National	Derived	SUM(a262, across all utilities)
	a262	Customers, potential nonresidential (number)	Total potential nonresidential customers in the utility service area who are not connected to power but with the technical possibility to be connected.	Utility	Raw	
	a261-d	Customers, potential residential (number)	Total potential residential customers in the country who are not connected to power but with the technical possibility to be connected.	National	Derived	SUM(a261, across all utilities)
	a261	Customers, potential residential (number)	Total potential residential customers in the utility service area who are not connected to power but with the technical possibility to be connected.	Utility	Raw	
	a196	Customers, residential (number)	Total residential customers across the country who are connected to power.	National	Derived	If a195 available then SUM(a195, across all utilities) otherwise sum(a203, across all utilities)
	a195	Customers, residential (number)	Total residential customers in the utility area who are connected to power.	Utility	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Access	b050	Prepayment customers with meters (number)	Number of residential customers with installed prepayment meters.	Utility	Raw	
	b051	Prepayment customers with operational meters (number)	Number of residential customers with installed and operating prepayment meters.	Utility	Raw	
	b202	Prepayment electricity meters (% of customers)	Customers with installed prepayment meters at the utility level as share of total customers of the utility.	Utility	Derived	PRODUC T (DIVIDE (b50, a192),100)
	b202-d	Prepayment electricity meters (% of customers)	Customers with installed prepayment meters at the national level as share of total customers of all power utilities in the country.	National	Derived	DIVIDE (b015,a212)
	a193	Electricity connection rate—National (% of population)	Share of the national population that has access to electricity.	National	Derived	sum(a192, across utilities)/x001
Affordability	a159	HH spending on electricity—National (% of HH spending)	Household spending on electricity as a share of monthly household spending.	National	Raw	
	a011	HH spending on electricity—National (2002 US$)	Monthly household spending on electricity for the national level, expressed in 2002 US$.	National	Raw	
	a008	HH spending on electricity—National (LCU)	Monthly household spending on electricity at the national level, expressed in LCUs.	National	Raw	
	a162	HH spending on electricity—Quintile 1 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a014	HH spending on electricity—Quintile 1 (2002 US$)	Monthly household spending on electricity by the first (and poorest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a218	HH spending on electricity—Quintile 1 (LCU)	Household spending on electricity in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a163	HH spending on electricity—Quintile 2 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a015	HH spending on electricity—Quintile 2 (2002 US$)	Monthly household spending on electricity by the second budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a219	HH spending on electricity—Quintile 2 (LCU)	Household spending on electricity in the second budget quintile, expressed in LCUs.	National	Raw	
	a164	HH spending on electricity—Quintile 3 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a016	HH spending on electricity—Quintile 3 (2002 US$)	Monthly household spending on electricity by the third budget quintile of the population expressed, in 2002 US$.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a220	HH spending on electricity—Quintile 3 (LCU)	Household spending on electricity in the third budget quintile, expressed in LCUs.	National	Raw	
	a165	HH spending on electricity—Quintile 4 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a017	HH spending on electricity—Quintile 4 (2002 US$)	Monthly household spending on electricity by the fourth budget quintile of the population expressed, in 2002 US$.	National	Raw	
	a221	HH spending on electricity—Quintile 4 (LCU)	Household spending on electricity in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a166	HH spending on electricity—Quintile 5 (% of HH spending)	Household spending on electricity as a share of total household spending in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a018	HH spending on electricity—Quintile 5 (2002 US$)	Monthly household spending on electricity by the fifth (and richest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a217	HH spending on electricity—Quintile 5 (LCU)	Household spending on electricity in the fifth (richest) budget quintile, expressed in LCUs.	National	Raw	
	a161	HH spending on electricity—Rural (% of HH spending)	Household spending on electricity as a share of monthly household spending in rural areas.	National	Raw	
	a012	HH spending on electricity—Rural (2002 US$)	Monthly household spending on electricity in rural areas level, expressed in 2002 US$.	National	Raw	
	a009	HH spending on electricity—Rural (LCU)	Monthly household spending on electricity in rural areas level, expressed in LCUs.	National	Raw	
	a160	HH spending on electricity—Urban (% of HH spending)	Household spending on electricity as a share of monthly household spending in urban areas.	National	Raw	
	a013	HH spending on electricity—Urban (2002 US$)	Monthly household spending on electricity in urban areas, expressed in 2002 US$.	National	Raw	
	a010	HH spending on electricity—Urban (LCU)	Monthly household spending on electricity in urban areas, expressed in LCUs.	National	Raw	
	a151	HH spending on charcoal/ wood —National (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending.	National	Raw	
	a044	HH spending on charcoal/wood —National (2002 US$)	Monthly household spending on charcoal/wood at the national level, expressed in 2002 US$.	National	Raw	
	a041	HH spending on charcoal/wood —National (LCU)	Monthly household spending on charcoal/wood at the national level, expressed in LCUs.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a154	HH spending on charcoal/wood —Quintile 1 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a047	HH spending on charcoal/wood —Quintile 1 (2002 US$)	Monthly household spending on charcoal/wood by the first (and poorest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a233	HH spending on charcoal/wood —Quintile 1 (LCU)	Household spending on charcoal/wood in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a155	HH spending on charcoal/wood —Quintile 2 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a048	HH spending on charcoal/wood —Quintile 2 (2002 US$)	Monthly household spending on charcoal/wood by the second budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a234	HH spending on charcoal/wood —Quintile 2 (LCU)	Household spending on charcoal/wood in the second budget quintile, expressed in LCUs.	National	Raw	
	a156	HH spending on charcoal/wood —Quintile 3 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a049	HH spending on charcoal/wood —Quintile 3 (2002 US$)	Monthly household spending on charcoal/wood by the third budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a235	HH spending on charcoal/wood —Quintile 3 (LCU)	Household spending on charcoal/wood in the third budget quintile, expressed in LCUs.	National	Raw	
	a157	HH spending on charcoal/wood —Quintile 4 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a050	HH spending on charcoal/wood —Quintile 4 (2002 US$)	Monthly household spending on charcoal/wood by the fourth budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a236	HH spending on charcoal/wood —Quintile 4 (LCU)	Household spending on charcoal/wood in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a158	HH spending on charcoal/wood —Quintile 5 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a051	HH spending on charcoal/wood —Quintile 5 (2002 US$)	Monthly household spending on charcoal/wood by the fifth (and richest) budget quintile of the population, expressed in 2002 US$.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a237	HH spending on charcoal/wood —Quintile 5 (LCU)	Household spending on charcoal/wood in the fifth (richest) budget quintile, expressed in LCUs.	National	Raw	
	a153	HH spending on charcoal/wood —Rural (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending in rural areas.	National	Raw	
	a046	HH spending on charcoal/wood —Rural (2002 US$)	Monthly household spending on charcoal/wood in rural areas, expressed in 2002 US$.	National	Raw	
	a043	HH spending on charcoal/wood —Rural (LCU)	Monthly household spending on charcoal/wood in rural areas, expressed in LCUs.	National	Raw	
	a152	HH spending on charcoal/wood —Urban (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending in urban areas.	National	Raw	
	a045	HH spending on charcoal/wood —Urban (2002 US$)	Monthly household spending on charcoal/wood in urban areas, expressed in 2002 US$.	National	Raw	
	a042	HH spending on charcoal/wood —Urban (LCU)	Monthly household spending on charcoal/wood in urban areas, expressed in LCUs.	National	Raw	
	a250	HH spending on energy—National (% of HH spending)	Household spending on energy as a share of household spending.	National	Raw	
	a066	HH spending on energy—National (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) at the national level, expressed in 2002 US$.	National	Raw	
	a063	HH spending on energy—National (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) at the national level, expressed in LCUs.	National	Raw	
	a265	HH spending on energy—Quintile 1 (% of total HH spending)	Household spending on energy in the first (poorest) budget quintile as a share of total household spending.	National	Raw	
	a069	HH spending on energy—Quintile 1 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the first (and poorest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a243	HH spending on energy—Quintile 1 (LCU)	Household spending on energy in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a266	HH spending on energy—Quintile 2 (% of total HH spending)	Household spending on energy in the second budget quintile as a share of total household spending.	National	Raw	
	a070	HH spending on energy—Quintile 2 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the second budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a244	HH spending on energy—Quintile 2 (LCU)	Household spending on energy in the second budget quintile, expressed in LCUs.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a267	HH spending on energy—Quintile 3 (% of total HH spending)	Household spending on energy in the third budget quintile as a share of total household spending.	National	Raw	
	a071	HH spending on energy—Quintile 3 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the third budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a245	HH spending on energy—Quintile 3 (LCU)	Household spending on energy in the third budget quintile, expressed in LCUs.	National	Raw	
	a268	HH spending on energy—Quintile 4 (% of total HH spending)	Household spending on energy in the fourth budget quintile as a share of total household spending.	National	Raw	
	a072	HH spending on energy—Quintile 4 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the fourth budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a246	HH spending on energy—Quintile 4 (LCU)	Household spending on energy in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a269	HH spending on energy—Quintile 5 (% of total HH spending)	Household spending on energy in the fifth (richest) budget quintile as a share of total household spending.	National	Raw	
	a073	HH spending on energy—Quintile 5 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the fifth (and richest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a247	HH spending on energy—Quintile 5 (LCU)	Household spending on energy in the fifth (richest) budget quintile expressed in LCUs.	National	Raw	
	a248	HH spending on energy—Rural (% of HH spending)	Household spending on energy in rural areas as a share of total household spending.	National	Raw	
	a067	HH spending on energy—Rural (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in rural areas, expressed in 2002 US$.	National	Raw	
	a064	HH spending on energy—Rural (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in rural areas, expressed in LCUs.	National	Raw	
	a249	HH spending on energy—Urban (% of HH spending)	Household spending on energy in urban areas as a share of total household spending.	National	Raw	
	a074	HH spending on energy—Urban (% of total HH spending)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) as a share of total household spending.	National	Raw	
	a068	HH spending on energy—Urban (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in urban areas, expressed in 2002 US$.	National	Raw	
	a065	HH spending on energy—Urban (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in urban areas, expressed in LCUs.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Af-ford-ability	a167	HH spending on gas—National (% of HH spending)	Household spending on gas as a share of monthly household spending.	National	Raw	
	a022	HH spending on gas—National (2002 US$)	Monthly household spending on gas at the national level, expressed in 2002 US$.	National	Raw	
	a019	HH spending on gas—National (LCU)	Monthly household spending on gas at the national level, expressed in LCUs.	National	Raw	
	a170	HH spending on gas—Quintile 1 (% of HH spending)	Household spending on gas as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a025	HH spending on gas—Quintile 1 (2002 US$)	Monthly household spending on gas by the first (and poorest) budget quintile of the population.	National	Raw	
	a223	HH spending on gas—Quintile 1 (LCU)	Household spending on gas in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a171	HH spending on gas—Quintile 2 (% of HH spending)	Household spending on gas as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a026	HH spending on gas—Quintile 2 (2002 US$)	Monthly household spending on gas by the second budget quintile of the population.	National	Raw	
	a224	HH spending on gas—Quintile 2 (LCU)	Household spending on gas in the second budget quintile, expressed in LCUs.	National	Raw	
	a172	HH spending on gas—Quintile 3 (% of HH spending)	Household spending on gas as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a027	HH spending on gas—Quintile 3 (2002 US$)	Monthly household spending on gas by the third budget quintile of the population.	National	Raw	
	a225	HH spending on gas—Quintile 3 (LCU)	Household spending on gas in the third budget quintile, expressed in LCUs.	National	Raw	
	a173	HH spending on gas—Quintile 4 (% of HH spending)	Household spending on gas as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a028	HH spending on gas—Quintile 4 (2002 US$)	Monthly household spending on gas by the fourth budget quintile of the population.	National	Raw	
	a226	HH spending on gas—Quintile 4 (LCU)	Household spending on gas in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a174	HH spending on gas—Quintile 5 (% of HH spending)	Household spending on gas as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a029	HH spending on gas—Quintile 5 (2002 US$)	Monthly household spending on gas by the fifth (and richest) budget quintile of the population.	National	Raw	
	a227	HH spending on gas—Quintile 5 (LCU)	Household spending on gas in the fifth (richest) budget quintile, expressed in LCUs.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a169	HH spending on gas—Rural (% of HH spending)	Household spending on gas as a share of monthly household spending in rural areas.	National	Raw	
	a024	HH spending on gas—Rural (2002 US$)	Monthly household spending on gas in rural areas, expressed in 2002 US$.	National	Raw	
	a021	HH spending on gas—Rural (LCU)	Monthly household spending on gas in rural areas, expressed in LCUs.	National	Raw	
	a168	HH spending on gas—Urban (% of HH spending)	Household spending on gas as a share of monthly household spending in urban areas.	National	Raw	
	a023	HH spending on gas—Urban (2002 US$)	Monthly household spending on gas in urban areas, expressed in 2002 US$.	National	Raw	
	a020	HH spending on gas—Urban (LCU)	Monthly household spending on gas in urban areas, expressed in LCUs.	National	Raw	
	a175	HH spending on kerosene—National (% of HH spending)	Household spending on kerosene as a share of monthly household spending.	National	Raw	
	a033	HH spending on kerosene—National (2002 US$)	Monthly household spending on kerosene at the national level, expressed in 2002 US$.	National	Raw	
	a030	HH spending on kerosene—National (LCU)	Monthly household spending on kerosene at the national level, expressed in LCUs.	National	Raw	
	a178	HH spending on kerosene—Quintile 1 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a036	HH spending on kerosene—Quintile 1 (2002 US$)	Monthly household spending on kerosene by the first (and poorest) budget quintile of the population.	National	Raw	
	a228	HH spending on kerosene—Quintile 1 (LCU)	Household spending on kerosene in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a179	HH spending on kerosene—Quintile 2 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a037	HH spending on kerosene—Quintile 2 (2002 US$)	Monthly household spending on kerosene by the second budget quintile of the population.	National	Raw	
	a229	HH spending on kerosene—Quintile 2 (LCU)	Household spending on kerosene in the second budget quintile, expressed in LCUs.	National	Raw	
	a180	HH spending on kerosene—Quintile 3 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a038	HH spending on kerosene—Quintile 3 (2002 US$)	Monthly household spending on kerosene by the third budget quintile of the population.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a230	HH spending on kerosene—Quintile 3 (LCU)	Household spending on kerosene in the third budget quintile, expressed in LCUs.	National	Raw	
	a181	HH spending on kerosene—Quintile 4 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a039	HH spending on kerosene—Quintile 4 (2002 US$)	Monthly household spending on kerosene by the fourth budget quintile of the population.	National	Raw	
	a231	HH spending on kerosene—Quintile 4 (LCU)	Household spending on kerosene in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a182	HH spending on kerosene—Quintile 5 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a040	HH spending on kerosene—Quintile 5 (2002 US$)	Monthly household spending on kerosene by the fifth (and richest) budget quintile of the population.	National	Raw	
	a232	HH spending on kerosene—Quintile 5 (LCU)	Household spending on kerosene in the fifth (richest) budget quintile expressed in LCUs.	National	Raw	
	a177	HH spending on kerosene—Rural (% of HH spending)	Household spending on kerosene as a share of monthly household spending in rural areas.	National	Raw	
	a035	HH spending on kerosene—Rural (2002 US$)	Monthly household spending on kerosene in rural areas, expressed in 2002 US$.	National	Raw	
	a032	HH spending on kerosene—Rural (LCU)	Monthly household spending on kerosene in rural areas, expressed in LCUs.	National	Raw	
	a176	HH spending on kerosene—Urban (% of HH spending)	Household spending on kerosene as a share of monthly household spending in urban areas.	National	Raw	
	a034	HH spending on kerosene—Urban (2002 US$)	Monthly household spending on kerosene in urban areas, expressed in 2002 US$.	National	Raw	
	a031	HH spending on kerosene—Urban (LCU)	Monthly household spending on kerosene in urban areas, expressed in LCUs.	National	Raw	
	a183	HH spending on other fuels—National (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending.	National	Raw	
	a055	HH spending on other fuels—National (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) at the national level, expressed in 2002 US$.	National	Raw	
	a052	HH spending on other fuels—National (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) at the national level, expressed in LCUs.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Af-ford-ability	a186	HH spending on other fuels—Quintile 1 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a058	HH spending on other fuels—Quintile 1 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the first (and poorest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a238	HH spending on other fuels—Quintile 1 (LCU)	Household spending on other fuels in the first (poorest) budget quintile, expressed in LCUs.	National	Raw	
	a187	HH spending on other fuels—Quintile 2 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a059	HH spending on other fuels—Quintile 2 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the second budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a239	HH spending on other fuels—Quintile 2 (LCU)	Household spending on other fuels in the second budget quintile expressed in LCUs.	National	Raw	
	a188	HH spending on other fuels—Quintile 3 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a060	HH spending on other fuels—Quintile 3 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the third budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a240	HH spending on other fuels—Quintile 3 (LCU)	Household spending on other fuels in the third budget quintile, expressed in LCUs.	National	Raw	
	a189	HH spending on other fuels—Quintile 4 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	
	a061	HH spending on other fuels—Quintile 4 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the fourth budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a241	HH spending on other fuels—Quintile 4 (LCU)	Household spending on other fuels in the fourth budget quintile, expressed in LCUs.	National	Raw	
	a190	HH spending on other fuels—Quintile 5 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Affordability	a062	HH spending on other fuels—Quintile 5 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the fifth (and richest) budget quintile of the population, expressed in 2002 US$.	National	Raw	
	a242	HH spending on other fuels—Quintile 5 (LCU)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) in the fifth (richest) budget quintile, expressed in LCUs.	National	Raw	
	a185	HH spending on other fuels—Rural (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending in rural areas.	National	Raw	
	a056	HH spending on other fuels—Rural (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in rural areas, expressed in 2002 US$.	National	Raw	
	a053	HH spending on other fuels—Rural (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in rural areas, expressed in LCUs.	National	Raw	
	a184	HH spending on other fuels—Urban (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending in urban areas.	National	Raw	
	a057	HH spending on other fuels—Urban (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in urban areas, expressed in 2002 US$.	National	Raw	
	a054	HH spending on other fuels—Urban (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in urban areas, expressed in LCUs.	National	Raw	
Financial	b086	Asset value (LCU per year)	Annual total book value of gross fixed assets, expressed in LCUs.	Utility	Raw	
	b201	Asset value (US$ per year)	Annual total book value of gross fixed assets, expressed in 2002 US$.	Utility	Derived	DIVIDE (b086,x003)
	b238	Cost recovery, operational (%)	Average revenue per unit of power generated as a share of operational costs of producing this power.	Utility	Derived	=100*B143/ B230
	b238-d	Cost recovery, operational (%)	Average revenue per unit of power generated in the country as a share of operational costs of producing this power.	National	Derived	simple average b238 over utilities
	b246	Cost recovery, total (%)	Average revenues as a share of the average operational costs; reflects the extent to which the revenues recover operational costs.	Utility	Derived	=100*B143/ B233
	b246-d	Cost recovery, total (%)	Average revenues in the country as a share of the average operational costs across all power utilities in the country; reflects the extent to which the revenues recover operational costs.	National	Derived	simple average b246 over utilities
	b233-d	Costs, average (US$ per kWh)	Average cost (operational and capital) per unit of power generated in the country.	National	Derived	simple average of b233 across utilities
	b233	Costs, average (US$ per kWh)	Sum of the average operational cost and average capital cost for the kWh produced by the utility.	Utility	Derived	=b230+ b231

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Financial	b232	Costs, average capital - country specific parameter (US$ per kWh)	Average capital cost per unit of power for generated based on average capital cost per technology for Sub-Saharan Africa and the country-specific technology mix for the installed generation capacity.	National	Derived	(b030*y002+b032*y004+b031*y003+b033*y005)/100)
	b231	Costs, average capital (US$ per kWh)	Average capital cost per unit of power generated by the utility taking into account the life span of the technology mix of the installed generation and the country specific value of the generation assets of the utility.	Utility	Derived	Raw
	b231d	Costs, average capital (US$ per kWh)	Average capital cost per unit of power generated by the utility taking into account the life span of the technology mix of the installed generation and the country specific value of the generation assets of each utility aggregated at the national level.	National	Derived	average(b231, utilities)
	b230	Costs, average operational (US$ per kWh)	Average operational cost per unit of power generated by the utility expressed in local currency units. Operational costs are cash outflows related to labor, fuel, maintenance, and payment of financial transaction related to operations.	Utility	Derived	DIVIDE(b121, b235)
	b239	Costs, average operational (LCU per kWh)	Average operational cost per unit of power generated in the country expressed in local currency units. Operational costs are cash outflows related to labor, fuel, maintenance, and payment of financial transaction related to operations.	Utility	Derived	DIVIDE (b076,b235)
	b081	Costs, capital (LCU per year)	Capital costs relate to investments made by the company in the plant property, equipment, and other infrastructure, expressed in LCUs.	Utility	Raw	
	b196	Costs, capital (US$ per year)	Capital costs relate to investments made by the company in the plant property, equipment, and other infrastructure, expressed in US$.	Utility	Derived	DIVIDE (b081,x003)
	b083	Costs, capital on new assets (LCU per year)	Capital costs related to investments (nonfinancial) in new assets, expressed in local currency units	Utility	Raw	
	b198	Costs, capital on new assets (US$ per year)	Capital costs related to investments (nonfinancial) in new assets, expressed in US$.	Utility	Derived	DIVIDE (b083,x003)
	b085	Costs, debt service (LCU per year)	Annual debt service expenditure, expressed in local currency units.	Utility	Raw	
	b200	Costs, debt service (US$ per year)	Annual debt service expenditure, expressed in US$.	Utility	Derived	DIVIDE (b085,x003)
	b078	Costs, fuel (LCU per year)	Total operational costs associated with fuel related costs, expressed in local currency units.	Utility	Raw	
	b119-d	Costs, labor (% of operational costs)	Total wages and social contributions paid to the workers and others for delivering the services across power utilities as a share of average operational costs in the country.	National	Derived	w-average (b119, b122,utilities)
	b119	Costs, labor (% of operational costs)	Total wages and social contributions paid to the workers and others for delivering the services expressed as a share of total operational costs of the utility.	Utility	Derived	PRODUCT (Divide (b077,b076),100)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Financial	b077	Costs, labor (LCU per year)	Total wages and social contributions paid to the workers and others for delivering the services, expressed in local currency units.	Utility	Raw	
	b120	Costs, labor (US$ per year)	Total wages and social contributions paid to the workers and others for delivering the services, expressed in US$.	Utility	Derived	DIVIDE(b119, x003)
	b079	Costs, maintenance (LCU per year)	Cash flows purchase of goods and services directly used in production, expressed in US$.	Utility	Raw	
	b194	Costs, maintenance (US$ per year)	Cash flows purchase of goods and services directly used in production, expressed in local currency units.	Utility	Derived	DIVIDE (b079,x003)
	b076	Costs, operational (LCU per year)	Total operational costs per year (excluding depreciation and debt service), expressed in US$. Operational costs are cash outflows related to labor, fuel, maintenance, and payment of financial transaction related to operations.	Utility	Raw	
	b121	Costs, operational (US$ per year)	Total operational costs per year (excluding depreciation and debt service), expressed in local currency units. Operational costs are cash outflows related to labor, fuel, maintenance, and payment of financial transaction related to operations.	Utility	Derived	DIVIDE(b076, x003)
	b082	Costs, rehabilitation (LCU per year)	Capital costs relate to investments in rehabilitation of existing infrastructure, expressed in local currency units.	Utility	Raw	
	b197	Costs, rehabilitation (US$ per year)	Capital costs relate to investments in rehabilitation of existing infrastructure, expressed in US$.	Utility	Derived	DIVIDE (b082,x003)
	b143	Revenue, average (US$ per kWh)	Total utility revenue in US$ per unit of power sold.	Utility	Derived	DIVIDE (b122,b043)
	b143-d	Revenue, average (US$ per kWh)	Total revenue in US$ per unit of power sold for the country.	National	Derived	simple average of b143 across utilities
	b206	Revenue, total (LCU)	Total annual revenues of the utility, expressed in local currency units.	Utility	Raw	
	b122	Revenue, total (US$ per year)	Total annual revenues of the utility, expressed in US$.	Utility	Derived	DIVIDE(b206, x003)
	b069	Billing of electricity (LCU per year)	Total electricity billed from sales of power, expressed in local currency units.	Utility	Raw	
	b189	Billing of electricity (US$ per year)	Total electricity billed from sales of power, expressed in US$.	Utility	Derived	DIVIDE (b069,x003)
	b245-d	Billing of electricity to government entities (% of billings)	Billings of power to government entities as a share of all power billings in the country.	National	Derived	w-average(b245, b189, across utilities)
	b245	Billing of electricity to government entities (% of billings)	Billings of power to government entities as a share of all utility billings.	Utility	Derived	Divide (b244,b189)
	b243	Billing of electricity to government entities (LCU per year)	Billings of electricity to government entities, expressed in US$.	Utility	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Financial	b244-d	Billing of electricity to government entities (US$ per year)	Billings of electricity for utilities in the country to government entities for all, expressed in US$.	National	Derived	sum (b244, across utilities)
	b244	Billing of electricity to government entities (US$ per year)	Billings of electricity to government entities, expressed in US$.	Utility	Derived	Divide (b244,x003)
	b071	Billing of electricity, commercial customers (LCU per year)	Total electricity billed from sales of power to commercial customers, expressed in local currency units.	Utility	Raw	
	b075	Billing of electricity, high voltage customers (LCU per year)	Total electricity billed from sales of power to high voltage customers, expressed in local currency units.	Utility	Raw	
	b072	Billing of electricity, industrial customers (LCU per year)	Total electricity billed from sales of power to industrial customers, expressed in local currency units.	Utility	Raw	
	b073	Billing of electricity, low voltage customers (LCU per year)	Total electricity billed from sales of power to low voltage customers, expressed in local currency units.	Utility	Raw	
	b074	Billing of electricity, medium voltage customers (LCU per year)	Total electricity billed from sales of power to medium voltage customers, expressed in local currency units.	Utility	Raw	
	b070	Billing of electricity, residential customers (LCU per year)	Total electricity billed from sales of power to residential customers, expressed in local currency units.	Utility	Raw	
	b061	Collected bills (LCU per year)	Total revenue collected from sales of power.	Utility	Raw	
	b063	Collected bills, commercial customers (LCU per year)	Total revenue collected from sales of power to commercial customers, expressed in local currency units.	Utility	Raw	
	b067	Collected bills, high voltage customers (LCU per year)	Total revenue collected from sales of power to high voltage customers, expressed in local currency units.	Utility	Raw	
	b064	Collected bills, industrial customers (LCU per year)	Total revenue collected from sales of power to industrial customers, expressed in local currency units.	Utility	Raw	
	b065	Collected bills, low voltage customers (LCU per year)	Total revenue collected from sales of power to low voltage customers, expressed in local currency units.	Utility	Raw	
	b066	Collected bills, medium voltage customers (LCU per year)	Total revenue collected from sales of power to medium voltage customers, expressed in local currency units.	Utility	Raw	
	b062	Collected bills, residential customers (LCU per year)	Total revenue collected from sales of power to residential customers, expressed in local currency units.	Utility	Raw	
	b088-d	Collection ratio (% of billing)	Share of electricity bills for electricity in the country actually collected.	National	Raw	simple average b088 across utilities;

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Financial	b088	Collection ratio (% of billing)	Share of electricity bills of the utility actually collected.	Utility	Raw	if 'nav' in template then (b061/ b069)*100
	b228	Hidden costs, losses (% of GDP)	Inefficiencies due to system losses for all utilities, expressed as a share of GDP.	National	Derived	=100*b216/ x002
	b220	Hidden costs, losses (% of revenue)	Inefficiencies due to system losses, expressed as a share of total utility revenues.	Utility	Derived	=100*B212/ B122
	b224	Hidden costs, losses (% of revenue)	Inefficiencies due to system losses for all utilities, expressed as a share of total revenues for power in the country.	National	Derived	w-average (b220, b122,across utilities)
	b216	Hidden costs, losses (US$)	Inefficiencies associated with system losses for power for all power utilities in the country, expressed in US$.	National	Derived	sum(b212,across utilities)
	b212	Hidden costs, losses (US$)	Inefficiencies associated with system losses for power for the utility in US$.	Utility	Derived	if [(b175-y001)*b235*b233)>=0 then =[((b1 75-y00 1)/100)*b235*b233] otherwise 02
	b229	Hidden costs, total (% of GDP)	Inefficiencies due to underpricing, under-collection of revenues and system losses for all utilities, expressed as a share of GDP.	National	Derived	=sum(b226:228)
	b221	Hidden costs, total (% of revenue)	Inefficiencies due to underpricing, under- collection and system losses of power, expressed as a share of total utility revenues.	Utility	Derived	=sum(b218:220)
	b225	Hidden costs, total (% of revenue)	Inefficiencies due to underpricing, under-collection of revenues and system losses for all utilities, expressed as a share of total revenues for power in the country.	National	Derived	=sum(b222:224)
	b213	Hidden costs, total (US$)	Total hidden costs associated with underpricing, under-collection and system losses, expressed in US$.	Utility	Derived	=sum(b210:212)
	b217	Hidden costs, total (US$)	Total hidden costs associated with underpricing, under-collection and system losses for all power utilities in the country, expressed in US$.	National	Derived	=sum (b214:b216)
	b227	Hidden costs, under-collection (% of GDP)	Inefficiencies due to under-collection of power for all utilities, expressed as a share of GDP.	National	Derived	=100*b215/ x002
	b223	Hidden costs, under-collection (% of revenue)	Inefficiencies due to under-collection of power for all utilities, expressed as a share of total revenues for power in the country.	National	Derived	w-average (b219, b122,across utilities)
	b219	Hidden costs, under-collection (% of revenue)	Inefficiencies due to under-collection of power revenues, expressed as a share of total utility revenues.	Utility	Derived	=100*B211/ B122
	b215	Hidden costs, under-collection (US$)	Inefficiencies associated with inadequate collection of revenues for all power utilities in the country, expressed in US$.	National	Derived	sum(b211,across utilities)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Financial	b211	Hidden costs, under-collection (US$)	Inefficiencies associated with inadequate collection of revenues for power for the utility in US$.	Utility	Derived	if [(100 - b088)* b234*10^6*b236] >=0 then = [((100 - b088)/100)*b234*10^6*b236] otherwise 0
	b226	Hidden costs, underpricing (% of GDP)	Inefficiencies due to underpricing of power for all utilities, expressed as a share of GDP.	National	Derived	=100*b214/x002
	b218	Hidden costs, underpricing (% of revenue)	Inefficiencies due to underpricing of power, expressed as a share of total utility revenues.	Utility	Derived	=100*B210/B122
	b222	Hidden costs, underpricing (% of revenue)	Inefficiencies due to underpricing of power for all utilities, expressed as a share of total revenues for power in the country.	National	Derived	w-average (b218,b122,across utilities)
	b214	Hidden costs, underpricing (US$)	Inefficiencies associated with under-pricing of power for all power utilities in the country, expressed in US$.	National	Derived	Sum(b210,across utilities)
	b210	Hidden costs, underpricing (US$)	Inefficiencies associated with under- pricing of power for the utility in US$.	Utility	Derived	if [(b233 - b236)*b234*10^6] >= 0 then =[(b2 33 - b 236)*b234*10^6] otherwise 0
Fiscal	F063	Investment - off-budget (% of GDP)	Sum of capital spending for SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F017	Investment - off-budget (US$)	Sum of capital spending for SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F060	Investment - on-budget (% of GDP)	Sum of capital spending for government for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F014	Investment - on-budget (US$)	Sum of capital spending for government for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F057	Investment - public sector (% of GDP)	Sum of capital spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F011	Investment - public sector (US$)	Sum of capital spending for government and SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F064	Recurrent spending (mostly O&M) - off-budget (% of GDP)	Sum of recurrent spending for SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F018	Recurrent spending (mostly O&M) - off-budget (US$)	Sum of recurrent spending for SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F061	Recurrent spending (mostly O&M) - on-budget (% of GDP)	Sum of recurrent spending for government for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F015	Recurrent spending (mostly O&M) - on-budget (US$)	Sum of recurrent spending for government for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Fiscal	F058	Recurrent spending (mostly O&M) - public sector (% of GDP)	Sum of recurrent spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F012	Recurrent spending (mostly O&M) - public sector (US$)	Sum of recurrent spending for government and SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F062	Total spending - off-budget (% of GDP)	Sum of capital and recurrent spending for SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F016	Total spending - off-budget (US$)	Sum of capital and recurrent spending for SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F059	Total spending - on-budget (% of GDP)	Sum of capital and recurrent spending for government for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F013	Total spending - on-budget (US$)	Sum of capital and recurrent spending for government for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
	F056	Total spending - public sector (% of GDP)	Sum of capital and recurrent spending for government and SOEs for the sector. (% of GDP)	Sector	Derived	See Chapter 5: Fiscal Spending
	F010	Total spending - public sector (US$)	Sum of capital and recurrent spending for government and SOEs for the sector. (US$)	Sector	Derived	See Chapter 5: Fiscal Spending
Institutional	d051	Reform index, Electricity (base 100)	Index that ranks whether the electricity sector has competition, unbundling and decentralization. This implicitly assumes that vertical separation, decentralization, and competition are desirable institutional objectives. A score of 100 indicates the electricity sector is fully unbundled and largely competitive.	National	Derived	Average (d045:d047)
	d007	Reform: Decentralization, Accountability level for rural electrification provision (0=Central, 1=Regional, 2=Local/ Municipal)	Categorical value between 0 and 3 that characterizes the level of government responsible for rural electrification.	National	Raw	
	d008	Reform: Decentralization, Accountability level for rural electrification provision, central (1=yes, 0=no)	Positively scores an electricity sector if the central government is responsible for rural electrification.	National	Derived	if(d007=0, then 1; otherwise = 0)
	d010	Reform: Decentralization, Accountability level for rural electrification provision, local/municipal (1=yes, 0=no)	Positively scores an electricity sector if local/municipal authority is responsible for rural electrification.	National	Derived	if (d007=2 then 1; otherwise=0)
	d009	Reform: Decentralization, Accountability level for rural electrification provision, regional (1=yes, 0=no)	Positively scores an electricity sector if regional authority is responsible for rural electrification.	National	Derived	if (d007=1 then 1; otherwise=0)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	d011	Reform: Decentralization, Urban utility with responsibility in states and municipalities (1=yes, 0=no)	Positively scores an electricity sector if national urban utility has significant responsibilities in states and municipalities.	National	Raw	
	d046	Reform: Electricity Decentralization, subindex (base 100)	Index that ranks whether the electricity sector has decentralized. This implicitly assumes that is a desirable institutional objective. A score of 100 indicates the electricity sector is fully decentralized.	National	Derived	Average (d008:d011)*100
	d047	Reform: Electricity Market Structure - sub -index (base 100)	Index that ranks whether the electricity sector has competition. This implicitly assumes that competition is a desirable institutional objective. A score of 100 indicates the electricity sector is largely competitive.	National	Derived	Average ((d013:d016), (d018:d020), (d022:d 024), (d026:d029))*100
	d045	Reform: Electricity Restructuring, subindex (base 100)	Index that ranks whether the electricity sector has vertically unbundled. This implicitly assumes that vertical separation is a desirable institutional objective. A score of 100 indicates the electricity sector is fully unbundled	National	Derived	Average (d001:d006)*100
	d013	Reform: Market Structure and model , Same company (1=no, 0=yes)	Positively scores an electricity sector if the market structure is different from a vertically integrated monopoly at all levels of the supply chain within a country (typically) or a region in parallel to other vertically integrated regional monopolies, with no competition	National	Derived	if (d012= 0 then 1, 0 otherwise)
	d014	Reform: Market Structure and model , Single buyer model (1=yes, 0=no)	Positively scores an electricity sector where the power regulatory framework allows a single buyer or purchasing agency to encourage competition between generators by choosing its sources of electricity from a number of different electricity producers. The agency on-sells electricity to distribution companies and large power users without competition from other suppliers.	National	Derived	if (d012= 1 then 1, 0 otherwise)
	d016	Reform: Market Structure and model, Retail competition (1=Retail competition, 0=otherwise)	Positively scores an electricity sector in which the power regulatory framework allows all customers to choose their electricity supplier, which implies full retail competition, under open access for suppliers to the transmission, and distribution systems. Retail competition enables small customers to buy electricity from competing brokers. The brokers, in turn, purchase electricity in the wholesale market and pay a regulated fee to transmission company and distributors for the use of their infrastructure.	National	Derived	if (d012= 3 then 1, 0 otherwise)
	d015	Reform: Market Structure and model, Wholesale competition (1=yes, 0=no)	Positively scores an electricity sector where the power regulatory framework allows distribution companies to purchase electricity directly from generators they choose, transmit this electricity under open access arrangements over the transmission system to their service area, and deliver it over their local grids to their customers, which brings competition into the wholesale supply market but not the retail power market.	National	Derived	if (d012= 2 then 1, 0 otherwise)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	d012	Reform: Market Structure, (0=same company,1=single buyer model, 2=Wholesale competition, 3=Retail competition)	Categorical value between 0 and 3 that characterizes the market structure based on the level of competition within each segment of the industry and the level of competition existing.	National	Raw	
	d019	Reform: Market Structure, Duopolistic with two operators generating power (1=yes, 0=no)	Positively score an electricity sector where there are two operators providing generation services.	National	Derived	if (d017= 2 then 1, 0 otherwise)
	d018	Reform: Market Structure, Monopolistic with one operator generating power (1=no, 0=yes)	Positively score an electricity sector where there are more than one operator providing generation services.	National	Derived	if (d017= 1 then 1, 0 otherwise)
	d029	Reform: Market Structure, Community providers that have significant responsibility in rural power provision (1=yes, 0=no)	Positively score an electricity sector where community based service providers have any significant responsibilities in provision of rural power.	National	Raw	if (d029=1 then 1, 0 otherwise)
	d020	Reform: Market Structure, Competitive with more than two operators generating power (1=yes, 0=no)	Positively score an electricity sector where there are more than two operators providing generation services.	National	Derived	if (d017 >2 then 1, 0 otherwise)
	d028	Reform: Market Structure, Competitive, with one operator distributing power (1=yes, 0=no)	Positively score an electricity sector where there are more than two operators providing distribution services.	National	Derived	if (d025 >2 then 1, 0 otherwise)
	d027	Reform: Market Structure, Duopolistic, with one operator distributing power (1=yes, 0=no)	Positively score an electricity sector where there are two operators providing distribution services.	National	Derived	if (d025= 2 then 1, 0 otherwise)
	d023	Reform: Market Structure, Duopolistic, with one operator transmitting power (1=yes, 0=no)	Positively score an electricity sector where there are two operators providing transmission services.	National	Derived	if (d021= 2 then 1, 0 otherwise)
	d026	Reform: Market Structure, Monopolistic, with one operator distributing power (1=no, 0=yes)	Positively score an electricity sector where there is more than one operator providing distribution services.	National	Derived	if (d025= 1 then 1, 0 otherwise)
	d022	Reform: Market Structure, Monopolistic, with one operator transmitting power (1=no, 0=yes)	Positively score an electricity sector where there are more than one operator providing transmission services.	National	Derived	if (d021= 1 then 1, 0 otherwise)
	d025	Reform: Market Structure, Number of operators distributing power (Number)	Number of active operators currently providing the service.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	d017	Reform: Market Structure, Number of operators generating power (Number)	Number of active operators currently providing the service.	National	Raw	
	d024	Reform: Market Structure, Reform: competitive, with one operator transmitting power (1=yes, 0=no)	Positively score an electricity sector where there are more than two operators providing transmission services.	National	Derived	if (d021 >2 then 1, 0 otherwise)
	d021	Reform: Market Structure, Number of Operators transmitting power (Number)	Number of active operators currently providing the service.	National	Raw	
	d004	Reform: Restructuring, De facto unbundling distribution and transmission (1=yes, 0=no)	Positively scores an electricity sector where distribution of electricity and transmission of electricity are provided by different companies.	National	Raw	
	d006	Reform: Restructuring, De facto unbundling generation and distribution (1=yes, 0=no)	Positively scores an electricity sector where generation of electricity and distribution of electricity are provided by different companies.	National	Raw	
	d002	Reform: Restructuring, De facto unbundling generation and transmission (1=yes, 0=no)	Positively scores an electricity sector where generation of electricity and transmission of electricity are provided by different companies.	National	Raw	
	d003	Reform: Restructuring, De jure unbundling distribution and transmission (1=yes, 0=no)	Positively scores an electricity sector that by Law banes companies providing distribution and transmission of electricity to be owned by the same operator.	National	Raw	
	d005	Reform: Restructuring, De jure unbundling generation and distribution (1=yes, 0=no)	Positively scores an electricity sector that by Law banes companies providing generation and distribution of electricity to be owned by the same operator.	National	Raw	
	d001	Reform: Restructuring, De jure unbundling generation and transmission (1=yes, 0=no)	Positively scores an electricity sector that by Law banes companies providing generation and transmission of electricity to be owned by the same operator.	National	Raw	
	d052	Regulation index, Electricity (base 100)	Index that ranks whether an electricity sector is regulated by modern and not invasive regulations to foster transparency, autonomy, with adequate regulatory tools. A score of 100 indicates the most advanced regulatory setting.	National	Derived	Average (d048:d050)
	d041xx	Regulation: Cost-recovery of rural fund, full capital subsidy (1=no, 0=yes)	Full capital subsidy for cost recovery for electricity services in rural electricity.	National	Derived	if (d040=1 then 1, 0 otherwise)
	d043	Regulation: Cost-recovery of rural fund, no subsidy (1=yes, 0=no)	Positively score an electricity sector where no subsidy for cost recovery for electricity services in rural electricity.	National	Derived	if (d040=3 then 1, 0 otherwise)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	d042	Regulation: Cost-recovery of rural fund, partial capital subsidy (1=yes, 0=no)	Positively score an electricity sector where only partial capital subsidy for cost recovery for electricity services in rural electricity.	National	Derived	if (d040=2 then 1, 0 otherwise)
	d040	Regulation: Cost-recovery of rural fund (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)	Categorical value between 0 and 3 that characterizes the policy on cost recovery for electricity services in rural electricity services.	National	Raw	
	d041	Regulation: Cost-recovery of rural fund, full subsidy (1=0, 0=yes)	Positively score an electricity sector where some cost recovery exists in rural electricity. (Full subsidy for cost recovery for electricity services is outlawed.)	National	Derived	if (d040=0 then 1, 0 otherwise)
	d049	Regulation: Electricity Cost Recovery, subindex (base 100)	Index that ranks whether an electricity sector is able to have cost recovery when providing rural electrification. A score of 100 indicates cost recovery.	National	Derived	Average(d041: d043)*100
	d050	Regulation: Electricity Environment, subindex (base 100)	Index that ranks whether an electricity sector has in incentives to promote use and production of renewable energy. A score of 100 indicates environment incentives are in place.	National	Derived	d044*100
	d048	Regulation: Electricity Tools, subindex (base 100)	Index that ranks whether an electricity sector has modern, flexible, and transparent mechanisms for tariff setting, third party access and penalties for nonpayment. A score of 100 indicates good tools.	National	Derived	Average(d030, (d032:d039) *100
	d044	Regulation: Environmental, Incentives for renewable energy (1=yes, 0=no)	Positively score an electricity sector where there are incentives for renewable energy.	National	Raw	if (d044=1 then 1, 0 otherwise)
	d039	Regulation: Tools, Cut off possibility (1=yes, 0=no)	Positively score an electricity sector where utility can cut-off service in case of nonpayment.	National	Raw	
	d037	Regulation: Tools, Minimum quality standards for operators (1=yes, 0=no)	Positively score an electricity sector where regulation establishes penalties for noncompliance to minimum quality standards.	National	Raw	
	d038	Regulation: Tools, Penalties for noncompliance with minimum quality standards (1=yes, 0=no)	Positively score an electricity sector where regulation establishes penalties for noncompliance with minimum quality standards.	National	Raw	
	d030	Regulation: Tools, Regulation of large customers (1=yes, 0=no)	Positively score an electricity sector where large customers are regulated.	National	Raw	if (d030=1 then 1, 0 otherwise)
	d036	Regulation: Tools, Third-party access to transmission and distribution (1=yes, 0=no)	Positively score an electricity sector where third-party access to a transmission and distribution network is allowed by law.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	d031	Regulation: Tools, Transmission tariff regulation methodology used (0=none, 1=price cap, 2=rate of return, 3=other)	Categorical value between 0 and 3 that characterizes the tariff regulation methodology used for transmission.	National	Raw	
	d035	Regulation: Tools, Transmission tariff regulation methodology used for transmission, other (1=yes, 0=no)	Positively score an electricity sector where some type of formal methodology used for transmission.	National	Derived	if (d031= 3 then 1, 0 otherwise)
	d033	Regulation: Tools, Transmission tariff regulation methodology used for transmission, price cap (1=yes, 0=no)	Positively score an electricity sector where price cap methodology used for transmission. Price cap refers to the process by which governments sometimes apply ceilings or other controls on the prices that operators can charge for certain kinds of service.	National	Derived	if (d031= 1 then 1, 0 otherwise)
	d034	Regulation: Tools, Transmission tariff regulation methodology used for transmission, rate of return (1=yes, 0=no)	Positively score an electricity sector where rate of return methodology used for transmission. Rate-of-return regulation is a system for setting the prices charged by regulated monopolies. The central idea is that monopoly firms should be required to charge the price that would prevail in a competitive market, which is equal to efficient costs of production plus a market-determined rate of return on capital.	National	Derived	if (d031= 2 then 1, 0 otherwise)
	d032	Regulation: Tools, Transmission tariff regulation methodology used for transmission, none (1=yes, 0=no)	Positively score an electricity sector where no tariff regulation methodology is used for transmission.	National	Derived	if (d031= 0 then 1, 0 otherwise)
	GOV012	Governance: Accounting and Disclosure and Performance Monitoring: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to account, monitor, and disclose key performance indicators. A score of 100 indicates key mechanisms are in place.	Sector	Derived	See Chapter 4: Institutions
	GOV009	Governance: Capital Market Discipline: Subindex Sector (base 100)	Index that ranks how intense capital discipline is established on operators through various capital market mechanisms within a sector. A score of 100 indicates the capital market discipline is in place.	Sector	Derived	See Chapter 4: Institutions
	GOV008	Governance: General index Sector (base 100)	Index that ranks how prone to independent and self-regulating environment for infrastructure operators a specific sector is. A score of 100 indicates the most pro-self regulating environment for operators.	Sector	Derived	See Chapter 4: Institutions
	GOV010	Governance: Labor Market Discipline: Subindex Sector (base 100)	Index that ranks how intense labor discipline is established on operators through various free labor market mechanisms within a sector. A score of 100 indicates the labor market discipline is in place.	Sector	Derived	See Chapter 4: Institutions
	GOV013	Governance: Managerial and Board Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to avoid interference of governments in operator managerial decisions. A score of 100 indicates the operator board is substantially autonomous.	Sector	Derived	See Chapter 4: Institutions

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	GOV011	Governance: Outsourcing: Subindex Sector (base 100)	Index that ranks whether outsourcing mechanisms are introduced to improve operators governance within a sector. A score of 100 indicates key outsourcing elements are allowed.	Sector	Derived	See Chapter 4: Institutions
	GOV014	Governance: Ownership and Shareholder Quality: Subindex Sector (base 100)	Index that ranks whether a sector within a country has in place mechanisms for ownership and shareholder quality. A score of 100 indicates highest quality.	Sector	Derived	See Chapter 4: Institutions
	REF006	Reform: General Index Sector (base 100)	Compounded index that ranks the level of effort that a sector within a country has in incepting modern reforms to foster competition, private sector participation, and independent institutions across all utility infrastructures. A score of 100 indicates the most advanced reform setting.	Sector	Derived	See Chapter 4: Institutions
	REF041	Reform: Legislation: 10 Or More Years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms.	Sector	Derived	See Chapter 4: Institutions
	REF037	Reform: Legislation: Existence of reform (1=yes, 0=no)	Positively scores a sector within a country that has undertaken at least one key reform of the sector.	Sector	Derived	See Chapter 4: Institutions
	REF040	Reform: Legislation: Last 10 Years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms during last ten years.	Sector	Derived	See Chapter 4: Institutions
	REF036	Reform: Legislation: Legal reform (1=yes, 0=no)	Positively scores a sector within a country where sector legislation has been passed within the last 10 years.	Sector	Derived	See Chapter 4: Institutions
	REF010	Reform: Legislation: Subindex Sector (base 100)	Index that ranks whether modern legislation has been recently introduced to support the functioning of the providers within a specific sector, private participation, and adequate support of vulnerable users.	Sector	Derived	See Chapter 4: Institutions
	REF019	Reform: Policy Oversight: Dispute Arbitration Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on dispute resolution is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	See Chapter 4: Institutions
	REF022	Reform: Policy Oversight: Investment Plan Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on investment plans is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	See Chapter 4: Institutions
	REF020	Reform: Policy Oversight: Regulation Monitoring Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on regulatory monitoring is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	See Chapter 4: Institutions
	REF008	Reform: Policy Oversight: Subindex Sector (base 100)	Index that ranks how effective a country is to oversight the well functioning of the provision of a specific infrastructure service. A score of 100 indicates optimal policy oversight.	Sector	Derived	See Chapter 4: Institutions
	REF023	Reform: Policy Oversight: Tariff Approval Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on tariff approval is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	See Chapter 4: Institutions

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REF021	Reform: Policy Oversight: Technical Standard Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on technical standards is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Sector	Derived	See Chapter 4: Institutions
	REF007	Reform: Private Sector Involvement: Subindex Sector (base 100)	Index that ranks how friendly and effective a country is to allow for private participation in a specific sector. A scare of 100 indicates the most private-participation investment environment.	Sector	Derived	See Chapter 4: Institutions
	REF009	Reform: Restructuring: Subindex Sector (base 100)	Index that ranks whether the country is fostering independent operators and vertical separation of the industry. This implicitly assumes that vertical separation and corporatization are desirable institutional objectives. A score of 100 indicates the country has fully corporatized and restructured its infrastructure sectors.	Sector	Derived	See Chapter 4: Institutions
	REG017	Regulation: Accountability: Full Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows the possibility to appeal regulatory decisions to independent arbitration.	Sector	Derived	See Chapter 4: Institutions
	REG018	Regulation: Accountability: Partial Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows appeal to regulatory decisions to bodies other than government/line ministries.	Sector	Derived	See Chapter 4: Institutions
	REG008	Regulation: Accountability: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms for the operators and the users to appeal regulatory decision taken by the regulatory bodies. A score of 100 indicates good mechanism to regulate the regulator is in place.	Sector	Derived	See Chapter 4: Institutions
	REG028	Regulation: Autonomy: Formal autonomy – fire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory authorities cannot be fired by government/line ministry.	Sector	Derived	See Chapter 4: Institutions
	REG029	Regulation: Autonomy: Formal autonomy – hire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body is not directly appointed by government/line ministry officials.	Sector	Derived	See Chapter 4: Institutions
	REG026	Regulation: Autonomy: Full Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget fully funded through fees.	Sector	Derived	See Chapter 4: Institutions
	REG024	Regulation: Autonomy: Full Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where government agencies, line ministry, or any other state body can veto a regulatory decision.	Sector	Derived	See Chapter 4: Institutions
	REG027	Regulation: Autonomy: Partial Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget that at least is partially funded through fees and/or donors.	Sector	Derived	See Chapter 4: Institutions
	REG025	Regulation: Autonomy: Partial Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where entities other that the government or ministries can veto regulatory decisions.	Sector	Derived	See Chapter 4: Institutions
	REG010	Regulation: Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has regulatory bodies able to work independently, minimizing the chance that they will be captured by interest groups or revoked by the government. A score of 100 indicates that the regulatory body is independent.	Sector	Derived	See Chapter 4: Institutions

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	REG006	Regulation: General index Sector (base 100)	Index that ranks the level of effort that a sector within a country is incepting modern and not invasive regulations to foster transparency, autonomy, and provide adequate tools for regulation across all utility infrastructures. A score of 100 indicates the most advanced regulatory setting.	Sector	Derived	See Chapter 4: Institutions
	REG011	Regulation: Tools: Length Regulatory Review (1=yes, 0=no)	Positively scores a sector within a country that has tariff reviews in periods not longer than three years.	Sector	Derived	See Chapter 4: Institutions
	REG007	Regulation: Tools: Subindex Sector (base 100)	Index that ranks whether a sector within a country has modern, flexible, and transparent mechanisms for tariff setting in infrastructure sectors. A score of 100 indicates good tools.	Sector	Derived	See Chapter 4: Institutions
	REG012	Regulation: Tools: Tariff Methodology (1=yes, 0=no)	Positively scores a sector within a country that has a clear tariff methodology set in place.	Sector	Derived	See Chapter 4: Institutions
	REG009	Regulation: Transparency: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to make regulatory decisions public and easily available to operators and users. A score of 100 indicates information on regulation is easily available.	Sector	Derived	See Chapter 4: Institutions
Pricing	b060	Connection charge, medium-voltage customer (LCU per connection)	One-time fee charged by the utility to the medium voltage customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in local currency units.	Utility	Raw	
	b179-d	Connection charge, medium-voltage customer (US$ per connection)	Average one-time fee charged by all power utilities in the country to the medium voltage customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in US$.	National	Derived	simple average of b179 across all utilities per country
	b179	Connection charge, medium-voltage customer (US$ per connection)	One-time fee charged by the utility to the medium voltage customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in US$.	Utility	Derived	=b060/x003
	b059	Connection charge, residential customers (LCU per connection)	One-time fee charged by the utility to the residential customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in local currency units.	Utility	Raw	
	b169-d	Connection charge, residential customers (US$ per connection)	Average one-time fee charged by all power utilities in the country to the residential customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in US$.	National	Derived	Simple average of b169 across all utilities per country
	b169	Connection charge, residential customers (US$ per connection)	One-time fee charged by the utility to the medium voltage customer in order to activate the physical connection (for example, transmission lines, transformers, switch gear, and such) to the electricity service, expressed in US$.	Utility	Derived	DIVIDE (b059,x003)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Pricing	b240	Fixed charge (LCU per month)	A fee paid by a consumer for electricity regardless of its level of consumption but determined by the type of consumer. The charge is usually determined by the level of development of the network, the location and—when subsidization practices apply—the purchasing power of the consumer. Expressed in local currency units.	Utility	Raw	
	b242	Fixed charge (US$ per month)	An average at the country level of the lump-sum fee paid by the consumer for electricity. The charge is usually determined by the level of development of the network, the location and—when subsidization practices apply—the purchasing power of the consumer. Expressed in US dollars.	National	Derived	simple average b241 across utilities
	b241	Fixed charge (US$ per month)	A fee paid by a consumer for electricity, regardless of its level of consumption but determined by the type of consumer. The charge is usually determined by the level of development of the network, the location and—when subsidization practices apply—the purchasing power of the consumer. Expressed in US$.	Utility	Derived	Divide (b240,x003)
	b237	Tariff, average effective (LCU per kWh)	Effective payment that an average consumer of a utility should be charged for a monthly consumption of electricity of 100 kWh. The effective tariff calculation takes into account fixed charges and the block structure that characterizes the tariff schedule (expressed in LCU)	Utility	Power Template C	
	b236	Tariff, average effective (US$ per kWh)	Effective payment that an average consumer of a utility should be charged for a monthly consumption of electricity of 100 kWh. The effective tariff calculation takes into account fixed charges and the block structure that characterizes the tariff schedule (expressed in US dollars).	Utility	Power Template C	=b237/x003
	b236-d	Tariff, average effective (US$ per kWh)	Effective payment that an average consumer of the country should be charged for a monthly consumption of electricity of 100 kWh. The effective tariff calculation takes into account fixed charges and the block structure that characterizes the tariff schedule. It is calculated by averaging the effective tariffs of functioning utilities (expressed in US dollars).	National	Derived	simple average of b236 across utilities
Technical	b019	Electricity generated by emergency generation (GWh per year)	Total net electricity generated by emergency generators.	National	Raw	
	b018	Electricity generated by isolated (off grid) systems (GWh per year)	Total net electricity generated outside of the interconnected network by isolated (off-grid) systems.	National	Raw	
	b020	Electricity generated by self-generation (GWh per year)	Total net electricity generated by individual generators	National	Raw	
	b043	Electricity generated on the Interconnected system (GWh per year)	Total power generated by utility or generation company and IPPs, excluding captive generation.	National	Derived	SUM(b14:b17)

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	b015	Electricity generated on the interconnected system from conventional thermal (GWh per year)	Consists of electricity generated on the interconnected grid from oil, gas, and coal.	National	Raw	
	b014	Electricity generated on the interconnected system from hydro-electric (GWh per year)	Consists of net electricity generated on the interconnected grid from hydroelectric plants.	National	Raw	
	b016	Electricity generated on the interconnected system from nuclear (GWh per year)	Consists of electricity generated on the interconnected grid from nuclear power plants.	National	Raw	
	b017	Electricity generated on the interconnected system from solar, wind, biomass, geothermal (GWh per year)	Consists of electricity generated on the interconnected grid from solar, wind, biomass, geothermal. Includes wood and waste combustible renewals.	National	Raw	
	b235	Electricity generated, volume (GWh per year)	Volume of electricity produced by the utility.	Utility	Raw	
	b204	Electricity generation (kWh per capita)	Total power generated per capita.	National	Derived	DIVIDE (SUM(B0 14:b019)),x001)
	b234	Electricity sold, volume (GWh per year)	Volume of electricity sold by the utility.	Utility	Raw	
	b013	Load Served on grid (GWh)	Total annual net electricity generated on the interconnected grid per year. Total electricity generated on the interconnected grid from hydro-electric, conventional thermal, nuclear and solar, wind, biomass and geothermal.	National	Raw	
	b034	Load shed (GWh)	Total volume of load shed during unplanned outages.	National	Raw	
	b040	Power purchased from IPPs (% total generation)	Share of power purchased by the utility from independent power producers over the year in terms of installed capacity.	National	Derived	DIVIDE (b021,b043)
	b021	Power purchased from IPPs (GWh per year)	Electricity purchased by the utility from independent power producers over the year.	National	Raw	
	b001	Generation capacity (MW)	Total capacity of the interconnected grid in hydro-electric, conventional thermal, nuclear, and solar, wind, biomass, geothermal. This variable includes IPP generation capacity but excludes emergency generation and self-generation capacities.	National	Raw	
	b031	Generation capacity conventional thermal (% of total generation capacity)	Share of generation from conventional sources in terms of total power generation.	National	Derived	DIVIDE (b003,b001)
	b003	Generation capacity conventional thermal (MW)	Capacity of electric plants using oil, gas, and coal on the interconnected grid.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	b030	Generation capacity hydroelectric (% of total generation capacity)	Share of generation from hydropower sources in terms of total power generation.	National	Derived	DIVIDE (b002,b001)
	b002	Generation capacity hydro-electric (MW)	Capacity of hydro-electric plants on the interconnected grid.	National	Raw	
	b032	Generation capacity nuclear (% of total generation capacity)	Share of generation from nuclear sources in terms of total power generation.	National	Derived	DIVIDE (b004,b001)
	b004	Generation capacity nuclear (MW)	Capacity of nuclear plants.	National	Raw	
	b007	Generation capacity of isolated (off grid) systems (MW)	The rated capacity as stated on the nameplate of the equipment in the isolated power plant. These are not part of the interconnected network in the isolated power plant.	National	Raw	
	b008	Generation capacity of isolated (off-grid) systems in operational conditional (MW)	Available capacity of the isolated power plants—that is, the maximum capacity at which the stations can be operated.	National	Raw	
	b180	Generation capacity operational (% total capacity)	Functioning capacity as a share of total installed capacity.	National	Derived	DIVIDE (b006,b001)
	b006	Generation capacity operational (MW)	Available capacity of the power plant—that is, the maximum capacity at which the stations can be operated.	National	Raw	
	b042	Generation capacity per population (MW per million population)	Generation capacity per million people in the country.	National	Derived	DIVIDE(b001, x001/10^6)
	b033	Generation capacity solar, wind, biomass, geothermal (% of total generation capacity)	Share of generation from solar, wind, geothermal sources in terms of total power generation.	National	Derived	DIVIDE (b005,b001)
	b005	Generation capacity solar, wind, biomass, geothermal (MW)	Capacity of generators using sun, wind, wood, waste, combustible renewables, and other biomass and geothermal sources.	National	Raw	
	b038	Emergency generation capacity (% of operational capacity)	Share of emergency generation in terms of installed capacity.	National	Derived	DIVIDE (b009,b006)*100
	b009	Emergency generation capacity (MW)	Total capacity of emergency generators available per year.	National	Raw	
	b039	Self-generation capacity (% of operational capacity)	Share of self-generation capacity in terms of installed capacity.	National	Derived	DIVIDE(b010/ b006)*100
	b010	Self-generation capacity (MW)	Total installed capacity of individual generators by firms.	National	Raw	
	b024	Length of high-voltage transmission lines (km)	Total cumulative length of the high-voltage transmission network.	National	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	b025	Length of high-voltage transmission lines in need of rehabilitation (km)	Total cumulative length of the high-voltage transmission network in need of rehabilitation.	National	Raw	
	b028	Length of low-voltage transmission lines (km)	Total cumulative length of the low-voltage transmission network (up to 415V).	National	Raw	
	b029	Length of low-voltage transmission lines in need of rehabilitation (km)	Total cumulative length of the low-voltage transmission network in need of rehabilitation (up to 415V).	National	Raw	
	b026	Length of medium-voltage transmission lines (km)	Total cumulative length of the medium voltage transmission network (415V- 11-kV).	National	Raw	
	b027	Length of medium-voltage transmission lines in need of rehabilitation (km)	Total cumulative length of the medium voltage transmission network in need of rehabilitation (415V-11kV).	National	Raw	
	b012	Peak demand on interconnected system (MW)	Maximum load for the main interconnected network during a given year.	National	Raw	
	b044	Trade, net power balance (GWh per year)	The total power trade (imports - exports).	National	Derived	SUBTRACT ((b022, b023)
	b023	Trade, power exports (GWh per year)	Total annual power exports.	National	Raw	
	b022	Trade, power imports (GWh per year)	Total annual power imports.	National	Raw	
	b037	Peak demand factor	Share of maximum monthly load in terms of installed capacity.	National	Derived	DIVIDE (b012,b006)
	b172	Load factor (%)	Total electricity generated as a share of peak demand.	National	Derived	DIVIDE (b043,b037)
	b035	Capacity utilization factor (%)	Share of the operational capacity in terms of total capacity installed.	National	Derived	DIVIDE (b006,b001)
	b057	Employees in utility (number)	Total number of employees of the utility.	Utility	Raw	
	a257-d	Labor productivity (connections per employee)	Ratio of the number of power connections in the country to the total number of employees across utilities.	National	Derived	AVERAGE (a257,UTILITIES)
	a257	Labor productivity (connections per employee)	Ratio of the number of power connections in the utility to the total number of employees of the utility.	Utility	Derived	DIVIDE (a192,b057)
	b056	Losses, distribution (MWh)	Energy lost in the distribution of power.	Utility	Raw	
	b054	Losses, nontechnical (MWh)	Energy lost due to unmetered and unbilled consumption including illegal connections and incorrect estimation of legal consumption due to meter tampering and inadequate billing. These losses are also called commercial losses.	Utility	Raw	

Policy	Temporary Code	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	b174	Losses, system (% of generation)	Energy that is lost during transmission and distribution of power as a share of total power. These losses include technical losses and nontechnical losses (for example, theft and metering losses) but do not include nonpayment by end-users.	National	Derived	DIVIDE(SUM(b052, across utilities), SUM(b014:b019, b021))
	b052	Losses, system (MWh)	Amount of energy that is lost during transmission and distribution of power. These losses include technical losses and nontechnical losses (for example, theft and metering losses) but do not include nonpayment by end-users.	Utility	Raw	
	b053	Losses, technical (MWh)	Energy lost due to resistance and iron core losses which occur during the process of transmission and distribution.	Utility	Raw	
	b055	Losses, transmission (MWh)	Energy lost in the transmission of power.	Utility	Raw	
	b175	Losses, transmission and distribution (% of electricity generated)	Energy lost in the transmission and distribution of power as a share of total power generated.	Utility	Derived	DIVIDE (SUM((b055+b 056), PRODUCT(b235*10^3))
	b175-d	Losses, transmission and distribution (% of electricity generated)	Energy that is lost during transmission and distribution of power at the country-level as a share of total power. These losses include technical losses and nontechnical losses (for example, theft and metering losses) but do not include nonpayment by end-users.	National	Derived	DIVIDE (SUM((b055+b056), across utilities), PRODUCT (b043*10^3))
	a259	Delay in obtaining a connection (days)	Average wait, in days, experienced to obtain electrical connection from the day this establishment applied for it to the day it received the service.	National	Raw	
	a216	Firms with own generator (% of firms)	Share of firms in the country that own generators.	National	Raw	
	a258	Firms that find power a constraint for business (% firms)	Share of firms that indicate that power is on the main constraints to doing business.	National	Raw	
	b045	Outages per year (number)	Average number of power outages in a year.	National	Raw	
	a191	Utility Area (square km)	The area, in square km, where the utility is in a position to supply electricity to customers.	Utility	Raw	
	b046	Value of sales lost from outages per year (% of sales)	Losses as percentage of annual sales that resulted from power outages.	National	Raw	

Annex A6.2 Sector-specific benchmarks

GROUP	SSA		ECONOMIC					GEOG-PRAHY			REC					Pool				Tech-nology		Scale		
Country Name	SSA	AICD Phase I	Resource-Rich	MIC	LIC-Fragile	LIC-NonFragile	LIC-Landlocked	Coastal	Island	Landlocked	ECOWAS	SADC	CEMAC	EAC	COMESA	CAPP	EAPP/NB	SAPP	WAPP	Hydro	Thermal	Small-Scale	Medium-Scale	Large-Scale
Algeria	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
Angola	1	–	1	–	–	–	–	1	–	–	–	1	–	–	–	–	–	1	–	1	–	–	1	-
Benin	1	1	–	–	–	1	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Botswana	1	–	–	1	–	–	–	–	–	1	–	1	–	–	–	–	–	1	–	–	1	1	–	-
Burkina Faso	1	1	–	–	–	1	1	–	–	1	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Burundi	1	–	–	–	1	–	1	–	–	1	–	–	–	1	1	–	1	–	–	1	–	1	–	-
Cameroon	1	1	1	–	–	–	–	1	–	–	–	–	1	–	–	1	–	–	–	1	–	–	1	-
Cape Verde	1	1	–	1	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	1	1	–	-
Central African Republic	1	–	–	–	1	–	1	–	–	1	–	–	1	–	–	1	–	–	–	–	1	1	–	-
Chad	1	1	1	–	–	–	–	–	–	1	–	–	1	–	–	1	–	–	–	–	1	1	–	-
Comoros	1	–	–	–	1	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	1	1	–	-
Congo, Rep. of	1	–	1	–	–	–	–	1	–	–	–	–	1	–	–	1	–	–	–	1	–	–	–	1
Côte d'Ivoire	1	1	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	1	–	1	–	-
Congo, Dem. Rep. of	1	1	–	–	1	–	1	–	–	1	–	1	–	–	1	–	–	1	–	1	–	–	–	1
Egypt	–	–	1	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	1
Equatorial Guinea	1	–	1	–	–	–	–	1	–	–	–	–	1	–	–	1	–	–	–	–	1	1	–	-
Eritrea	1	–	–	–	1	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	1	1	–	-
Ethiopia	1	1	–	–	–	1	1	–	–	1	–	–	–	–	1	–	1	–	–	1	–	–	1	-
Gabon	1	–	1	–	–	–	–	1	–	–	–	–	1	–	–	1	–	–	–	–	1	–	1	-
Gambia, The	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Ghana	1	1	–	–	–	1	–	1	–	–	1	–	–	–	–	–	–	–	1	1	–	–	–	1
Guinea	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	–	1	-
Guinea-Bissau	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Kenya	1	1	–	–	–	1	–	1	–	–	–	–	–	1	1	–	1	–	–	1	–	–	–	1
Lesotho	1	1	–	1	–	–	–	–	–	1	–	1	–	–	–	–	–	1	–	1	–	1	–	-
Liberia	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Libya	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
Madagascar	1	1	–	–	–	1	–	–	1	–	–	1	–	–	1	–	–	–	–	–	1	–	1	-
Malawi	1	1	–	–	–	1	1	–	–	1	–	1	–	–	1	–	–	1	–	1	–	–	1	-
Mali	1	–	–	–	–	1	1	–	–	1	1	–	–	–	–	–	–	–	1	1	–	–	1	-
Mauritania	1	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	1	1	–	1	–	-

GROUP	SSA		ECONOMIC					GEOG-PRAHY			REC					Pool				Tech-nology		Scale		
Country Name	SSA	AICD Phase I	Resource-Rich	MIC	LIC-Fragile	LIC-NonFragile	LIC-Landlocked	Coastal	Island	Landlocked	ECOWAS	SADC	CEMAC	EAC	COMESA	CAPP	EAPP/NB	SAPP	WAPP	Hydro	Thermal	Small-Scale	Medium-Scale	Large-Scale
Mauritius	1	–	–	1	–	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	1	–	1	-
Mayotte	1	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–					
Morocco	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
Mozambique	1	1	–	–	–	1	–	1	–	–	–	1	–	–	–	–	–	1	–	1	–	–	–	1
Namibia	1	1	–	1	–	–	–	1	–	–	–	1	–	–	–	–	–	1	–	1	–	–	1	-
Niger	1	1	–	–	–	1	1	–	–	1	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Nigeria	1	1	1	–	–	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	–	–	1
Rwanda	1	1	–	–	–	1	1	–	–	1	–	–	–	1	1	–	1	–	–	1	–	1	–	-
São Tomé and Príncipe	1	–	–	–	1	–	–	–	1	–	–	–	1	–	–	–	–	–	–	1	–	1	–	-
Senegal	1	1	–	–	–	1	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	–	1	-
Seychelles	1	–	–	1	–	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	1	1	–	-
Sierra Leone	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	–	1	1	–	-
Somalia	1	–	–	–	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	-
South Africa	1	1	–	1	–	–	–	1	–	–	–	1	–	–	–	–	–	1	–	–	1	–	–	1
Sudan	1	1	1	–	–	–	–	–	–	1	–	–	–	–	1	–	–	1	–	–	1	–	1	-
Swaziland	1	–	–	1	–	–	–	–	–	1	–	1	–	–	1	–	–	1	–	–	1	1	–	-
Tanzania	1	1	–	–	–	1	–	1	–	–	–	1	–	1	–	–	1	–	–	1	–	–	1	-
Togo	1	–	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	–	1	1	–	1	–	-
Tunisia	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1
Uganda	1	1	–	–	–	1	1	–	–	1	–	–	–	1	1	–	1	–	–	1	1	–	1	-
Zambia	1	1	1	–	–	–	1	–	–	1	–	1	–	–	1	–	–	1	–	1	–	–	–	1
Zimbabwe	1	–	–	–	1	–	1	–	–	1	–	1	–	–	1	–	–	1	–	–	1	–	–	1

Annex A6.3 Unit conversions and technical parameters

Unit Conversions

From	To
1 Megawatt (MW)	1000 Kilowatt (KW)
1 Gigawatt (GW)	1000 Megawatt (MW)
1Terrawatt (TW)	1000 Gigawatt (GW)
10^3 Kilowatt-hour (KWh)	1 Megawatt-hour (MWh)
10^3 Megawatt-hour (MWh)	1 Gigawatt-hour (GWh)

Technical Parameters

Parameter	Definition	Calculation
Costs, hydro capital (US$ per kWh)	The costs of hydropower are site specific. The investment costs for each country are based on estimated investment costs for actual planned hydropower projects in the country. Where there are several planned projects, the unit investment costs used in the least-cost expansion model is the weighted, average-unit investment cost of planned projects in the country, where weights reflect plants' planned capacity.	The unit cost calculation for Sub-Saharan Africa is an average of the unit cost calculations for hydropower projects in each country
Costs, thermal capital (US$ per kWh)	The unit cost of thermal is generic across countries and is calculated based on power market models. For diesel it is derived from earlier work.	The unit cost calculation is based on the average unit cost for all thermal power generation types for Sub-Saharan Africa
Costs, nuclear capital (US$ per kWh)		The unit cost calculation is based on the average unit cost for all nuclear power generation types for Sub-Saharan Africa
Costs, other power capital (US$ per kWh)		The unit cost calculation is based on the average unit cost for all 'other' power generation types for Sub-Saharan Africa

Annex A6.4 Target institutions

Table A6.4a: List of key power sector institutions in each country as of March 2011

	Regulatory agency	Website	Power Utility	Website	Rural Electrification Agency
Algeria					
Angola	Ministério da Energia e Águas - República de Angola	www.minea.gv.ao	Empresa de Distribuição de Electricidade de Luanda (EDEL)	www.edel.co.ao	Ministério da Energia e Águas
			Empresa National de l' Electricidade	www.ene.co.ao	Ministério da Energia e Águas
Benin	None		Société Béninoise d'Eau et d'Electricité (SBEE)	NA	Agence Béninoise d'Électrification Rurale et de Maitrise (ABERME)
Botswana			Botswana Power Corporation	www.bpc.bw	NA
Burkina Faso	None		Societe Nationale Burkinabe d'Electricité (SONABEL)	www.sonabel.bf	Fonds de Développement de l'Electrification
Cameroon	Agence de régulation du secteur de l'électricité		AES Société Nationale d'Electricité (AES Sonel)	www.aes-sonel.com	Rural Electrification Agency (AER)
Cape Verde			ELECTRA	NA	None
Central African Republic			Societe Energie de Centrafrique	NA	
Chad	None		Société Tchadienne d'Eau et d'Electricité SEG	NA	None
Congo, Dem. Rep.			Société Nationale d'Electricité SNEL	NA	None
Egypt	Ministry of Electricity and Energy	www.moee.gov.eg	Egyptian Electricity Holding Company Egyptian Electricity Transmission Company	www.egdec.com www.egdec.com	Rural Electrification Authority
Côte d'Ivoire	Agence Nationale de Régulation de l'Electricité (ANARE)	www.anare.ci	Compagnie Ivoirienne d'Electricite CIE	NA	
			Compagnie Ivoirienne de Production d'Electricité CIPREL	NA	
			Centrale Thermique d'Azito AZITO	NA	
Ethiopia	Ethiopia Electricity Agency (EEA) (Not yet established)		The Ethiopian Electric Power Corporation EEPCo	www.eepco.gov.et	Ethiopian Rural Energy Development and Promotion Center (EREDPC)
Gabon	Ministère des mines du pétrole et des ressources hydrauliques		Societe d'Energie et d'Eaux du Gabon	NA	Ministère des mines du pétrole et des ressources hydrauliques

	Regulatory agency	Website	Power Utility	Website	Rural Electrification Agency
Ghana	Public Utility Regulatory Commission (Water & Electricity)	www.ghana.energy-commission.gov.gh www.purc.com.gh	Volta Riva Authority VRA	www.vra.com	
			Electricity Corporation of Ghana (ECG)	NA	
			Takoradi International Company (TICO)	NA	
Guinea	None		Electricité de Guinee (EDG)		None
Kenya	Electricity Regulatory Board		Kenya Power and Lighting Co KPLC	www.kplc.co.ke	
			Kenya Generation Company KENGEN	www.kengen.co.ke	
Lesotho	Lesotho Electricity Authority		Lesotho Electricity Corporation LEC	www.lec.co	
Liberia					
Libya					
Madagascar	Office de Régulation de l'Electricité (ORE)	www.ore.mg	Jiro Sy Rano Malagasy JIRAMA	www.jirama.mg	Agence de développement de l'électrification rurale (ADER)
Malawi	Malawi Energy Regulatory Authority (MERA)		Electricity Supply Commission of Malawi ESCOM	www.escommw.com	A rural electrification unit has been set up to oversee the rural electrification issues
Mali	Commission de régulation de l'électricité et de l'eau		Energie du Mali EDM	www.edm-sa.com.ml	l'Agence Malienne pour le Développement de l'Energie Domestique et de l'Electrification rurale (AMADER)
Mauritania			Societe Mauritanienne d'Electricité		
Mauritius			Central Electricity Board	ceb.intnet.mu	Central Electricity Board
Morocco					
Mozambique	National Directorate of Energy		Electricidade de Mozambique EDM	www.edm.co.mz	
Namibia	Electricity Control Board	http://www.ecb.org.na/	NamPower Corp. Ltd. NAMPOWER	www.nampower.com.na	
Niger	Autorité de Régulation Multisectorielle		Société Nigerienne d'Electricité NIGELEC	nigelec@intemet.ne	
Nigeria	Energy Commission		Power Holding Corporation of Nigeria PHCN	www.nepanigeria.org	
Rwanda	Rwanda Utilities Regulatory Agency (RURA)		Energy, Water and Sanitation Authority (EWSA)	www.ewsa.rw	

	Regulatory agency	Website	Power Utility	Website	Rural Electrification Agency
São Tomé and Príncipe	Ministerio de Obras Publicas e Recursos Naturais		Empresa de Agua e Electricidada (EMAE)		
Senegal	Commission de Régulation du Secteur de l'Electricité	www.crse.sn	Société Nationale d'Electricité SENELEC GTI Senegal AGGREKKO KOUNOUNE Industries Chimiques du Senegal SUNEOR SOCOCIM Industries	www.senelec.sn	Agence Sénégalaise d'électrification rurale (ASER)
Sierra Leone	None		National Power Authority	NA	
South Africa	National Electricity Regulator (NER)	www.ner.org.za	Electricity Supply Commission ESKOM	www.eskom.co.za	
Sudan	Ministry of Electricity and Dams		National Electricity Corporation NEC	www.necsudan.com	
Swaziland	Swaziland Energy Regulatory Authority	www.sera.co.sz	Swaziland Electricity Company (SEC)	www.sec.co.sz	Ministry of Natural Resources and Energy
Tanzania	Electricity and Water Utilities Regulatory Authority (EWURA)	www.ewura.go.tz	Tanzania Electricity Supply Company TANESCO	www.taneso.co.tz	Rural Electrification Agency (REA)
			Independent Power Tanzania Ltd IPTL	NA	
			Songas	www.songas.com	
Togo	Autorité de Réglementation du Secteur de l'Energie (ARSE)	www.arse.tg	Compagnie Electrique du Benin (CEB)	dg@cebnet.tg	NA
			Compagnie de l'Energie Électrique du Togo (CEET)	www.ceet.tg	
Tunisia	Agence Nationale pour la Maitrise de l'Energie	www.anme.nat.tn	Societe Tunisienne de l'Électricité et du Gaz	www.steg.com.tn	
Uganda	Electricity Regulatory Authority		UMEME	www.umeme.co.ug	Rural Electrification Agency (REA)
Zambia	Energy Regulatory Board	http://www.erb.org.zm	Zambia Electricity Supply Corporation ZESCO	www.zesco.co.zm	Rural Electrification Administration (REA)
Zimbabwe	Zimbabwe Electricity Regulatory Commission and Zimbabwe Electricity Supply Authority		Zimbabwe Power Company	www.zpc.co.zw/	
			Zimbabwe Electricity Distribution Company	www.zetco.org	

Annex A6.5 Data collection templates

Power template A. National-level institutions

Country:	
Sector:	Power
Utility Name:	Non-applicable
Name of Data Collector:	
Period of Data Collection:	
Source Institution:	
Name of Interviewee(s):	

Policy Category	Temp Code	Indicator Name	New 2011	History 2010
Reform	**d001**	Reform: Restructuring, De jure unbundling generation and transmission (1=yes, 0=no)		
	d002	Reform: Restructuring, De facto unbundling generation and transmission (1=yes, 0=no)		
	d003	Reform: Restructuring, De jure unbundling distribution and transmission (1=yes, 0=no)		
	d004	Reform: Restructuring, De facto unbundling distribution and transmission (1=yes, 0=no)		
	d005	Reform: Restructuring, De jure unbundling generation and distribution (1=yes, 0=no)		
	d006	Reform: Restructuring, De facto unbundling generation and distribution (1=yes, 0=no)		
	d007	Reform: Decentralization, Accountability level for rural electrification provision (0=Central, 1=Regional, 2=Local/Municipal)		
	d011	Reform: Decentralization, Urban utility with responsibility in states and municipalities (1=yes, 0=no)		
	d012	Reform: Market Structure, (0=same company,1=single buyer model, 2=Wholesale competition, 3=Retail competition)		
	d017	Reform: Market Structure, Number of operators generating power (Number)		
	d021	Reform: Market Structure, Number of Operators transmitting power (Number)		
	d025	Reform: Market Structure, Number of operators distributing power (Number)		
	d029	Reform: Market Structure, Community providers that have significant responsibility in rural power provision (1=yes, 0=no)		
Regulation	**d030**	Regulation: Tools, Regulation of large customers (1=yes, 0=no)		
	d031	Regulation: Tools, Transmission tariff regulation methodology used (0=none, 1=price cap, 2=rate of return, 3=other)		
	d036	Regulation: Tools, Third party access to transmission and distribution (1=yes, 0=no)		
	d037	Regulation: Tools, Minimum quality standards for operators (1=yes, 0=no)		
	d038	Regulation: Tools, Penalties for noncompliance of minimum quality standards (1=yes, 0=no)		
	d039	Regulation: Tools, Cut off possibility (1=yes, 0=no)		
	d040	Regulation: Cost recovery of rural fund (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)		
	d044	Regulation: Environmental, Incentives for renewable energy (1=yes, 0=no)		

Power template B. National-level data variables

Country:
Sector: Power
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Technical	**b001**	Generation capacity (MW)					
	b002	Generation capacity hydro-electric (MW)					
	b003	Generation capacity conventional thermal (MW)					
	b004	Generation capacity nuclear (MW)					
	b005	Generation capacity solar, wind, biomass, geothermal (MW)					
	b006	Generation capacity operational (MW)					
	b007	Generation capacity of isolated (off grid) systems (MW)					
	b008	Generation capacity of isolated (off-grid) systems in operational conditional (MW)					
	b009	Emergency generation capacity (MW)					
	b010	Self-generation capacity (MW)					
	b012	Peak demand on interconnected system (MW)					
	b013	Load served on grid (GWh)					
	b014	Electricity generated on the interconnected system from hydro-electric (GWh per year)					
	b015	Electricity generated on the interconnected system from conventional thermal (GWh per year)					
	b016	Electricity generated on the interconnected system from nuclear (GWh per year)					
	b017	Electricity generated on the interconnected system from solar, wind, biomass, geo-thermal (GWh per year)					
	b018	Electricity generated by isolated (off grid) systems (GWh per year)					
	b019	Electricity generated by emergency generation (GWh per year)					
	b020	Electricity generated by self-generation (GWh per year)					
	b021	Power purchased from IPPs (GWh per year)					
	b022	Trade, power imports (GWh per year)					
	b023	Trade, power exports (GWh per year)					
	b024	Length of high-voltage transmission lines (km)					
	b025	Length of high-voltage transmission lines in need of rehabilitation (km)					
	b026	Length of medium-voltage transmission lines (km)					
	b027	Length of medium-voltage transmission lines in need of rehabilitation (km)					
	b028	Length of low-voltage transmission lines (km)					
	b029	Length of low-voltage transmission lines in need of rehabilitation (km)					
	b034	Load shed (GWh)					

Power template C. Utility-level data variables

Country:
Sector: Power
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Access	a192	Customers (number)					
	a195	Customers, residential (number)					
	a197	Customers, nonresidential (number)					
	a199	Customers, commercial (number)					
	a201	Customers, industrial (number)					
	a203	Customers, low voltage (number)					
	a205	Customers, medium voltage(number)					
	a207	Customers, high voltage (number)					
	a214	Customers, potential (number)					
	a261	Customers, potential residential (number)					
	a262	Customers, potential nonresidential (number)					
	b048	Customers with installed meters (number)					
	b049	Customers with operational meters (number)					
	b050	Prepayment customers with meters (number)					
	b051	Prepayment customers with operational meters (number)					
Financial	b061	Collected bills (LCU per year)					
	b062	Collected bills, residential customers (LCU per year)					
	b063	Collected bills, commercial customers (LCU per year)					
	b064	Collected bills, industrial customers (LCU per year)					
	b065	Collected bills, low voltage customers (LCU per year)					
	b066	Collected bills, medium voltage customers (LCU per year)					
	b067	Collected bills, high voltage customers (LCU per year)					
	b069	Billing of electricity (LCU per year)					
	b070	Billing of electricity, residential customers (LCU per year)					
	b071	Billing of electricity, commercial customers (LCU per year)					
	b072	Billing of electricity, industrial customers (LCU per year)					
	b073	Billing of electricity, low voltage customers (LCU per year)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	b074	Billing of electricity, medium voltage customers (LCU per year)					
	b075	Billing of electricity, high voltage customers (LCU per year)					
	b076	Costs, operational (LCU per year)					
	b077	Costs, labor (LCU per year)					
	b078	Costs, fuel (LCU per year)					
	b079	Costs, maintenance (LCU per year)					
	b081	Costs, capital (LCU per year)					
	b082	Costs, rehabilitation (LCU per year)					
	b083	Costs, capital on new assets (LCU per year)					
	b085	Costs, debt service (LCU per year)					
	b086	Asset value (LCU per year)					
	b206	Revenue, total (LCU)					
	b243	Billing of electricity to government entities (LCU per year)					
Pricing	b059	Connection charge, residential customers (LCU per connection)					
	b060	Connection charge, medium voltage customer (LCU per connection)					
	b179	Connection charge, medium voltage customer (US$ per connection)					
	b237	Tariff, average effective (LCU per kWh)					
	b240	Fixed charge (LCU per month)					
Technical	a191	Utility Area (square km)					
	b052	Losses, system (MWh)					
	b053	Losses, technical (MWh)					
	b054	Losses, nontechnical (MWh)					
	b055	Losses, transmission (MWh)					
	b056	Losses, distribution (MWh)					
	b057	Employees in utility (number)					
	b234	Electricity sold, volume (GWh per year)					
	b235	Electricity generated, volume (GWh per year)					

7. Water and Sanitation

7.1 Motivation

Only five African countries have met the Millennium Development Goal (MDG) for access to safe water, and only 12 other countries are likely to do so. Because of rapid urbanization and limited investment, the coverage of improved water services is actually falling in Africa's cities. Access to piped water, and even stand posts, is confined to the most affluent segments of the population. A significant share of the population does not have access to water provided by public utilities. About 40 percent of rural dwellers continue to rely on unsafe surface water. Groundwater accessed through boreholes is by far the fastest growing source of water supply for both urban and rural households in Africa.

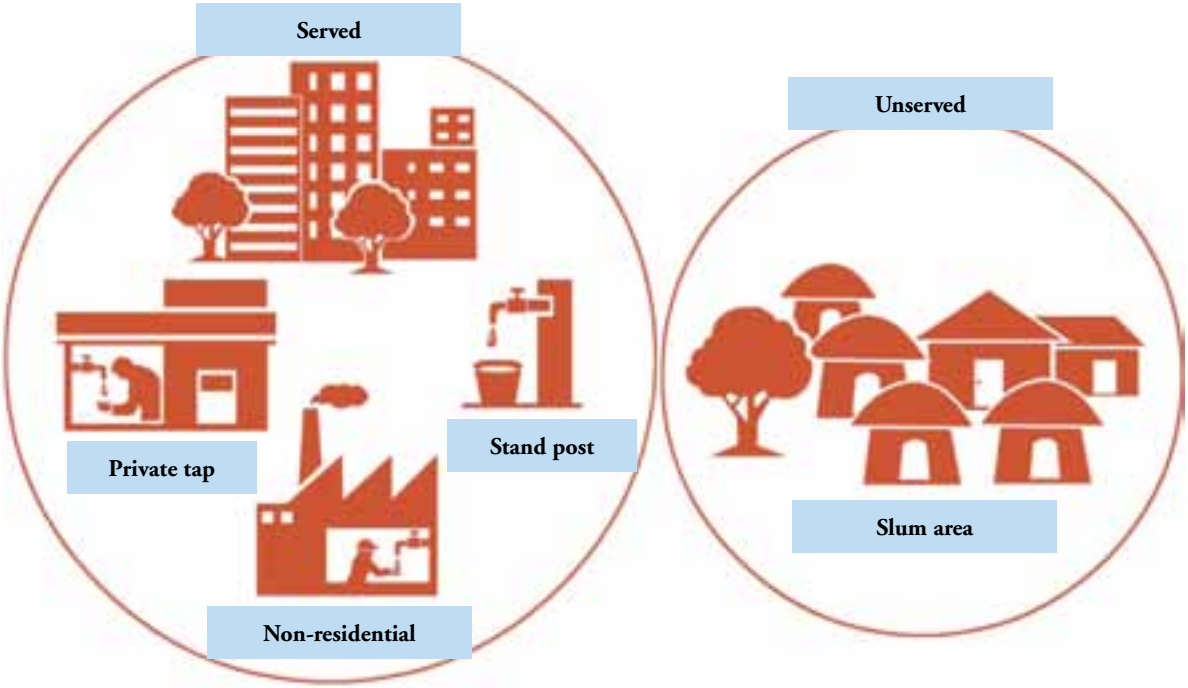
Africa is unlikely to meet the MDG for access to safe sanitation; as of 2006, one in three Africans had to make do without any kind of toilet facility, and half the population relied on the most basic latrines providing minimal sanitary protection. Sewerage coverage is virtually nonexistent except in larger cities and in middle-income countries. Households are today the largest financiers of sanitation, devoting substantial resources to developing their own on-site facilities. Governments can play a key facilitating role through promoting hygiene education and the development of local capacity to produce improved latrine facilities.

Existing spending on water supply and sanitation is nowhere near the $22 billion needed annually to meet the MDGs. The annual funding gap is estimated at $11 billion a year. About $1 billion a year is lost due to the operational inefficiencies of water utilities. The pricing of water services below cost leads to a deficit of around $1.8 billion annually.

7.2 Tracking Performance

This sector synopsis serves to highlight some of the key policy issues facing the water sector. In order to continue to track sector performance over time, a number of indicators are needed to shed light on each of a number of key policy themes. Figure 7.1 illustrates the overall situation of water service provision in Africa: water networks serve a range of nonresidential and residential customers, where the latter may obtain water directly through a private tap or through a public access stand post. In addition, the water distribution network does not reach significant sections of the population, forcing them to rely on boreholes, water vendors, or surface water courses.

Figure 7.1: Illustrative overview of different modes of water service provision



Institutional: The institutional indicators capture the extent to which the water sector in any given country has undergone the reform measures to modernize the sector, provide regulatory oversight, and improve enterprise governance. These indicators were discussed in some detail in the chapter on institutions, and so need not be repeated here.

Access: Given the political prominence of the MDG for water and sanitation and the low access to water on the continent, it becomes critical to track access trends over time. There are two ways in which household access to water can be tracked:

- The first way is through household surveys, where individual households directly report whether or not they have access to different kinds of water and sanitation facilities. In each case, it is important to document the type of facility that the household has access to, since this will determine the level of safety. In the case of water, facilities range from piped water to stand posts and boreholes or, in the worst case, surface water. In the case of sanitation, facilities range from flush toilets to various kinds of improved and traditional latrines or, in the worst case, open defecation. Chapter 13 on household surveys describes the source of these data and the many ways we can analyze the data.
- The second way is through utility data. Utilities report the number of piped water and sewer connections that they serve, as well as the number of stand posts that they operate. Multiplying the number of residential connections by the typical household size and dividing by the population gives an alternative access rate derived from the utility data. In the case of stand posts, multiplying the number of stand posts by the typical number of people served by each, and dividing by the population, gives the access rate derived from the utility data. But it should be noted that there is often considerable uncertainty regarding the number of people using stand posts, and that utilities tend to overestimate this number.

It is important to note that these two methods should not be expected to give consistent answers. Typically, access rates from household surveys will be higher than those based on utility data. The reason is that household surveys will pick up clandestine and informal connections of various kinds that are not reported in the utility data. In addition, household surveys will pick up households outside the utility service area that have access to water, either because they have their own private system or because they are serviced by a small local provider.

Beyond the household sector, it is also relevant to consider access to water by firms. Although utilities provide data on the number of nonresidential connections, there is usually no census among firms and institutions that can be used to convert this to an access rate. Therefore, the best source of information on nonresidential access to power is enterprise surveys, which provide a picture of the extent to which firms find water to be a constraint on their business.

Affordability: Due to the high costs of water in Africa and the relatively low income of households, affordability of water services is a key policy issue. Affordability is typically measured by the share of the household's budget dedicated to the purchase of water. This information comes directly from household surveys and is covered in Chapter 13.

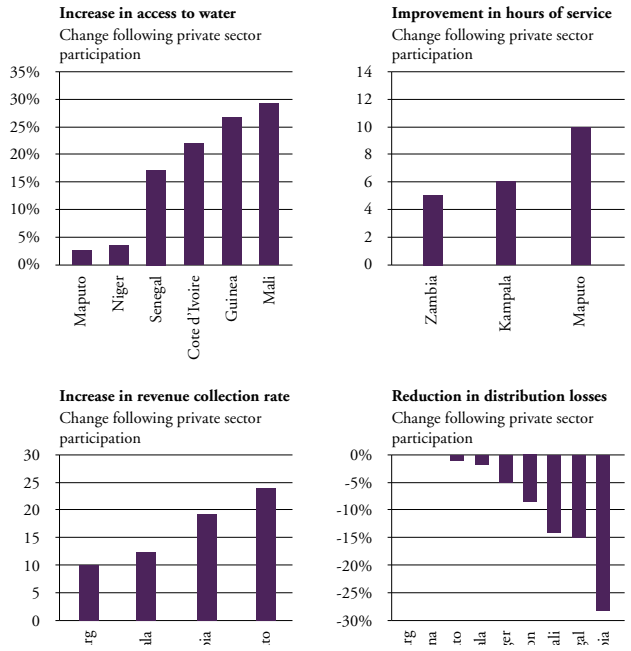
Pricing: Water utilities typically apply highly complex tariff schedules under which tariffs vary by customer category, volume consumed, and location. For that reason, there is no single easily measurable "price" of water. Nevertheless, utilities are typically able to report their average effective tariff, and this is the reference variable that will be used for price. The average effective tariff is the total amount billed, divided by the total volume of water sold.

This kind of information can be very useful in order to allow countries to benchmark their water tariffs against each other. For example, in Sub-Saharan Africa as of 2006 there was a huge range of water tariffs in application, ranging from $0.05 per cubic meter in Congo to over $3.00 per cubic meter in Cape Verde (the outliers). Figure 7.2 still shows a wide range for other countries.

Financial: African utilities often present a weak financial position, and thus it is important to track the utilities' financial ratios. The financial accounts of a utility provide detailed information on the structure of its costs and revenues.

- Costs are typically broken down between operating costs (including labor costs, fuel costs, maintenance costs, and so on) and capital costs. The key financial ratio on the cost side is average operating cost, which can be used to evaluate whether power tariffs are high enough to cover the recurrent costs of the business. Capital costs are not typically reliably measured in utility financial accounts, due to deficient and/or heterogeneous accounting norms. Where capital costs are needed, for example, to understand the extent to which tariffs may fall short of cost recovery, these are best estimated on the basis of replacement costs of a utility's main physical assets (treatment plant, trunk mains, thousands of customer connections, and so on).

Figure 7.2 African water tariffs span a very wide range



Source: Africa Infrastructure Country Diagnostic 2009.

Note: Tariffs presented in the graph are average effective tariffs of the utilities operating in the country, and they correspond to the latest available observation.

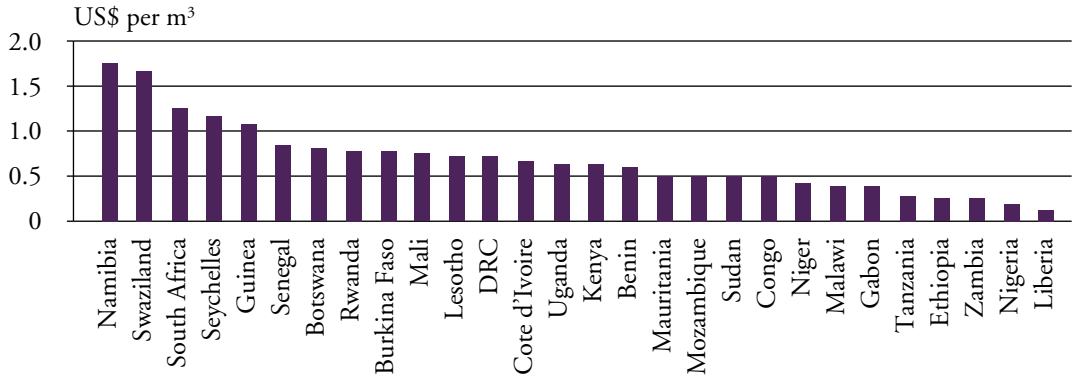
- Revenues are sometimes broken down by customer category. There are two key financial ratios on the revenue side. The first is the collection ratio, which shows the total revenue collected as a percentage of the total sum billed to customers. Since the underpayment of bills is a major issue among African utilities, this ratio is often well below 100 percent. The second is the average revenue per unit of water sold. Because of the undercollection of bills, the average revenue will typically be lower than the average effective tariff.

This kind of information can be used to try and understand the cost structure of the water supply and sanitation sectors. For example, the cross-tabulation of average effective tariffs and unit operating costs show a large variation (Figure 7.3).

Technical: Technical indicators are helpful in highlighting the performance of water utilities in terms of the efficiency and quality of their operations.

- A number of operational ratios are critical in identifying the relative efficiency with which utilities are being managed. Distribution losses (also known as unaccounted-for

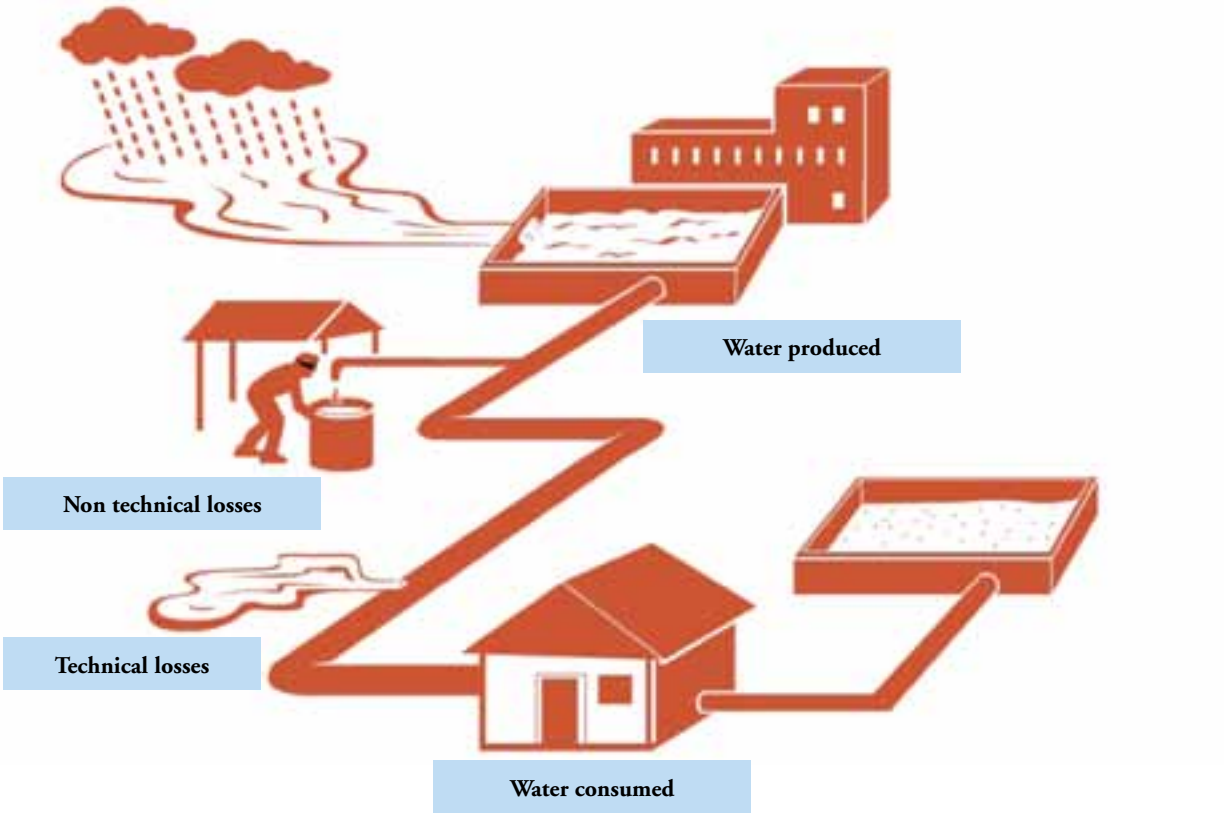
Figure 7.3 Average operating costs of African water systems



Source: Africa Infrastructure Country Diagnostic 2009.

Note: Data as of 2005. Average operating cost calculated as a simple average of the sample of utilities in a given country.

Figure 7.4 Illustration of distribution losses on the water network



water) capture the percentage of water produced that is lost on the distribution network on its way to the final consumer. Some of this water is lost due to deficiencies in the distribution infrastructure, while some of it is simply stolen from the network by consumers (Figure 7.4). Labor productivity looks at the relationship between the number of personnel and the overall output of the utility, usually measured in terms of customers connected to the service.

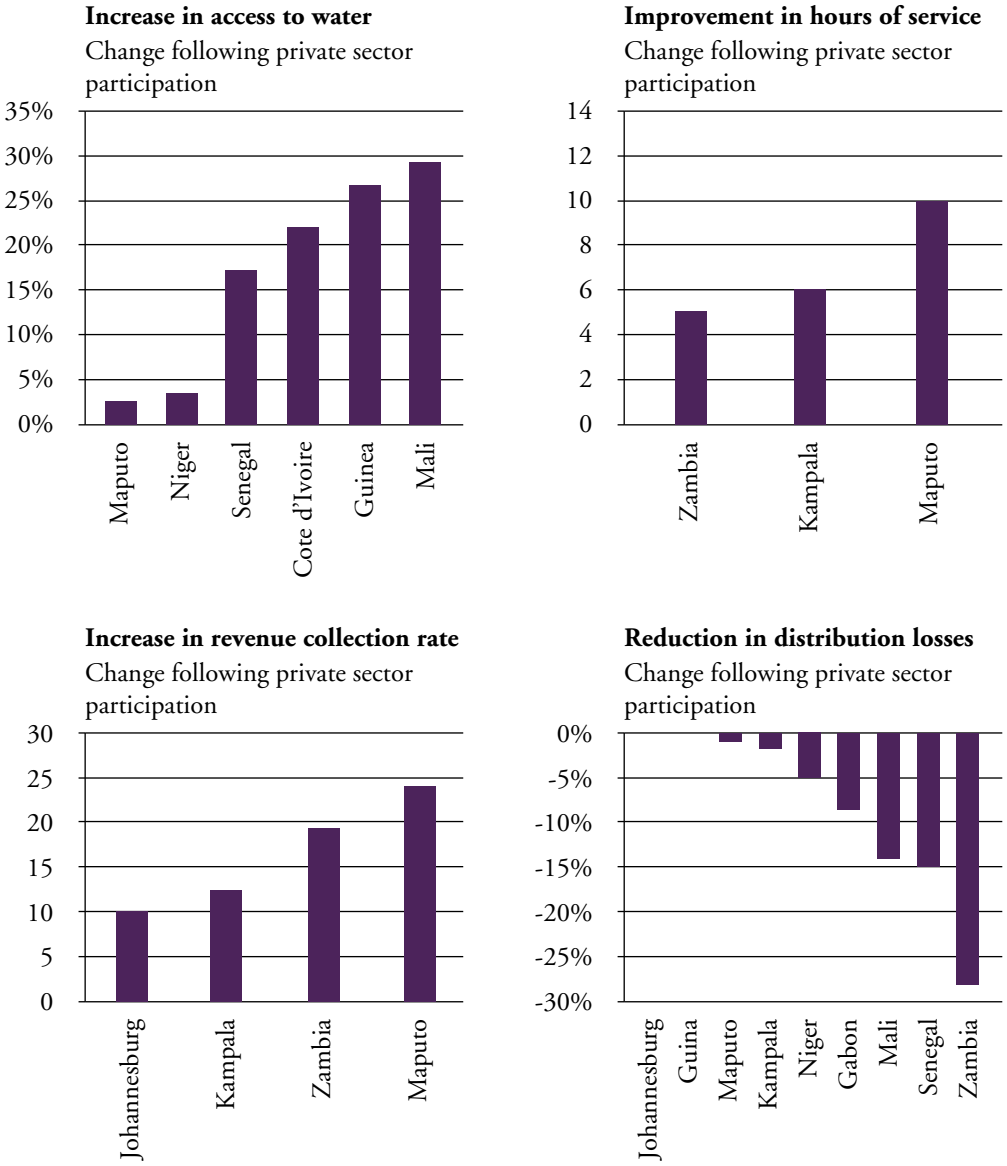
- Quality is also a critical dimension of service, though one that is often poorly measured. The two most important measures of quality for water utilities are the continuity of service (measured in terms of the number of hours each day that service is available), and the quality of the water provided (measured in terms of the percentage of samples passing the requisite chemical and bacteriological checks).

This kind of information can be used, among other things, to analyze the changes in operational performance resulting from institutional reforms such as private participation. For example, the following set of charts illustrates changes in access, hours of service, revenue collection, and distribution losses that resulted following a number of private participation contracts (Figure 7.5). The findings illustrate a wide variation in the magnitude of the impacts across contracts. The most consistent areas of improvement are in continuity of service (with an increase of 4–10 hours daily) and revenue collection rates (with an increase of 10–20 percentage points).

Finally, by bringing different types of indicators together, it is possible to do more complex analysis of critical policy questions. For example, by bringing together data on average effective tariffs, system losses, and collection rates and comparing these against best practice norms, it is possible to estimate the total hidden costs of underpricing and operational inefficiencies. Box 7.1 provides an outline of the methodology involved.

Figure 7.6 illustrates that these hidden costs can be very large, amounting to as much as 300 percent of utility revenues in the most egregious cases. On the other hand, a number of African utilities are managing to perform at a much higher efficiency standard, with hidden costs amounting to less than 50 percent of utility revenues. For more discussion and illustration of how water and sanitation sector indicators can be used to inform policy analysis, the reader is referred to the following publication: Banerjee and others. 2011. *Africa's Water and Sanitation Infrastructure*, World Bank, Washington DC.

Figure 7.5 Evidence of positive operational impacts from private participation in water in largest utility of country



Source: Africa Infrastructure Country Diagnostic 2009 –

Note: Data in graphs refer to utility level data either national utilities (when country is named) or utility with largest costumer based (when a city is named).

7.3 Indicator Overview

Annex A7.1 provides a comprehensive list of all indicators needed to track and monitor water supply and wastewater sector trends, together with their corresponding technical definitions. While the full list of indicators amounts to several hundred items, the indicators lend themselves to easy grouping around a smaller number of some 50 primary indicators. Table 7.1 provides a synthetic overview of these 50 primary indicators.

Box 7.1 Calculating hidden costs for the water sector

A monetary value can be attributed to observable operational inefficiencies (mispricing, unaccounted-for losses, and undercollection of bills, to mention three of the most conspicuous operational inefficiencies) by using the opportunity costs of operational inefficiencies: tariffs for uncollected bills and production costs for mispricing and unaccounted-for losses. These costs are considered hidden as they are not explicitly captured by the financial flows of the operator. Hidden costs are calculated by comparing a specific inefficiency against the value of that operational parameter in a well-functioning utility (or the respective engineering norm) and multiplying the difference by the opportunity costs of that operational inefficiency.

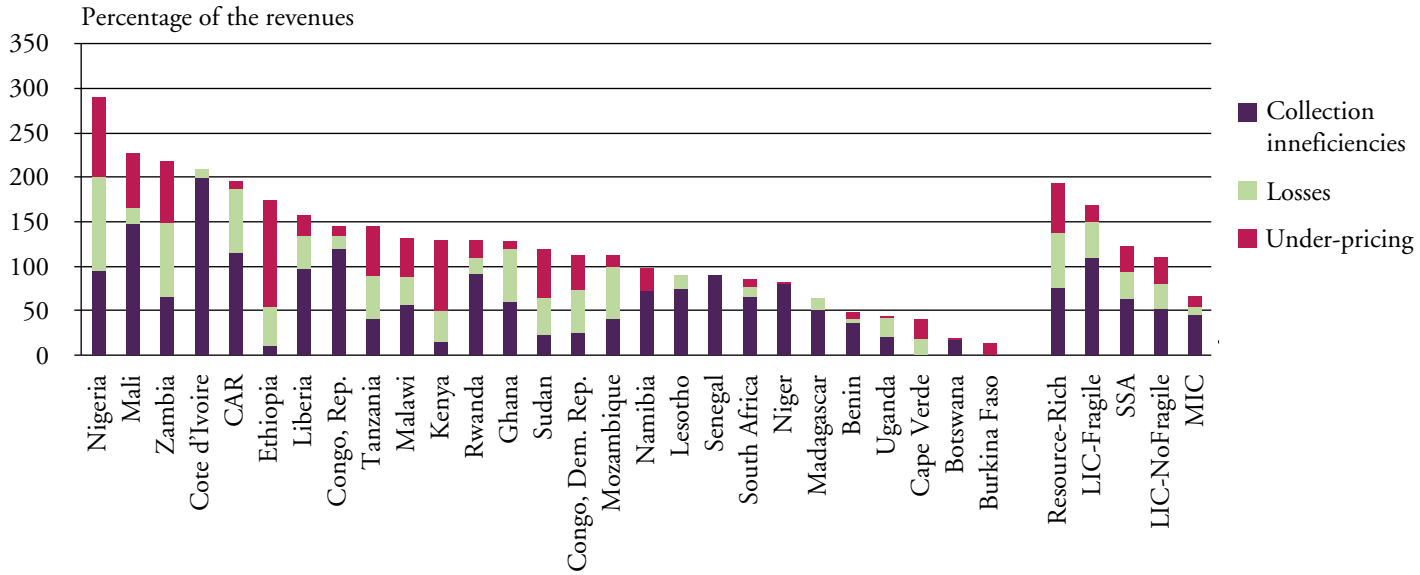
The methodology for calculating the four main inefficiencies are described below:

- Collection inefficiencies = [(Volume of water billed)* (Average effective tariffs)] / [(100-Collection Ratio)/100]
- Underpricing= Volume of water billed *(Normative cost recovery tariff- Average effective tariff)
  Where normative cost-recovery tariff is the average unit cost of each cubic meter produced (historical unit operating cost+ unit capital premium)
- Unaccounted-for losses= (Volume of water produced * Normative cost recovery tariff * (Unaccounted-for Water - normative unaccounted-for water) /(100)

Where normative unaccounted-for water is assumed to be 20 percent, based on the engineering norms of technical and nontechnical losses for a well-functioning electricity network.

Source: Adapted from Briceño-Garmendia and others, 2009, Financing Public Infrastructure in Sub-Saharan Africa: Patterns and Emerging Issues, AICD Background Paper 15.

Figure 7.6 Hidden costs vary widely across African water utilities



Source: Africa Infrastructure Country Diagnostic 2009.

Note: Calculations based on latest available year data for a given country.

Table 7.1 Overview of primary indicators for water and sanitation

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Access	Availability of service		Piped water/flush toilet	% population	Utility		HH survey
	Take-up of service		Piped water/flush toilet		National		
	Population access		Quintile 1/2/3/4/5 National/urban/rural Piped water Public tap or stand post Well or borehole Surface water Other water supply Flush toilet or septic tank Improved latrines Traditional pit latrine Bucket or pan Other sanitation No sanitation facility/nature/bush Solid waste disposal by burning Solid waste disposal by government Solid waste disposal by pit or heap Solid waste disposal by other means				
	Population resident in utility service area		Utility water		Utility		WSS template B
	Population served		Private residential connection Direct supply and shared taps Residential connection of neighbors Stand post Stand post providing utility water Sewerage	% population living in the service are			
	Stand posts		Installed/Functioning				
Affordability	Household spending		Quintile 1/2/3/4/5 National/urban/rural Water Water from vendors Solid waste disposal	$ % HH spending			HH Survey

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Financial	Accounts receivable			$	Utility		WSS template B
	Billing cycle						
	Billing		Water and wastewater To residential customers, nonresidential customers, and government entities	$ $, % billing			
	Collection period						
	Collection ratio						
	Connection charge		Water/Wastewater	$			
	Cost of PVC pipe			$/meter			
	Costs		Debt service Energy Labor Operational Services contracted out	$ $, % costs $, % costs $, per m3, per connection $, % costs			
	Employees						
	Gross fixed assets		Water Wastewater Water and wastewater	$ $/connection			
	Hidden costs		Distribution losses Undercollection Underpricing	$ % revenues % GDP			
	Revenue		Water Wastewater Water and wastewater Water residential Water nonresidential	$/year % revenues			
	Revenue per unit		Water connection Wastewater connection Water consumed Wastewater collected	$/connection $/m3			
	Water billed and collected						
	Wastewater billed and collected						
Pricing	Fixed charge		Water/Wastewater	$, $/month	Utility		WSS template B
	Average effective tariff			$, $/m3			

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Quality	Customer complaints		Water/Wastewater	#/connection	Utility		WSS template B
	Continuity of water service						
	Samples passing chlorine test			%			
	Wastewater receiving primary treatment			%			
	Wastewater receiving secondary or tertiary treatment			%			
Technical	Labor productivity		Water Wastewater		Utility		WSS template B
	Connections		Water/Wastewater Residential/Nonresidential With operational meter	% connections			
	Efficiency of water consumption in service area						
	Households with water connection that also have wastewater connection			% residential water connections			
	Nonrevenue water			% water produced			
	Pipe blockages (wastewater)			Per km of network			
	Pipe breaks (water)			Per km of network			
	Stand posts functioning			% total stand posts			
	Treated water			% water produced			
	Water consumption		Residential/nonresidential	Liters pc pd m3/conn./mo.			
	Water distribution system			Km/'0000 conn. Km/'0000 popn.			
	Water production			Liters pc pd m3/conn./mo			
	Wastewater collected			% water consumed			
	Wastewater treated			% waste water collected			
	Wastewater receiving primary treatment			% wastewater treated			
	Wastewater receiving secondary/tertiary treatment			% wastewater treated			
	Wastewater collection system			Km/'0000 conn. Km/'0000 popn.			
	Wastewater treatment plants		Installed/Functioning				

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Reform Water and Sanitation Specific Index				National		WSS template A
	Reform Decentralization Subindex		Accountability level for sanitation Decentralization water Decentralization rural water				
	Reform Legislation Subindex		Hygiene promotion Sanitation policy Rural water policy				
	Reform Market Structure Subindex		Community providers rural water Community providers sanitation Household providers sanitation Separation of water and electricity Separation of water and wastewater				
	Reform Policy Oversight Subindex		Accountability level for water provision Monitoring water quality Oversight of customer service Setting of water quality standards				
	Regulation Water and Sanitation Specific Index						
	Regulation Autonomy Subindex		Regulatory body vulnerability to donors				
	Regulation Cost Recovery Subindex		Partial/full cost recovery for on-site sanitation Partial/full cost recovery for rural water Partial/full cost recovery for water Partial/full cost recovery for wastewater				
	Regulation Environmental Subindex		Dumpsite for sanitation disposal Regulation for dumpsite for sanitation disposal Lack of contamination of groundwater by latrines Storm water drainage				

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Regulation Social Accountability Subindex		Consumers membership of regulatory body Consumers right to appeal regulatory decisions Consumers right to comment regulatory decisions Consumers right to demand tariff reviews		National		WSS template A
	Regulation Subsidy Subindex		Partial/full subsidy for on-site sanitation Partial/full subsidy for rural water Partial/full subsidy for water Partial/full subsidy for wastewater				
	Regulation: Universal service			% funded by community			

The Table clarifies how one can express each primary indicator in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators that relate to the primary ones. It also lists whether the indicator originates at the national level or at the level of the utility operator, and in the latter case whether it is desirable to aggregate the variable across utilities to provide a national picture. Finally, the table gives the source of the data, whether it comes from data reported in the sector templates or one of the secondary sources, such as household or enterprise surveys. We now proceed to describe in some detail the process for obtaining data from both of these sources.

For example, the access indicator "population with access to piped water" can be broken down into numerous subcategories by geographic area ("urban," "rural") or according to the purchasing power of the household ("first quintile," "second quintile," "third quintile," "fourth quintile," "fifth quintile"). In addition, different normalizations can be used for a given variable. For example, the hidden costs of a water utility can be expressed either in terms of percentage of utility revenues (which gives a sense of how serious hidden costs are from an enterprise perspective) and in terms of percentage of GDP (which gives a sense of how serious hidden costs are from a macroeconomic perspective).

Where relevant, benchmarks are calculated to facilitate cross-country comparisons. In addition to the general benchmarks introduced in the data-processing chapter, there are a number of sector-specific benchmarks that can be used for the water and sanitation sectors. Annex A7.2 provides a table clarifying which countries belong to each of the benchmark groups for water supply and sanitation. In particular, different benchmarks are calculated for countries with water-abundant and water-scarce hydrological conditions, since this greatly affects the extent to which the population is reliant on utility water. Annex A7.3 also provides a list of all the relevant unit conversions for the water and sanitation sector, as well as the technical parameters used to calculate some of the derived indicators. In particular, for hidden cost calculations it is assumed that the capital cost of producing a cubic meter of water is equal to US$0.40.

Finally, Table 7.2, which compares Ghana's water and sanitation sector to African low and middle-income country benchmarks, provides an example of how indicators can be used to inform water and sanitation sector policy analysis. The table also shows the evolution of key indicators for Ghana between the mid- and late 2000s. Analysis shows that Ghana's water and sanitation sector compares very well to those of other low-income countries in Africa in terms of access to services; insanitary practices of drinking surface water and practicing open defecation are much less evident than in the peer group. Nevertheless, Ghana has serious issues with utility inefficiency. Revenue collection ratios in the mid-2000s were as low as 75 percent, but improved markedly to 95 percent as a result of management reforms. But distribution losses, at 50 percent, remain very high and are at least double best practice levels.

Table 7.2 Example of benchmarking water and sanitation indicators for Ghana

	Unit	Low-income countries	Ghana		Middle-income countries
		Mid-2000s	Mid-2000s	Late 2000s	Mid-2000s
Access to piped water	% pop	10.1	**15.1**	**13.1**	56.4
Access to stand posts	% pop	16.1	**20.5**	**27.5**	20.4
Access to wells/boreholes	% pop	38.3	**42.1**	**40.1**	6.3
Access to surface water	% pop	33.8	**20.1**	**11.1**	13.9
Access to septic tanks	% pop	5.3	**10.3**	**14.1**	44.0
Access to latrines	% pop	57.2	**63.1**	**62.5**	33.9
Prevalence of open defecation	% pop	37.1	**24.6**	**23.1**	15.8
Revenue collection	% sales	96.0	**75.0**	**95.0**	99.2
Distribution losses	% production	33.0	**53.0**	**50.8**	23.1
Cost recovery	% total costs	56.0	**48.4**	**61.8**	80.6
Total hidden costs as % of revenue	%	130.0	**183.7**	**128.9**	84.9

	Ghana		Scarce water resources	Other developing regions
U.S. cents per m3	**Mid-2000s**	**Late 2000s**		
Residential tariff	41.7	46.2	60.26	3.0—60.0
Nonresidential tariff	219.8	142.0	120.74	

Source: Banerjee and others, AICD Background Paper No. 12, 2009; Morella and others, AICD Background Paper No. 13, 2009.

7.4 Data Collection

The following Box is a summary of the generic cross-cutting guidelines and procedures for data collection discussed in Chapter 2 of the Handbook, and it is important to spend some time to review them before embarking on the actual data collection exercise.

Target institutions

This section identifies the water and sanitation sector data that are to be collected in order to create the indicators presented above. Annex A7.4 provides a comprehensive list of the water and sanitation sector institutions in Sub-Saharan Africa. These are the target institutions that need to be approached for data collection in this sector. The list is accurate as of March 2011; however, the sector is always evolving, and changes may take place over time. For this reason, the list provided is only intended as general guidance, and should be reviewed and updated, in consultation with sector specialists, as a starting point in any future data collection exercise.

The target institutions can essentially be divided into four categories:

- *Line ministries* refer to the government ministries responsible for overseeing the water supply and sanitation (WSS) sector. They are a useful source of national level data on the sector, though they many not necessarily have detailed information at the operator level.
- *Regulators*. Many African countries have established independent regulators and restructured the sector to foster decentralization and various forms of management and private sector participation. *Where they exist, regulators are typically the best single source of information about WSS services at the national level, and may even be able to provide operator-level data.*
- *WSS utilities* refer to the main providers of water supply and wastewater services either at the national or at the sub-national level. A number of countries have opted for a highly decentralized system in which the national WSS utility is substituted by a fringe of small/regional WSS utilities. When that is the case, these operators individually become target institutions. They are the main source of operator-level information on WSS provision that cannot be found elsewhere.

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the comma-dot or dot-comma convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

- *Rural WSS agencies*. Many countries have created rural water agencies to face the challenge of extending water provision to the most remote and seemingly vulnerable areas. If such an agency exists, it is potentially one of the best sources of information on rural water issues.

Data templates

A complete set of data collection templates for the WSS sector is provided in Annex A7.5. The data collection process for the WSS sector divides into a number of parts.

- *National level*. Institutional variables are collected at the national level, following WSS template A. The template asks detailed institutional questions specific to the WSS sector that complement more generic institutional questions reviewed in the institutional chapter earlier. They are implicitly grouped to capture both reform (legislation, policy oversight, decentralization, market structure) and regulatory (autonomy, social accountability, cost recovery, universal service provision, environment) aspects of the sector. Altogether there are 35 institutional variables that

are laid out in WSS template A. These data should be collected primarily from a regulator and from the central government entity that is likely to have an overall picture of the current situation of the WSS sector as a whole.

- *Operator level*. Operational and financial performance variables are collected from the utilities following WSS template B. This template collects variables relating to access, technical aspects, financing, and quality. Some of the key relevant definitions for the operator-level data are given in the technical glossary below. The best source for this information is usually the utility itself, or in some cases the regulator.

Turning to WSS template A in greater detail, there are two blocks of questions covering each of the two sector-specific institutional indices.

- *Reform*: The reform index is composed of the following series of subindices, each of which is based on a specific set of questions.
  - *Decentralization*: Given the local nature of water and sanitation services, there has been an increasing tendency to decentralize them in lower tiers of government to bring decisions closer to the affected communities. The components of this subindex explore the extent to which responsibility for sanitation, water, and rural water has been decentralized.
  - *Legislation*: In addition to the standard elements of utility legislation, there are a number of aspects specific to the water and sanitation sector. The components of this subindex establish whether important (but often overlooked) issues such as hygiene promotion, sanitation policy, and rural water policy are included in the legal framework of the sector.
  - *Market structure*: The organization of the market into different suppliers will affect the delivery of the service. This subindex captures whether water services are jointly provided with electricity or sanitation services, and also explores the extent of community and household participation in the provision of on-site sanitation and rural water services.
  - *Policy oversight*: Policy oversight of the water and sanitation sector is not simply about economic parameters, but in particular about quality parameters. The components of this subindex capture whether there is regulation of water quality and setting of quality of service standards to provide a basis for the oversight of customer service aspects.
- *Regulation*: The regulation index is composed of the following series of subindices, each of which is based on a specific set of questions.
  - *Autonomy*: In order to function effectively, regulators should have some autonomy from the executive branch. An important way of securing autonomy is to provide regulators with their own independent source of income, typically a sector levy, so that they are not reliant on unpredictable fiscal transfers.
  - *Cost-recovery*: Cost-recovery is a key principle that ensures the sustainability of services, but that is not always practiced due to the social sensitivity of the sector. This subindex is based on a series of questions regarding whether partial or full cost-recovery is applied to on-site sanitation, rural water, water, and wastewater services.
  - *Environmental*: Water and sanitation are highly sensitive from an environmental standpoint. It is therefore important that the regulatory framework for the sector should cover some key environmental issues. These include provision of a regulated dumpsite for waste from septic tanks and other on-site sanitation facilities, monitoring of possible contamination of urban wells from on-site latrines, and provisions for storm water drainage to prevent flooding.
  - *Social accountability*: Water and sanitation, as essential services, are also highly sensitive from a social perspective. It is therefore important to ensure that the regulatory framework builds in channels to promote social accountability. These may include consumer representation in the regulatory body, and consumer rights to comment on or appeal against regulatory decisions, or even initiate tariff reviews at consumers' own request.

WSS template B covers all of the standard utility performance variables. The first block of indicators in WSS template B relates to access issues, and provides a utility perspective to complement the access story emerging from the household survey data.

- *Population in service area*: Utilities are typically responsible for providing service in a clearly delineated service area, which may be a country, a state, province or municipality, or one or more urban areas of a country. The service area is sometimes closely related to the reach of the utility's infrastructure, and at other times captures a large area that the utility is intended to expand into over time. The population resident in this service area, therefore, is the maximum possible size of the market that the utility could be serving.

- *Population served*: In the African context, most utilities are only able to serve a fraction of the population resident in their service area, due to the limited reach of infrastructure and the shortage of investment funds to expand the network. Utilities can serve the populace through a variety of routes, including private residential connections, stand posts or public taps, and indirectly (as when customers sell their utility water to neighbors).
- *Stand posts*: One of the ways in which utilities provide water to customers is through a network of public taps known as stand posts. Due to their open access nature, it is not unusual for stand posts to malfunction. It is therefore important to know how many of these stand posts have been installed, and (more importantly) how many of them are actually in service.

The second block of indicators in WSS template B relates to financial aspects of the utility.

- *Costs*: The company accounts should provide a clear picture of the various kinds of operating costs that the water utility faces. These include the following: energy, the cost of the fuel needed to operate all the machinery; labor, the cost of wages and salaries paid to employees; services contracted out, the cost of paying various types of contractors that work for the utility; and debt service, the annual interest payments on outstanding loans.
- *Billing*: Billing is the process of communicating to customers the amount of money that they owe the company. This is usually done by sending out a monthly bill.
    - *Billings*: Billings are the total value of the bills that are sent out to customers over a yearly period.
    - *Billing cycle*: The billing cycle refers to the frequency with which bills are sent out; typically every 30 days or once a month.
    - *Accounts receivable*: This is the total value of outstanding bills that have not yet been paid to the company.

- *Collection*: Collection is the process whereby the money that customers owe through the billing process is actually collected by the company. Collection may either be through door-to-door visits or at established payment centers at banks or other public facilities. In most developing country environments, the collection of revenue is far from guaranteed, and often public institutions are the worst culprits.
    - *Collection period*: This is the average number of days taken to collect a bill that is owed. Typically, customers have a 15–30 day grace period to pay their bills after they have been received. If the collection period exceeds this value, it indicates that the utility has a problem with tardy payments. It is not unusual to see collection periods as long as 90 days or even more.
    - *Water billed and collected*: This is the amount that is actually collected out of the total amount that was originally billed.
    - *Collection ratio*: This is the ratio of the water billed and collected to the water originally billed. Ideally, this ratio should come to 100 percent, or close to 100 percent. In the African context, however, it is not unusual for utilities to collection only 80 to 90 percent of billings, and sometimes significantly less than that.

- *Revenues*: A company's income is brought in from various sources. The main source is likely to be water and wastewater billed and collected from customers, but there may be others. Ideally, revenues should be broken down between those relating to water services and those relating to *wastewater services* (if any), and if possible it is also useful to distinguish between revenues from *residential* customers and *nonresidential* customers. Typically, utilities with a larger share of nonresidential revenues have a more secure overall source of revenue, since it is often easier to extract payment from larger commercial and industrial customers. It is often useful to normalize *revenues per unit* of water produced or per connection served.
- *Gross fixed assets*: Company accounts may sometimes provide an estimate of the gross fixed value of assets for the utility. If so, this number is recorded. If possible, it is of interest to have the breakdown of these asset values between water and wastewater services. In practice, these data are not always very useful because there is a wide range of accounting practices in place across African utilities, and so it is very difficult to compare asset value estimates across utilities. In particular, assets are often valued at the historic prices as which they were set, and these values are not updated to reflect the often much higher prices that would be associated with replacing the assets.
- *Hidden costs*: Hidden costs, described in some detail in Box 7.1, are essentially a way of estimating the monetary value of various kinds of utility inefficiencies, in particular underpricing of services, undercollection of revenues, and losses on the distribution network. The magnitude of these hidden costs is estimated by looking at the difference between the revenues the utility captures and the revenues that it would capture if it was fully efficient in terms of pricing, collection, and distribution. Hidden costs

can be disaggregated to examine the relative importance of each of these three different sources of inefficiency. It is also useful to normalize them as a percentage of utility revenues to see how much of a burden they represent for the utility, and as a percentage of GDP to see how much of a burden they represent for the economy. It is not unusual to find that hidden costs absorb more than 100 percent of utility revenues, and represent as much as 1 percent of GDP, or even more in some cases.

The third block of indicators in WSS template B relates to the pricing of utility services.

- *Connection charge*: This is the charge that new customers must pay in order to be connected to the system. At least notionally, it is intended to cover the costs associated with connecting the street mains to the inside of a customer's dwelling. Connection charges are an important policy issue, because they are often set so high as to be prohibitive for low-income households, effectively excluding them from access to the network.
- *Fixed charge*: Utility tariff structures tend to be highly varied and complex. In many cases, a fixed charge is applied irrespective of consumption, and then a series of variable charges that change according to the band of consumption. In some cases, fixed charges are quite high and may weigh heavily on customers with low levels of consumption. It is therefore important to know the level of this charge for residential customers. Where there are multiple residential tariff structures for different groups of customers, attention should be confined to the one that is most widely used.
- *Average effective tariff*: This is the average amount that the utility charges for a cubic meter of water, looking across all different customer groups and tariff charges. In some cases, the utility will be able to report this value directly. In other cases, it can be estimated by taking the total value of billings and dividing by the total volume of water sold.

The fourth block of indicators in WSS template B relates to quality of utility services.

- *Customer complaints*: There is increasing recognition among utilities of the importance of providing customers with the opportunity to complain about inadequate quality of service. This helps to make the utility accountable to the public and provides useful information about where things may be going wrong. While customer complaints may refer to fundamental quality of service issues such as continuity and potability (see below), they are often also associated with administrative issues such as errors in billing or delays in scheduled repairs.
- *Continuity of service*: One of the key aspects of the quality of water service is its continuity, measured in terms of the number of hours per day that service is available on average. The ideal for a service as essential as water is for 24-hour continuous availability. In many African countries, this goal is not yet a reality, and it is not unusual to find lower values of a few hours per day.
- *Samples passing chlorine test*: Perhaps the most significant quality attribute of utility water is its potability, that is, it should be safe to drink. Ideally, water should be tested at various points in the network to see whether it meets the chemical and bacteriological standards that potability demands. In practice, however, many African countries lack the capacity to do complex testing of this kind throughout the network. Instead, a simple alternative is to check the water leaving the treatment plant to check that it has adequate levels of chlorination. While this is a necessary condition for the potability of water at the tap, it is by no means sufficient, since many other kinds of contamination may affect the water en route to the customer.
- *Wastewater receiving treatment*: Wastewater treatment is comparatively rare in Africa outside of the major cities and the middle-income countries; however, we expect it to grow over time. This indicator is intended to capture whether such treatment takes place and if so whether treatment is *primary*, *secondary*, or *tertiary*. Primary treatment is the simplest type of treatment and typically involves settlement lagoons that allow liquids and solids to separate. Various kinds of secondary and tertiary treatment exist, and typically involve more complex forms of wastewater treatment and filtering of various kinds.

The fifth block of indicators in WSS template B relates to various technical aspects of the utility service.

- *Water*: The following set of indicators essentially follows the progression of water through the utility's system.
  - *Water produced*: This is the volume of water that the utility captures from nature (through springs, rivers, boreholes) and puts into the distribution network. This is measured by a macro-meter at the point of entry into the network, and is typically reported in millions of cubic meters per year.
  - *Water treated*: This is the percentage of water produced that undergoes some kind of treatment, usually a minimum disinfection with chlorine.
  - *Water consumption*: This is the amount of water that actually reaches and is consumed by the utility's

customers. This is usually measured as the sum of all the individual meter readings of all the customers in millions of cubic meters per year. If metering is not universal, or if meters are not in good working order, than it can be difficult to measure this variable precisely.

- *Nonrevenue water*: En route from the treatment plant to the final customer, a significant volume of water goes astray. Part of it simply leaks away into the ground through fissured and cracks in the distribution network; the older and more poorly maintained the network, the larger these leaks are likely to be. Another part may actually be stolen from the network by clandestine customers who break the public main to insert their own primitive hoses and circumvent the utility payment system. This is the difference between water production and water consumption, typically measured as a percentage of water production. Even a well-performing water utility can lose around 20 percent of water produced in distribution; it is physically impossible and not even economically viable to identify and remedy every single fissure in a subterranean network of pipes that may be hundreds or even thousands of kilometers in length. In Africa, it is not unusual for losses to be significantly above this level: values of 40 and even 50 percent are not unheard of.

- *Wastewater*: The following set of indicators essentially follows the progression of wastewater through the utility's system. Sewer networks remain comparatively rare in Africa, confined to middle-income countries and a handful of larger cities.
  - *Households with water connection that also have wastewater connection*: Even where wastewater networks exist, their reach is usually much more limited than those of water networks in the same city. Hence, this variable calculates the percentage of households with water connections that also have wastewater connections.
  - *Wastewater collected*: This is the percentage of water consumed that is actually collected by the wastewater system. Since there is no metering of wastewater, it is simply estimated as the water consumption of those that have a wastewater connection, divided by total water consumption.
  - *Wastewater treated*: This is the percentage of wastewater collected that undergoes some kind of treatment to improve its quality before being returned to nature (usually a local river or the sea).
  - *Wastewater treated receiving primary treatment*: This is the percentage of wastewater treated that receives primary treatment only. As noted above, in most cases this value would come to 100 percent.
  - *Wastewater treated receiving secondary/tertiary treatment*: This is the percentage of wastewater treated that receives secondary or tertiary treatment. All wastewater must receive primary treatment before it is ready to receive secondary or tertiary treatment.

- *Assets*: This group of indicators documents the extent and condition of the physical assets that make up the utility's system.
  - *Stand posts*: This is the number of stand posts that exist in the service area. It is also relevant to present the percentage of these stand posts that are actually in functioning order.
  - *Water distribution system*: This refers the length of the water distribution system in kilometers. A useful normalization is to consider the number of kilometers of network per connection, as this gives a good idea of the density with which the network is being used.
  - *Pipe breaks (water):* The main technical failure associated with the water distribution network is full pipe breakages (as opposed to smaller cracks and fissures) that typically result in visible street flooding. The incidence of such technical failures per kilometer of the distribution network gives a good indication of the age and condition of the assets.
  - *Wastewater collection system*: This refers the length of the wastewater collection system (also known as sewers) in kilometers. A useful normalization is to consider the number of kilometers of sewer per connection, as this gives a good idea of the extent to which the network is being used.
  - *Pipe blockages (wastewater):* The main technical failure associated with the wastewater collection system (or sewerage network) is pipe blockages that prevent the normal flow of wastewater and may force it to emerge on the surface by a different route. The incidence of such technical failures per kilometer of the sewerage network gives a good indication of the age and condition of the assets, and how effectively they are being maintained. In this case, such failures may also provide an indica-

tion of incorrect use, as when people use the sewer to dispose of solid (as opposed to liquid) waste.

- *Wastewater treatment plants*: This refers to the number of wastewater treatment plants that are installed and functioning in the utility's service area.

Supporting documents

One of the most important source documents for the completion of the templates will be the annual report of the national (or sub-national) water utility (utilities). It is therefore valuable to collect and archive these annual reports as supporting documentation for the templates themselves.

In addition to filling out these templates, it is critical to collect two additional documents that support a more detailed analysis of the tariff practices in the sector.

- *Published tariff schedules*. The tariff schedule explains the rules by which a customer's bill is determined according to customer category. There is a tremendous variation in the types of tariff schedules applied across utilities, and it is therefore difficult to provide a single standardized template for recording tariff schedules/ regimes. Depending on the complexity of tariffs in any given country, the tariff schedule can vary in length from a page to a booklet of 20 pages. This document should be available directly from the operator, and is always a public document since it is used to provide tariff information to customers.

- *Most recent tariff revision document*. From time to time, regulators or ministries adjust the overall tariff levels for service, without necessarily changing the tariff structures. For example, the government may decide to increase all

Table 7.3 List of water and sanitation sector complementary data variables and sources

Policy Code	Variable	Source
Access	Population with access to piped water	Demographic and Health Surveys (Multiple Indicator Cluster Surveys) http://www.measuredhs.com/pubs/Search/search_results.cfm?type=5&srchTp=type&newSrch=1 JMP- WHO: http://www.wssinfo.org/documents-links/documents/?tx_displaycontroller%5Btype%5D=country_files
	Population with access to public tap or stand post	
	Population with access to well or borehole	
	Population with access to surface water	
	Population with access to other water supply	
	Population with access to flush toilet or septic tank	
	Population with access to improved latrine	
	Population with access to traditional pit latrine	
	Population with access to bucket or pan	
	Population with access to other sanitation	
	Population with access to open defecation	
	Population with access to no sanitation facility/nature/bush	
	Availability of service—water	
	Availability of service—flush toilet	
	Take-up of service—water	
	Take-up of service—flush toilet	
Afford-ability	Household spending on water	Living Standards Measurement Surveys (Household Budget Surveys) [http://iresearch.worldbank.org/lsms/lsmssurveyFinder.htm]
	Household spending on water from vendors	
	Household spending on solid waste disposal	
Tech-nical	Delay in obtaining a connection (days)	World Bank Investment Climate Assessment Surveys [http://www.enterprisesurveys.org]
	Firms that find water a constraint for business (% firms)	

water charges by 10 percent. The tariff revision document is the place where this tariff adjustment is promulgated. The nature of the document will vary from country to country. In some cases, for example, it will be a regulatory edict, in others a ministerial decree. Since tariffs are not necessarily adjusted every year, the objective is to collect the most recent tariff revision document available, which may date back several years.

Data from secondary sources

Most of the data needed to produce the indicators are collected directly from the field. Nevertheless, there are also a number of variables that are taken directly from secondary sources. Table 7.3 identifies these variables and their corresponding sources. They relate to household and enterprise surveys and provide a consumer perspective on the service that is an important complement to data reported directly by the utility. We now provide a more extensive description of these variables.

The first block of indicators relates to access and is derived from household surveys regularly conducted by governments. In particular, the Demographic and Health Survey (DHS) is a standardized suite of surveys sponsored by the Joint Monitoring Program¬–World Health Organization and used for the global tracking of health trends. Due to the linkage with public health, they contain detailed information on the extent to which households have access to different kinds of water and sanitation services. Where the DHS is not available, a number of other surveys of household conditions, including the Multi-indicator Cluster Surveys (MICS), provide similar information.

- *Population with access to water*: This is the percentage of the population that actually has access to some kind of water service, which may take any one of the following forms, each with varying implications in terms of public health:
  - *Piped water*, a private residential connection inside the home
  - *Public tap or stand post*, tap in the street that provides access to all local households;
  - *Well or borehole*, some kind of subterranean source of water of varying depths and solidity of construction
  - *Water from vendor*, meaning that the household acquires water from carts, small tanks or drums, tanker trucks, or other entities that do not necessarily guarantee the provision of safe water
  - *Surface water*, meaning that the household collects water directly from rivers, lakes, and ponds in the vicinity
  - *Other water supply*, meaning the household accesses water by means of collecting rainwater, buying bottled water, and so on—which do not guarantee the provision of safe water
  - *Surface water and other non-improved sources*—a summation of the population using water from vendors, surface water or "other water supply" as the main source of water

- *Population with access to sanitation*: This is the percentage of the population that actually has access to some kind of sanitation service, which may take any one of the following forms, each with varying implications in terms of public health:
  - *Flush toilet or septic tank*, a toilet that is connected to water and allows feaces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer network
  - *Improved latrine*, an on-site sanitation facility that consists of a solidly constructed pit and a slab that provides a safe degree of separation from the feaces and prevents the circulation of flies, and is built according to an approved sanitary design (such as a ventilated improved pit latrine, SanPlat, or chemical toilet)
  - *Traditional pit latrine*, an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines
  - *Bucket or pan*, a bucket or pan used to collect feaces and then dispose of it in the vicinity
  - *No facility/nature/bush*, meaning that the members of the household leave their feaces out in the open
  - *Other sanitation*, meaning that the household uses a form of sanitation different from "no facility/nature/bush" but not considered improved as reported in the respective survey
  - *Open defecation*—a summation of the population reliant on "no facility/nature/bush" and "other sanitation" as the main sources of sanitation

- *Availability of service*: This is the percentage of the urban population that live within reach of a water or wastewater network, irrespective of whether or not they are actually connected to such a network. Survey sampling practice is based on geographical clusters, which in urban areas represent groups of people that live relatively close together, for example, on the same city block. If at least one household in each cluster has a connection to a water or wastewater

network, then it follows that the other households could potentially have connections because they are located physically close to the infrastructure. In other words, the service is available to them.

- *Take-up of service*: This is the percentage of the population that has water or wastewater service available to them and that actually make a connection to the service. For example, if there are 20 households in a cluster but only 5 of them connect, the take-up rate would be 25 percent. There are many reasons why households may not take up a service even when it is available to them; for example, they may not be able to afford the service, or they may not have tenure rights over their dwelling and therefore be unable to invest in improving their own living conditions.

The second block of indicators relates to the affordability of water and sanitation services and is derived from another set of surveys regularly conducted by government. The prototype of these surveys is the Living Standards Measurement Survey (LSMS), which includes a detailed itemization of how households spend their budgets. Where the LSMS is not available, a number of other surveys of household conditions, including the Household Expenditure Surveys (HES), provide similar information.

- *Household spending*: This is the amount that households spend on water and other sanitation services each month. This indicator is typically normalized against the overall household budget to obtain a water expenditure share that is helpful in gauging the affordability of water services. As a rule of thumb, the World Health Organization recommends that household spending on water should generally be kept within 5 percent of the household budget.

The third block of indicators relates to the quality of water and sanitation services as perceived by nonresidential (or business customers). These indicators are derived from the Investment Climate Surveys regularly performed by the World Bank Group to monitor the business climate of countries around the world. Alongside numerous questions about red tape and business regulations, these surveys also include a significant number of questions about how firms perceive infrastructure services.

- *Delay in obtaining a connection*: This is the average number of days that businesses report having to wait for a water connection once they have requested it from the utility.
- *Firms that find water a constraint for business*: This is the percentage of businesses that report that the inadequacies of the local water supply actually present a serious impediment to their operations.

A7. Annexes to Chapter 7: Water and Sanitation

Annex A7.1 Comprehensive list of indicators and definitions—WSS

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W103d	Utility provision of sewerage, domestic (% of population)	National average of the percentage of population resident in the utility service area with wastewater connection.	Derived	Sanitation	average [w103, across utilities]
	W146d	Utility provision of water (% of population)	National average of the percentage of population resident in the utility service area with access to water from private residential connection, residential connection from neighbors, shared taps, and stand posts.	Derived	Water supply	average [w146, across utilities]
	W100d	Utility provision of water, private residential connection (% of population)	National average of the percentage of population resident in the utility service area with private residential water connection.	Derived	Water supply	average [w100, across utilities]
	W101d	Utility provision of water, residential connection from neighbors and shared taps (% of population)	National average of the percentage of population resident in the utility service area with access to water connection from neighbors and shared taps.	Derived	Water supply	average [w101, across utilities]
	W102d	Utility provision of water, stand post (% of population)	National average of the percentage of population resident in the utility service area with access to stand post.	Derived	Water supply	average [w102, across utilities]
	W103	Utility provision of sewerage, domestic (% of population)	Percentage of population resident in the utility service area with wastewater connection.	Derived	Sanitation	[w123 x w151 x 100] / [w150]
	W146	Utility provision of water (% of population)	Percentage of population resident in the utility service area with access to water from private residential connection, residential connection from neighbors, shared taps, and standposts.	Derived	Water supply	[(w148 + w149) x 100] / [w150]
	W100	Utility provision of water, private residential connection (% of population)	Percentage of population resident in the utility service area with private residential water connection.	Derived	Water supply	[w209 x 100] / [w150]
	W101	Utility provision of water, residential connection from neighbors and shared taps (% of population)	Percentage of population resident in the utility service area with access to water connection from neighbors and shared taps.	Derived	Water supply	[w210 x 100] / [w150]
	W102	Utility provision of water, stand post (% of population)	Percentage of population resident in the utility service area with access to stand post.	Derived	Water supply	[w149 x 100] / [w150]
	W550	Population take-up of flush toilet to network/septic tank—Urban (% of population)	Share of urban population that has water or wastewater service available to them that actually make a connection to the service.	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W648	Population take-up of piped water—Urban (% of population)	Share of urban population that has water service available to them that actually make a connection to the service.	Raw	Water supply	
	W500	Population access to bucket/pan—National (% of population)	Share of national households that use a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W504	Population access to bucket/pan—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W505	Population access to bucket/pan—Quintile 2 (% of population)	Share of households in the second budget quintile that uses a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W506	Population access to bucket/pan—Quintile 3 (% of population)	Share of households in the third budget quintile that uses a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W507	Population access to bucket/pan—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W508	Population access to bucket/pan—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W502	Population access to bucket/pan—Rural (% of population)	Share of rural households that use a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W503	Population access to bucket/pan—Urban (% of population)	Share of urban households that use a bucket or pan to collect feces and then dispose of it in the vicinity.	Raw	Sanitation	
	W509	Population access to flush toilet/septic tank—National (% of population)	Share of national households that use a toilet that is connected to water and allows feces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W513	Population access to flush toilet/septic tank—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that use a toilet that is connected to water and allows feces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W514	Population access to flush toilet/septic tank—Quintile 2 (% of population)	Share of households in the second budget quintile that use a toilet that is connected to water and allows faces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W515	Population access to flush toilet/septic tank—Quintile 3 (% of population)	Share of households in the third budget quintile that use a toilet that is connected to water and allows faces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W516	Population access to flush toilet/septic tank—Quintile 4 (% of population)	Share of households in the fourth budget quintile that use a toilet that is connected to water and allows faces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W517	Population access to flush toilet/septic tank—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that use a toilet that is connected to water and allows feces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W510	Population access to flush toilet/septic tank—Rural (% of population)	Share of rural households that use a toilet that is connected to water and allows feces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W511	Population access to flush toilet/septic tank—Urban (% of population)	Share of urban households that use a toilet that is connected to water and allows feces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Raw	Sanitation	
	W542	Population access to improved latrines—National (% of population)	Share of national households that use an improved latrine (Ventilated Improved Pit (VIP) latrine/SanPlat Sanitation System/ chemical toilet/Blair latrine).	Raw	Sanitation	
	W545	Population access to improved latrines—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that use an improved latrine VIP latrine/SanPlat/ chemical toilet/ Blair latrine).	Raw	Sanitation	
	W546	Population access to improved latrines—Quintile 2 (% of population)	Share of households in the second budget quintile that use an improved latrine (VIP latrine/SanPlat/chemical toilet/Blair latrine).	Raw	Sanitation	
	W547	Population access to improved latrines—Quintile 3 (% of population)	Share of households in the third budget quintile that use an improved latrine (VIP latrine/SanPlat/chemical toilet/Blair latrine).	Raw	Sanitation	
	W548	Population access to improved latrines—Quintile 4 (% of population)	Share of households in the fourth budget quintile that use an improved latrine (VIP latrine/SanPlat/chemical toilet/Blair latrine).	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W549	Population access to improved latrines—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that use an improved latrine (VIP latrine/SanPlat/chemical toilet/ Blair latrine).	Raw	Sanitation	
	W543	Population access to improved latrines—Rural (% of population)	Share of rural households that use an improved latrine (VIP latrine/SanPlat/ chemical toilet/Blair latrine).	Raw	Sanitation	
	W544	Population access to improved latrines—Urban (% of population)	Share of urban households that use an improved latrine (VIP latrine/SanPlat/ chemical toilet/Blair latrine).	Raw	Sanitation	
	W518	Population access to no facility/nature/bush as the main form of sanitation—National (% of population)	Share of national households that rely on no facility/nature/bush as the main form of sanitation.	Raw	Sanitation	
	W521	Population access to no facility/nature/bush as the main form of sanitation—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that rely on no facility/nature/bush as the main form of sanitation.	Raw	Sanitation	
	W522	Population access to no facility/nature/bush as the main form of sanitation—Quintile 2 (% of population)	Share of households in the second budget quintile that rely on no facility/nature/ bush as the main form of sanitation.	Raw	Sanitation	
	W523	Population access to no facility/nature/bush as the main form of sanitation—Quintile 3 (% of population)	Share of households in the third budget quintile that rely on no facility/nature/ bush as the main form of sanitation.	Raw	Sanitation	
	W524	Population access to no facility/nature/bush as the main form of sanitation—Quintile 4 (% of population)	Share of households in the fourth budget quintile that rely on no facility/nature/ bush as the main form of sanitation.	Raw	Sanitation	
	W525	Population access to no facility/nature/bush as the main form of sanitation—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that rely on no facility/nature/bush as the main form of sanitation.	Raw	Sanitation	
	W520	Population access to no facility/nature/bush as the main form of sanitation—Rural (% of population)	Share of rural households that rely on no facility/nature/bush as the main form of sanitation.	Raw	Sanitation	
	W519	Population access to no facility/nature/bush as the main form of sanitation—Urban (% of population)	Share of urban households that rely on no facility/nature/bush as the main form of sanitation.	Raw	Sanitation	
	W526	Population access to other sanitation—National (% of population)	Share of national households that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W529	Population access to other sanitation—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W530	Population access to other sanitation—Quintile 2 (% of population)	Share of households in the second budget quintile that use a form of sanitation different from no facility/nature/bush and that is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W531	Population access to other sanitation—Quintile 3 (% of population)	Share of households in the third budget quintile that use a form of sanitation different from no facility/nature/bush and that is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W532	Population access to other sanitation—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W533	Population access to other sanitation—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that use a form of sanitation different from no facility/nature/bush and that is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W527	Population access to other sanitation—Rural (% of population)	Share of rural households that use a form of sanitation different from no facility/nature/bush and that is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W528	Population access to other sanitation—Urban (% of population)	Share of urban households that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Raw	Sanitation	
	W551	Population access to other water supply—National (% of population)	Share of national households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W554	Population access to other water supply—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W555	Population access to other water supply—Quintile 2 (% of population)	Share of households in the second budget quintile that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W556	Population access to other water supply—Quintile 3 (% of population)	Share of households in the third budget quintile that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W557	Population access to other water supply—Quintile 4 (% of population)	Share of households in the fourth budget quintile that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W558	Population access to other water supply—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W552	Population access to other water supply—Rural (% of population)	Share of rural households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W553	Population access to other water supply—Urban (% of population)	Share of urban households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Raw	Water supply	
	W559	Population access to piped water—National (% of population)	Share of national households that have a private residential connection inside the home.	Raw	Water supply	
	W562	Population access to piped water—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that have a private residential connection inside the home.	Raw	Water supply	
	W563	Population access to piped water—Quintile 2 (% of population)	Share of households in the second budget quintile that have a private residential connection inside the home.	Raw	Water supply	
	W564	Population access to piped water—Quintile 3 (% of population)	Share of households in the third budget quintile that have a private residential connection inside the home.	Raw	Water supply	
	W565	Population access to piped water—Quintile 4 (% of population)	Share of households in the fourth budget quintile that have a private residential connection inside the home.	Raw	Water supply	
	W566	Population access to piped water—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that have a private residential connection inside the home.	Raw	Water supply	
	W561	Population access to piped water—Rural (% of population)	Share of rural households that have a private residential connection inside the home.	Raw	Water supply	
	W560	Population access to piped water—Urban (% of population)	Share of urban households that have a private residential connection inside the home.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W567	Population access to public tap/stand post—National (% of population)	Share of national households that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W570	Population access to public tap/stand post—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that has a tap in the street that provides access to all local households.	Raw	Water supply	
	W571	Population access to public tap/stand post—Quintile 2 (% of population)	Share of households in the second budget quintile that has a tap in the street that provides access to all local households.	Raw	Water supply	
	W572	Population access to public tap/stand post—Quintile 3 (% of population)	Share of households in the third budget quintile that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W573	Population access to public tap/stand post—Quintile 4 (% of population)	Share of households in the fourth budget quintile that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W574	Population access to public tap/stand post—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W568	Population access to public tap/stand post—Rural (% of population)	Share of rural households that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W569	Population access to public tap/stand post—Urban (% of population)	Share of urban households that have a tap in the street that provides access to all local households.	Raw	Water supply	
	W649	Population access to solid waste disposal by burning/ burying—National (% of population)	Share of national households that disposes solid waste by burning/burying.	Raw	Waste management	
	W652	Population access to solid waste disposal by burning/ burying—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that disposes solid waste by burning/burying.	Raw	Waste management	
	W653	Population access to solid waste disposal by burning/ burying—Quintile 2 (% of population)	Share of households in the second budget quintile that disposes solid waste by burning/burying.	Raw	Waste management	
	W654	Population access to solid waste disposal by burning/ burying—Quintile 3 (% of population)	Share of households in the third budget quintile that disposes solid waste by burning/burying.	Raw	Waste management	
	W655	Population access to solid waste disposal by burning/ burying—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes solid waste by burning/burying.	Raw	Waste management	
	W656	Population access to solid waste disposal by burning/ burying—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes solid waste by burning/burying.	Raw	Waste management	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W650	Population access to solid waste disposal by burning/ burying—Rural (% of population)	Share of rural households that dispose of solid waste by burning/burying.	Raw	Waste management	
	W651	Population access to solid waste disposal by burning/ burying—Urban (% of population)	Share of urban households that dispose of solid waste by burning/burying.	Raw	Waste management	
	W657	Population access to solid waste disposal by government/NGO/private company collection—National (% of population)	Share of national households that dispose of solid waste using services provided by/ NGO/ private company.	Raw	Waste management	
	W660	Population access to solid waste disposal by government/NGO/private company collection—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that disposes of solid waste using services provided by/NGO/ private company.	Raw	Waste management	
	W661	Population access to solid waste disposal by government/NGO/private company collection—Quintile 2 (% of population)	Share of households in the second budget quintile that disposes of solid waste using services provided by/NGO/ private company.	Raw	Waste management	
	W662	Population access to solid waste disposal by government/NGO/private company collection—Quintile 3 (% of population)	Share of households in the third budget quintile that disposes of solid waste using services provided by/NGO/ private company.	Raw	Waste management	
	W663	Population access to solid waste disposal by government/NGO/private company collection—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes of solid waste using services provided by/NGO/ private company.	Raw	Waste management	
	W664	Population access to solid waste disposal by government/NGO/private company collection—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes of solid waste using services provided by/NGO/ private company.	Raw	Waste management	
	W658	Population access to solid waste disposal by government/NGO/private company collection—Rural (% of population)	Share of rural households that dispose of solid waste using services provided by/ NGO/ private company.	Raw	Waste management	
	W659	Population access to solid waste disposal by government/NGO/private company collection—Urban (% of population)	Share of urban households that dispose of solid waste using services provided by/ NGO/ private company.	Raw	Waste management	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W665	Population access to solid waste disposal by other means—National (% of population)	Share of national households that dispose of solid waste by other means.	Raw	Waste management	
	W668	Population access to solid waste disposal by other means—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that disposes of solid waste by other means.	Raw	Waste management	
	W669	Population access to solid waste disposal by other means—Quintile 2 (% of population)	Share of households in the second budget quintile that disposes of solid waste by other means.	Raw	Waste management	
	W670	Population access to solid waste disposal by other means—Quintile 3 (% of population)	Share of households in the third budget quintile that disposes of solid waste by other means.	Raw	Waste management	
	W671	Population access to solid waste disposal by other means—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes of solid waste by other means.	Raw	Waste management	
	W672	Population access to solid waste disposal by other means—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes of solid waste by other means.	Raw	Waste management	
	W666	Population access to solid waste disposal by other means—Rural (% of population)	Share of rural households that dispose of solid waste by other means.	Raw	Waste management	
	W667	Population access to solid waste disposal by other means—Urban (% of population)	Share of urban households that dispose of solid waste by other means.	Raw	Waste management	
	W673	Population access to solid waste disposal by pit/heap—National (% of population)	Share of national households that dispose of solid waste by pit/heap.	Raw	Waste management	
	W676	Population access to solid waste disposal by pit/heap—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that disposes of solid waste by pit/heap.	Raw	Waste management	
	W677	Population access to solid waste disposal by pit/heap—Quintile 2 (% of population)	Share of households in the second budget quintile that disposes of solid waste by pit/heap.	Raw	Waste management	
	W678	Population access to solid waste disposal by pit/heap—Quintile 3 (% of population)	Share of households in the third budget quintile that disposes of solid waste by pit/heap.	Raw	Waste management	
	W679	Population access to solid waste disposal by pit/heap—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes of solid waste by pit/heap.	Raw	Waste management	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W680	Population access to solid waste disposal by pit/heap—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes of solid waste by pit/heap.	Raw	Waste management	
	W674	Population access to solid waste disposal by pit/heap—Rural (% of population)	Share of rural households that dispose of solid waste by pit/heap.	Raw	Waste management	
	W675	Population access to solid waste disposal by pit/heap—Urban (% of population)	Share of urban households that dispose of solid waste by pit/heap.	Raw	Waste management	
	W232	Population access to surface water and other non-improved sources— -National (% of population)	Percentage of national households that relies on surface water or other non-improved sources of water as the main source of water supply (for example, summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved water)	Derived	Water supply	summation [W551+ W575+W583]
	W235	Population access to surface water and other non-improved sources— -Quintile 1 (% of population)	Percentage of households belonging to the first (poorest) budget quintile that relies on surface water or other non-improved sources of water as the main source of water supply (for example, summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved water)	Derived	Water supply	summation [W554+ W578+W586]
	W236	Population access to surface water and other non-improved sources— -Quintile 2 (% of population)	Percentage of households belonging to the second budget quintile that relies on surface water or other non-improved sources of water as the main source of water supply (for example, summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved water).)	Derived	Water supply	summation [W555+ W579+W587]
	W237	Population access to surface water and other non-improved sources— -Quintile 3 (% of population)	Percentage of households belonging to the third budget quintile that relies on surface water or other non-improved sources of water as the main source of water supply (for summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved-improved water)	Derived	Water supply	summation [W556+ W580+W588]
	W238	Population access to surface water and other non-improved sources— -Quintile 4 (% of population)	Percentage of households belonging to the fourth budget quintile that relies on surface water or other non-improved sources of water as the main source of water supply (for summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved-improved water)	Derived	Water supply	summation [W557+ W581+W589]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W239	Population access to surface water and other non-improved sources— -Quintile 5 (% of population)	Percentage of households belonging to the fifth (richest) budget quintile that relies on surface water or other non-improved sources of water as the main source of water supply (for summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved-improved water)	Derived	Water supply	summation [W558+ W582+W590]
	W234	Population access to surface water and other non-improved sources— -Rural (% of population)	Percentage of rural households that relies on surface water or other non-improved sources of water as the main source of water supply (for example, summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved water).)	Derived	Water supply	summation [W552+ W576+W585]
	W233	Population access to surface water and other non-improved sources— -Urban (% of population)	Percentage of urban households that relies on surface water or other non-improved sources of water as the main source of water supply (for example, summation of access to surface water, water from vendors/ (i.e., truck), rain water, and other forms of non-improved water).)	Derived	Water supply	summation [W553+ W577+W584]
	W575	Population access to surface water—National (% of population)	Share of national households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W578	Population access to surface water—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W579	Population access to surface water—Quintile 2 (% of population)	Share of households in the second budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W580	Population access to surface water—Quintile 3 (% of population)	Share of households in the third budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W581	Population access to surface water—Quintile 4 (% of population)	Share of households in the fourth budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W582	Population access to surface water—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W576	Population access to surface water—Rural (% of population)	Share of rural households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W577	Population access to surface water—Urban (% of population)	Share of urban households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Raw	Water supply	
	W534	Population access to traditional pit latrine—National (% of population)	Share of national households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W537	Population access to traditional pit latrine—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W538	Population access to traditional pit latrine—Quintile 2 (% of population)	Share of households in the second budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W539	Population access to traditional pit latrine—Quintile 3 (% of population)	Share of households in the third budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W540	Population access to traditional pit latrine—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W541	Population access to traditional pit latrine—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W535	Population access to traditional pit latrine—Rural (% of population)	Share of rural households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W536	Population access to traditional pit latrine—Urban (% of population)	Share of urban households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Raw	Sanitation	
	W583	Population access to water from vendor—National (% of population)	Share of national households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W586	Population access to water from vendor—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W587	Population access to water from vendor—Quintile 2 (% of population)	Share of households in the second budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W588	Population access to water from vendor—Quintile 3 (% of population)	Share of households in the third budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W589	Population access to water from vendor—Quintile 4 (% of population)	Share of households in the fourth budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W590	Population access to water from vendor—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W585	Population access to water from vendor—Rural (% of population)	Share of rural households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	
	W584	Population access to water from vendor—Urban (% of population)	Share of urban households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W591	Population access to well/ borehole—National (% of population)	Share of national households relying on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W594	Population access to well/ borehole—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W595	Population access to well/ borehole—Quintile 2 (% of population)	Share of households in the second budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W596	Population access to well/ borehole—Quintile 3 (% of population)	Share of households in the third budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W597	Population access to well/ borehole—Quintile 4 (% of population)	Share of households in the fourth budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W598	Population access to well/ borehole—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W593	Population access to well/ borehole—Rural (% of population)	Share of rural households relying on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W592	Population access to well/ borehole—Urban (% of population)	Share of urban households relying on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Raw	Water supply	
	W780	Population reliance on open defecation—-National (% of population)	Percentage of national households that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W526 + W518]
	W781	Population reliance on open defecation—-Quintile 1 (% of population)	Percentage of households belonging to the first (poorest) budget quintile that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W529 + W521]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W782	Population reliance on open defecation—-Quintile 2 (% of population)	Percentage of households belonging to the second budget quintile that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W530+ W522]
	W783	Population reliance on open defecation—-Quintile 3 (% of population)	Percentage of households belonging to the third budget quintile that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W530 + W523]
	W784	Population reliance on open defecation—-Quintile 4 (% of population)	Percentage of households belonging to the fourth budget quintile that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation	Derived	Sanitation	summation [W532 + W524]
	W785	Population reliance on open defecation—-Quintile 5 (% of population)	Percentage of households belonging to the fifth (richest) budget quintile that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W533 + W525]
	W786	Population reliance on open defecation—-Rural (% of population)	Percentage of rural households that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W527 + W520]
	W787	Population reliance on open defecation—-Urban (% of population)	Percentage of urban households that relies on open defecation as the main source of sanitation. Practice of open defecation refers to the use of no facility/nature/bush as the main form of sanitation and other sanitation.	Derived	Sanitation	summation [W528 + W519]
	W150	Population resident in the utility service area (number)	Total population resident in the utility service area, including those with and without direct utility service.	Raw	Water supply	
	W148	Population served by direct supply and shared taps (number)	Population served by private residential water connections, residential water connections from neighbors, and shared taps.	Raw	Water supply	
	W209	Population served by private residential connections (number)	Population served by private residential connections.	Raw	Water supply	
	W210	Population served by residential water connection from neighbors and shared taps (number)	Population served by residential water connections from neighbors and shared taps.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Access	W196	Population served by sewerage (number)	Population served by sewerage connections.	Raw	Sanitation	
	W147	Population served by stand post (ratio)	Number of people served by stand post installed in service area providing utility water.	Derived	Water supply	[w149] / [w122]
	W149	Population served by stand posts providing utility water (number)	Population served by stand posts installed in service area providing utility water.	Raw	Water supply	
	W197	Population served by utility water (number)	Population served by direct supply, shared taps, and stand posts providing utility water.	Derived	Water supply	[w148 + w149]
	W122	Stand posts providing utility water, functioning (number)	Number of functioning stand posts providing utility water.	Raw	Water supply	
	W124	Stand posts providing utility water, installed (number)	Number of installed stand posts providing utility water.	Raw	Water supply	
Affordability	W681	HH spending on solid waste disposal—National (% of HH spending)	Household spending on solid waste disposal as a share of total household spending at the national level.	Raw	Waste management	
	W690	HH spending on solid waste disposal—National (2002 US$)	Monthly household spending on solid waste disposal at the national level, expressed in 2002 US$.	Raw	Waste management	
	W689	HH spending on solid waste disposal—National (LCU)	Monthly household spending on solid waste disposal at the national level, expressed in LCUs.	Raw	Waste management	
	W684	HH spending on solid waste disposal—Quintile 1 (% of HH spending)	Household spending on solid waste disposal by the first (poorest) budget quintile as a share of total household spending in urban areas.	Raw	Waste management	
	W698	HH spending on solid waste disposal—Quintile 1 (2002 US$)	Monthly household spending on solid waste disposal by the first (poorest) budget quintile, expressed in 2002 US$.	Raw	Waste management	
	W697	HH spending on solid waste disposal—Quintile 1 (LCU)	Monthly household spending on solid waste disposal by the first (poorest) budget quintile, expressed in LCUs.	Raw	Waste management	
	W685	HH spending on solid waste disposal—Quintile 2 (% of HH spending)	Household spending on solid waste disposal by the second budget quintile as a share of total household spending in urban areas.	Raw	Waste management	
	W700	HH spending on solid waste disposal—Quintile 2 (2002 US$)	Monthly household spending on solid waste disposal by the second budget quintile, expressed in 2002 US$.	Raw	Waste management	
	W699	HH spending on solid waste disposal—Quintile 2 (LCU)	Monthly household spending on solid waste disposal by the second budget quintile, expressed in LCUs.	Raw	Waste management	
	W686	HH spending on solid waste disposal—Quintile 3 (% of HH spending)	Household spending on solid waste disposal by the third budget quintile as a share of total household spending in urban areas.	Raw	Waste management	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Affordability	W702	HH spending on solid waste disposal—Quintile 3 (2002 US$)	Monthly household spending on solid waste disposal by the third budget quintile, expressed in 2002 US$.	Raw	Waste management	
	W701	HH spending on solid waste disposal—Quintile 3 (LCU)	Monthly household spending on solid waste disposal by the third budget quintile, expressed in LCUs.	Raw	Waste management	
	W687	HH spending on solid waste disposal—Quintile 4 (% of HH spending)	Household spending on solid waste disposal by the fourth budget quintile as a share of total household spending in urban areas.	Raw	Waste management	
	W704	HH spending on solid waste disposal—Quintile 4 (2002 US$)	Monthly household spending on solid waste disposal by the fourth budget quintile, expressed in 2002 US$.	Raw	Waste management	
	W703	HH spending on solid waste disposal—Quintile 4 (LCU)	Monthly household spending on solid waste disposal by the fourth budget quintile, expressed in LCUs.	Raw	Waste management	
	W688	HH spending on solid waste disposal—Quintile 5 (% of HH spending)	Household spending on solid waste disposal by the fifth (richest) budget quintile as a share of total household spending in urban areas.	Raw	Waste management	
	W706	HH spending on solid waste disposal—Quintile 5 (2002 US$)	Monthly household spending on solid waste disposal by the fifth (richest) budget quintile, expressed in 2002 US$.	Raw	Waste management	
	W705	HH spending on solid waste disposal—Quintile 5 (LCU)	Monthly household spending on solid waste disposal by the fifth (richest) budget quintile, expressed in LCUs.	Raw	Waste management	
	W682	HH spending on solid waste disposal—Rural (% of HH spending)	Household spending on solid waste disposal as a share of total household spending in rural areas.	Raw	Waste management	
	W692	HH spending on solid waste disposal—Rural (2002 US$)	Monthly household spending on solid waste disposal in rural areas, expressed in 2002 US$.	Raw	Waste management	
	W691	HH spending on solid waste disposal—Rural (LCU)	Monthly household spending on solid waste disposal in rural areas, expressed in LCUs.	Raw	Waste management	
	W683	HH spending on solid waste disposal—Urban (% of HH spending)	Household spending on solid waste disposal as a share of total household spending in urban areas.	Raw	Waste management	
	W694	HH spending on solid waste disposal—Urban (2002 US$)	Monthly household spending on solid waste disposal in urban areas, expressed in 2002 US$.	Raw	Waste management	
	W693	HH spending on solid waste disposal—Urban (LCU)	Monthly household spending on solid waste disposal in urban areas, expressed in LCUs.	Raw	Waste management	
	W631	HH spending on water from vendors—National (% of HH spending)	Household spending on water from vendors as a share of total household spending at the national level.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Affordability	W600	HH spending on water from vendors—National (2002 US$)	Monthly household spending on water from vendors at the national level, expressed in 2002 US$.	Raw	Water supply	
	W599	HH spending on water from vendors—National (LCU)	Monthly household spending on water from vendors at the national level, expressed in LCUs.	Raw	Water supply	
	W634	HH spending on water from vendors—Quintile 1 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the first (poorest) budget quintile.	Raw	Water supply	
	W606	HH spending on water from vendors—Quintile 1 (2002 US$)	Monthly household spending on water from vendors in the first (poorest) budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W605	HH spending on water from vendors—Quintile 1 (LCU)	Monthly household spending on water from vendors in the first (poorest) budget quintile, expressed in LCUs.	Raw	Water supply	
	W635	HH spending on water from vendors—Quintile 2 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the second budget quintile.	Raw	Water supply	
	W608	HH spending on water from vendors—Quintile 2 (2002 US$)	Monthly household spending on water from vendors in the second budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W607	HH spending on water from vendors—Quintile 2 (LCU)	Monthly household spending on water from vendors in the second budget quintile, expressed in LCUs.	Raw	Water supply	
	W636	HH spending on water from vendors—Quintile 3 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the third budget quintile.	Raw	Water supply	
	W610	HH spending on water from vendors—Quintile 3 (2002 US$)	Monthly household spending on water from vendors in the third budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W609	HH spending on water from vendors—Quintile 3 (LCU)	Monthly household spending on water from vendors in the third budget quintile, expressed in LCUs.	Raw	Water supply	
	W637	HH spending on water from vendors—Quintile 4 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the fourth budget quintile.	Raw	Water supply	
	W612	HH spending on water from vendors—Quintile 4 (2002 US$)	Monthly household spending on water from vendors in the fourth budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W611	HH spending on water from vendors—Quintile 4 (LCU)	Monthly household spending on water from vendors in the fourth budget quintile, expressed in LCUs.	Raw	Water supply	
	W638	HH spending on water from vendors—Quintile 5 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the fifth (richest) budget quintile.	Raw	Water supply	
	W614	HH spending on water from vendors—Quintile 5 (2002 US$)	Monthly household spending on water from vendors in the fifth (richest) budget quintile, expressed in 2002 US$.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Affordability	W613	HH spending on water from vendors—Quintile 5 (LCU)	Monthly household spending on water from vendors in the fifth (richest) budget quintile, expressed in LCUs.	Raw	Water supply	
	W632	HH spending on water from vendors—Rural (% of HH spending)	Household spending on water from vendors as a share of total household spending in rural areas.	Raw	Water supply	
	W602	HH spending on water from vendors—Rural (2002 US$)	Monthly household spending on water from vendors in rural areas, expressed in 2002 US$.	Raw	Water supply	
	W601	HH spending on water from vendors—Rural (LCU)	Monthly household spending on water from vendors in rural areas, expressed in LCUs.	Raw	Water supply	
	W633	HH spending on water from vendors—Urban (% of HH spending)	Household spending on water from vendors as a share of total household spending in urban areas.	Raw	Water supply	
	W604	HH spending on water from vendors—Urban (2002 US$)	Monthly household spending on water from vendors in urban areas, expressed in 2002 US$.	Raw	Water supply	
	W603	HH spending on water from vendors—Urban (LCU)	Monthly household spending on water from vendors in urban areas, expressed in LCUs.	Raw	Water supply	
	W639	HH spending on water—National (% of HH spending)	Household spending on water as a share of total household spending at the national level as a share of total household spending in urban areas.	Raw	Water supply	
	W616	HH spending on water—National (2002 US$)	Monthly household spending on water at the national level, expressed in 2002 US$.	Raw	Water supply	
	W615	HH spending on water—National (LCU)	Monthly household spending on water at the national level, expressed in LCUs.	Raw	Water supply	
	W642	HH spending on water—Quintile 1 (% of HH spending)	Household spending on water by the first (poorest) budget quintile as a share of total household spending in urban areas.	Raw	Water supply	
	W622	HH spending on water—Quintile 1 (2002 US$)	Monthly household spending on water by the first (poorest) budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W621	HH spending on water—Quintile 1 (LCU)	Monthly household spending on water by the first (poorest) budget quintile, expressed in LCUs.	Raw	Water supply	
	W643	HH spending on water—Quintile 2 (% of HH spending)	Household spending on water by the second budget quintile as a share of total household spending in urban areas.	Raw	Water supply	
	W624	HH spending on water—Quintile 2 (2002 US$)	Monthly household spending on water by the second budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W623	HH spending on water—Quintile 2 (LCU)	Monthly household spending on water by the second budget quintile, expressed in LCUs.	Raw	Water supply	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Affordability	W644	HH spending on water—Quintile 3 (% of HH spending)	Household spending on water by the third budget quintile as a share of total household spending in urban areas.	Raw	Water supply	
	W626	HH spending on water—Quintile 3 (2002 US$)	Monthly household spending on water by the third budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W625	HH spending on water—Quintile 3 (LCU)	Monthly household spending on water by the third budget quintile, expressed in LCUs.	Raw	Water supply	
	W645	HH spending on water—Quintile 4 (% of HH spending)	Household spending on water by the fourth budget quintile as a share of total household spending in urban areas.	Raw	Water supply	
	W628	HH spending on water—Quintile 4 (2002 US$)	Monthly household spending on water by the fourth budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W627	HH spending on water—Quintile 4 (LCU)	Monthly household spending on water by the fourth budget quintile, expressed in LCUs.	Raw	Water supply	
	W646	HH spending on water—Quintile 5 (% of HH spending)	Household spending on water by the fifth (richest) budget quintile as a share of total household spending in urban areas.	Raw	Water supply	
	W630	HH spending on water—Quintile 5 (2002 US$)	Monthly household spending on water by the fifth (richest) budget quintile, expressed in 2002 US$.	Raw	Water supply	
	W629	HH spending on water—Quintile 5 (LCU)	Monthly household spending on water by the fifth (richest) budget quintile, expressed in LCUs/	Raw	Water supply	
	W640	HH spending on water—Rural (% of HH spending)	Household spending on water as a share of total household spending in rural areas as a share of total household spending in urban areas.	Raw	Water supply	
	W618	HH spending on water—Rural (2002 US$)	Monthly household spending on water in rural areas, expressed in 2002 US$.	Raw	Water supply	
	W617	HH spending on water—Rural (LCU)	Monthly household spending on water in rural areas, expressed in LCUs.	Raw	Water supply	
	W641	HH spending on water—Urban (% of HH spending)	Household spending on water as a share of total household spending in urban areas.	Raw	Water supply	
	W620	HH spending on water—Urban (2002 US$)	Monthly household spending on water in urban areas, expressed in 2002 US$.	Raw	Water supply	
	W619	HH spending on water—Urban (LCU)	Monthly household spending on water in urban areas, expressed in LCUs.	Raw	Water supply	
Financial	z191	Accounts receivable, end of the year (LCU)	Amounts due the utility on account from customers who have bought merchandise or received services at the end of the year. Accounts receivable are presented as a current asset in the balance sheet, expressed. Expressed in LCUs.	Raw	Water supply and sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W191	Accounts receivable, end of the year (US$)	Amounts due the utility on account from customers who have bought merchandise or received services at the end of the year. Accounts receivable are presented as a current asset in the balance sheet, expressed. Expressed in US$.	Derived	Water supply and sanitation	[z191 / x003]
	W180	Billing cycle, water (days)	Frequency of water bills issued to customers.	Raw	Water supply	
	W180d	Billing cycle, water (days)	National average of frequency of water bills issued to customers.	Derived	Water supply	average(w180, across utilities)
	z106	Billing for water and wastewater (LCU per year)	Total billed amounts to residential and nonresidential customers (for example, industrial, commercial, and government) during year for water and wastewater services;– include fixed and volumetric charges only, expressed in local currency.	Raw	Water supply and sanitation	
	W106	Billing for water and wastewater (US$ per year)	Total billed amounts to residential and nonresidential customers (for example, industrial, commercial, and government) during year for water and wastewater services;– include fixed and volumetric charges only, expressed in US$.	Derived	Water supply and sanitation	[z106 /x003]
	W108	Billing for water and wastewater, government entities (% of billing)	Percentage of total billings for water and wastewater billed to government.	Derived	Water supply and sanitation	[w107 x 100] / [w106]
	W108d	Billing for water and wastewater, government entities (% of billing)	National average of percentage of total billings for water and wastewater billed to government.	Derived	Water supply and sanitation	w-average(w108, w231, across utilities)
	z107	Billing for water and wastewater, government entities (LCU per year)	Total billings during year for water and wastewater billed to government, expressed in local currency.	Raw	Water supply and sanitation	
	W107	Billing for water and wastewater, government entities (US$ per year)	Total billings during year for water and wastewater billed to government, expressed in US$.	Derived	Water supply and sanitation	[z107 / x003]
	w213	Billing for water and wastewater, industrial and commercial customers (% of billing)	Percentage of total billings for water and wastewater billed to industrial and commercial consumers.	Derived	Water supply and sanitation	[w208 x 100 / w106]
	w213d	Billing for water and wastewater, industrial and commercial customers (% of billing)	National average of percentage of total billings for water and wastewater billed to industrial and commercial consumers.	Derived	Water supply and sanitation	w-average(w208, w231, across utilities)
	z208	Billing for water and wastewater, industrial and commercial customers (LCU per year)	Total billings during year for water and wastewater billed to industrial and commercial customers, expressed in LCUs.	Raw	Water supply	
	W208	Billing for water and wastewater, industrial and commercial customers (US$ per year)	Total billings during year for water and wastewater billed to industrial and commercial customers, expressed in US$.	Derived	Water supply	[z208 / x003]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	w216	Billing for water and wastewater, residential customers (% of billing)	Percentage of total billings for water and wastewater billed to residential consumers.	Derived	Water supply and sanitation	[w203 x 100 / w106]
	w216d	Billing for water and wastewater, residential customers (% of billing)	National average of percentage of total billings for water and wastewater billed to residential consumers.	Derived	Water supply and sanitation	w-average(w216, w231, across utilities)
	z203	Billing for water and wastewater, residential customers(LCU per year)	Total billings during year for water and wastewater billed to residential customers, expressed in local currency.	Raw	Water supply	
	W203	Billing for water and wastewater, residential customers(US$ per year)	Total billings during year for water and wastewater billed to residential customers, expressed in US$.	Derived	Water supply	[z203 / x003]
	W110	Collection period (days)	Frequency of water bills issued to customers.	Derived	Water supply	[w191 x 365] / [w186 x w173]
	W110d	Collection period (days)	National average of frequency of water bills issued to customers.	Derived	Water supply	average(w110, across utilities)
	W111	Collection ratio (% of total billings)	Percentage of total billings for water and wastewater that are recovered by total water and wastewater operating revenues.	Derived	Water supply and sanitation	[(w186 + w173) x 100] / [w106]
	W111d	Collection ratio (% of total billings)	National average of percentage of total billings for water and wastewater that are recovered by total water and wastewater operating revenues.	Derived	Water supply and sanitation	w-average(w111, w231, across utilities)
	z172	Connection charge, wastewater (LCU per connection)	Average connection charge for wastewater/ sewerage, expressed in LCUs.	Raw	Sanitation	
	W172	Connection charge, wastewater (US$ per connection)	Average connection charge for wastewater/ sewerage, expressed in US$.	Derived	Sanitation	[z172 / x003]
	W172d	Connection charge, wastewater (US$ per connection)	National average of connection charge for wastewater/sewerage, expressed in US$.	Derived	Sanitation	average(w172, across utilities)
	z181	Connection charge, water (LCU per connection)	Average connection charge for water, expressed in LCUs.	Raw	Water supply	
	W181	Connection charge, water (US$ per connection)	Average connection charge for water, expressed in US$.	Derived	Water supply	[z181 / x003]
	W181d	Connection charge, water (US$ per connection)	National average of connection charge for water, expressed in US$.	Derived	Water supply	average(w181, across utilities)
	z114	Cost of PVC pipe (LCU per linear meter)	Cost of purchasing a meter of PVC (plastic) water distribution pipe of half an inch (or 10mm) in diameter, expressed in LCUs.	Raw	Water supply	
	W114	Cost of PVC pipe (US$ per linear meter)	Cost of purchasing a meter of PVC (plastic) water distribution pipe of half an inch (or 10mm) in diameter, expressed in US$.	Derived	Water supply	[z114 / x003]
	W114d	Cost of PVC pipe (US$ per linear meter)	National average of the cost of purchasing a meter of PVC (plastic) water distribution pipe of half an inch (or 10 mm) in diameter, expressed in US$.	Derived	Water supply	w-average(w114, w152, across utilities)

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W302	Cost recovery, operational (%)	Percentage of operating cost that is recovered by operational revenue.	Derived	Water supply and sanitation	[(w186 + w173) x 100] / [w141]
	W302d	Cost recovery, operational (%)	National average of the percentage of operating cost that are recovered by operational revenue.	Derived	Water supply and sanitation	w-average(w302, w231, across utilities)
	z116	Costs, debt service (LCU per year)	Total annual debt service, expressed in LCUs.	Raw	Water supply and sanitation	
	W116	Costs, debt service (US$ per year)	Total annual debt service, expressed in US$.	Derived	Water supply and sanitation	[z116 / x003]
	W117	Costs, debt service ratio (ratio)	Ratio of debt service payments (principal and interest) to total operational costs.	Derived	Water supply and sanitation	[w186 x w173] / [w116]
	W117d	Costs, debt service ratio (ratio)	National average of the ratio of debt service payments (principal and interest) to total operational costs.	Derived	Water supply and sanitation	w-average(w117, w231, across utilities)
	W156	Costs, energy (% of operational cost)	Percentage of total operational costs that are energy costs.	Derived	Water supply and sanitation	[w120 x 100] / [w141]
	W156d	Costs, energy (% of operational cost)	National average of percentage of total operational costs that are energy costs.	Derived	Water supply and sanitation	w-average(w156, w231, across utilities)
	W129	Costs, labor (% of operational cost)	Percentage of total operational costs that are labor costs.	Derived	Water supply and sanitation	[w130 x 100] / [w141]
	W129d	Costs, labor (% of operational cost)	National average of percentage of total operational costs that are labor costs.	Derived	Water supply and sanitation	w-average(w129, w231, across utilities)
	z130	Costs, labor (LCU per year)	Total annual labor costs, including benefits, expressed in LCUs.	Raw	Water supply and sanitation	
	W130	Costs, labor (US$ per year)	Total annual labor costs, including benefits, expressed in US$.	Derived	Water supply and sanitation	[z130 / x003]
	z141	Costs, operational (LCU per year)	Total annual operational expenses, excluding depreciation and debt service, expressed in LCUs.	Raw	Water supply and sanitation	
	W141	Costs, operational (US$ per year)	Total annual operational expenses, excluding depreciation and debt service, expressed in US$.	Derived	Water supply and sanitation	[z141 / x002]
	W140	Costs, operational per water consumed (US$ per m3)	Total annual operational expenses per cubic meter, excluding depreciation and debt service, expressed in US$.	Derived	Water supply	[w141] / [w182]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W140d	Costs, operational per water consumed (US$ per m3)	National average of total annual operational expenses per cubic meter, excluding depreciation and debt service, expressed in US$.	Derived	Water supply	w-average(w140, w231, across utilities)
	W115	Costs, services contracted out (% of operational cost)	Percentage of total operational costs that are costs of services contracted out.	Derived	Water supply and sanitation	[w166 x 100] / [w141]
	W115d	Costs, services contracted out (% of operational cost)	National average of percentage of total operational costs that are costs of services contracted out.	Derived	Water supply and sanitation	w-average(w115, w231, across utilities)
	z166	Costs, services contracted out (LCU per year)	Total annual value of services contracted out, expressed in LCUs.	Raw	Water supply and sanitation	
	W166	Costs, services contracted out (US$ per year)	Total annual value of services contracted out, expressed in US$.	Derived	Water supply and sanitation	[z166 / x003]
	W121	Employees, full-time (number)	Total number of full time equivalent employees for water and wastewater services.	Raw	Water supply and sanitation	
	z167	Gross fixed assets, wastewater— -book value (LCU)	Book value of wastewater gross fixed assets, expressed in LCUs.	Raw	Sanitation	
	W167	Gross fixed assets, wastewater— -book value (US$)	Book value of wastewater gross fixed assets, expressed in US$.	Derived	Sanitation	[z167 / x003]
	z109	Gross fixed assets, water and wastewater— -book value (LCU)	Book value of water and wastewater gross fixed assets, expressed in LCUs.	Raw	Water supply	
	W109	Gross fixed assets, water and wastewater— -book value (US$)	Book value of water and wastewater gross fixed assets, expressed in US$.	Derived	Water supply	[z109 / x003]
	z168	Gross fixed assets, water— -book value (LCU)	Book value of water supply gross fixed assets, expressed in LCUs.	Raw	Water supply	
	W169	Gross fixed assets, water— -book value (US$ per connection)	Book value of water supply gross fixed assets per connection, expressed in US$.	Derived	Water supply	[w168] / [w152 + w136 + w124]
	W168	Gross fixed assets, water— -book value (US$)	Book value of water supply gross fixed assets, expressed in US$.	Derived	Water supply	[z168 / x003]
	W900	Hidden costs, losses (% of GDP)	Value of the distributional losses incurred by the utility, expressed as percentage of country's GDP.	Derived	Water supply and sanitation	[w904-d X 100] / [x002]
	W901	Hidden costs, losses (% of revenue)	Value of the distributional losses incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	[W904 X 100]/[w231]
	W901d	Hidden costs, losses (% of revenue)	National average of the value of the distributional losses incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	w-average[W901, [w231] , across utilities]
	W904	Hidden costs, losses (US$)	Value of the distributional losses incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	if {[w137-y007] X W188 X (W140 +Y006)}>=0 then {[w137-y007] X W188 X (W140+Y006)} otherwise 0

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W904d	Hidden costs, losses (US$)	National average of the value of the distributional losses incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	sum(w904, across utilities)
	W906	Hidden costs, total (% of GDP)	Value of the utility's inefficiencies (for example, inefficiencies (i.e., distributional losses, undercollection of billings, and underpricing of services) incurred by the utility, expressed as percentage of country's GDP.	Derived	Water supply and sanitation	[w915 + w910 + w900]
	W907	Hidden costs, total (% of revenue)	Value of the utility's inefficiencies (for example, inefficiencies (i.e., distributional losses, undercollection of billings, and underpricing of services) incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	[w916 + w911 + w901]
	W908	Hidden costs, total (% of revenue)	National average of the value of the utility's inefficiencies (i.e., distributional losses, undercollection of billings, and underpricing of services) incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	[w916-d + w911-d + w901-d]
	W909	Hidden costs, total (US$)	Value of the utility's inefficiencies (for example, inefficiencies (i.e., distributional losses, undercollection of billings, and underpricing of services) incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	[W904 +W913+W918]
	W909d	Hidden costs, total (US$)	National average of the value of the utility's inefficiencies (i.e., distributional losses, undercollection of billings, and underpricing of services) incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	[w904-d + w918-d + w913-d }
	W910	Hidden costs, undercollection (% of GDP)	Value of the undercollection of billings incurred by the utility, expressed as percentage of country's GDP.	Derived	Water supply and sanitation	[W913-d X 100] /x002
	W911	Hidden costs, undercollection (% of revenue)	Value of the undercollection of billings incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	[W913 X 100] / [w231]
	W911d	Hidden costs, undercollection (% of revenue)	National average of the value of the undercollection of billings incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	w-average[W911,[w231], across utilities]
	W913	Hidden costs, undercollection (US$)	Value of the undercollection of billings incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	if [(100 – W111) X W179 X w300]>0 then [(100 – W111) X W179 X w300] otherwise 0
	W913d	Hidden costs, undercollection (US$)	National average of the value of the undercollection of billings incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	sum [W913, across utilities]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W915	Hidden costs, underpricing (% of GDP)	Value of the underpricing of services incurred by the utility, expressed as percentage of country's GDP.	Derived	Water supply and sanitation	[w918-d X 100] /x002
	W916	Hidden costs, underpricing (% of revenue)	Value of the underpricing of services incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	[W918 X 100] / [w231]
	W916d	Hidden costs, underpricing (% of revenue)	National average of the value of the underpricing of services incurred by the utility, expressed as percentage of utility's revenues.	Derived	Water supply and sanitation	sum [W916, across utilities]
	W918	Hidden costs, underpricing (US$)	Value of the underpricing of services incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	IF [(W140 + y006 – w300) X W179]>0 THEN [(W140 + y006 – w300) X W179] OTHERWISE 0
	W918d	Hidden costs, underpricing (US$)	National average of the value of the underpricing of services incurred by the utility, expressed in US$.	Derived	Water supply and sanitation	w-average[W918 ,[w231], across utilities]
	W105	Revenue per wastewater collected (US$ per m3)	Total wastewater operating revenues per cubic meter collected, expressed in US$.	Derived	Sanitation	[w173] / [w175 + w176]
	W105d	Revenue per wastewater collected (US$ per m3)	National average of the total wastewater operating revenues per cubic meter collected, expressed in US$.	Derived	Sanitation	w-average(w105, w231, across utilities)
	W154	Revenue per wastewater connection (US$ per connection per month)	Total wastewater operating revenues per wastewater connection, expressed in US$.	Derived	Sanitation	[w173] / [(w151 + w135) X 12]
	W154d	Revenue per wastewater connection (US$ per connection per month)	National average of the total wastewater operating revenues per wastewater connection, expressed in US$.	Derived	Sanitation	w-average(w154, w231, across utilities)
	W155	Revenue per water connection (US$ per connection per month)	Total water operating revenues per water connection, expressed in US$.	Derived	Water supply	[w186] / [(w152 + w136 + w124) X 12]
	W155d	Revenue per water connection (US$ per connection per month)	National average of the total water operating revenues per water connection, expressed in US$.	Derived	Water supply	w-average(w155, w231, across utilities)
	W153	Revenue per water consumed (US$ per m3)	Total water operating revenues per cubic meter, expressed in US$.	Derived	Water supply	[w186] / [W182]
	W153d	Revenue per water consumed (US$ per m3)	National average of the total water operating revenues per cubic meter, expressed in US$.	Derived	Water supply	w-average(w153, w231, across utilities)
	z173	Revenue, wastewater (LCU per year)	Total wastewater operating revenues, expressed in LCU.	Derived	Sanitation	[z 231 – z186]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Financial	W173	Revenue, wastewater (US$ per year)	Total wastewater operating revenues, expressed in US$.	Derived	Sanitation	[z173 / x003]
	z186	Revenue, water (LCU per year)	Total water operating revenues, expressed in LCU.	Raw	Water supply	
	W186	Revenue, water (US$ per year)	Total water operating revenues, expressed in US$.	Derived	Water supply	[z186 / x003]
	z231	Revenue, water and wastewater (LCU per year)	Total water and wastewater operating revenues expressed in LCU	Raw	Water supply and sanitation	
	W231	Revenue, water and wastewater (US$ per year)	Total water and wastewater operating revenues, expressed in US$.	Derived	Water supply and sanitation	[z231 / x003]
	W201	Revenue, water nonresidential (% of total revenue)	Percentage of total revenue coming from nonresidential customers (i.e., industrial, commercial, government).	Derived	Water supply	[w208 X 100] / [w186]
	W199	Revenue, water residential (% of total revenue)	Percentage of total revenue coming from residential customers.	Derived	Water supply	[w203 X 100] / [w186]
	W170	Wastewater billed and collected (m3 per year)	Volume of wastewater billed for which bills are collected.	Raw	Sanitation	
	W179	Water billed and collected (m3 per year)	Volume of water billed (sold/consumed) for which bills are collected.	Raw	Water supply	
Pricing	W215d	Fixed charge, wastewater (US$ per month)	National average of monthly charge in the bill that does not vary with wastewater collected volume, expressed in US$.	Derived	Sanitation	average(w215, across utilities)
	W214d	Fixed charge, water (US$ per month)	National average of monthly charge in the bill that does not vary with water consumption volume, expressed in US$.	Derived	Water supply	average(w214, across utilities)
	W304d	Tariff, average effective wastewater (US cents per m3)	National average of the effective price per cubic meter of wastewater collected, expressed in US cents.	Derived	Sanitation	average(w304, across utilities)
	W300d	Tariff, average effective water (US$ per m3)	National average of the effective price per cubic meter of water consumed, expressed in US cents.	Derived	Water supply	average(w300, across utilities)
	z215	Fixed charge, wastewater (LCU per month)	Monthly charge in the bill that does not vary with wastewater collected volume, expressed in LCU.	Raw	Sanitation	
	W215	Fixed charge, wastewater (US$ per month)	Monthly charge in the bill that does not vary with wastewater collected volume, expressed in US$.	Derived	Sanitation	[z215 / x003]
	z214	Fixed charge, water (LCU per month)	Monthly charge in the bill that does not vary with water consumption volume, expressed in LCU.	Raw	Water supply	
	W214	Fixed charge, water (US$ per month)	Monthly charge in the bill that does not vary with water consumption volume, expressed in US$.	Derived	Water supply	[z214 / x003]
	W304	Tariff, average effective wastewater (US cents per m3)	Effective price per cubic meter of wastewater collected, expressed in US cents.	Derived	Sanitation	[z304 / x003]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Pricing	z304	Tariff, average effective wastewater residential (LCU cents per m3)	Effective price per cubic meter of wastewater collected, expressed in LCU.	Raw	Sanitation	
	z300	Tariff, average effective water (LCU per m3)	Effective price per cubic meter of water consumed, expressed in LCU.	Raw	Water supply	
	W300	Tariff, average effective water (US$ per m3)	Effective price per cubic meter of water consumed, expressed in US cents.	Derived	Water supply	[z300 /x003]
Quality	W113d	Continuity of water service (hours per day)	National average of continuity of service in terms of average number of hours of water supply service..	Derived	Water supply	w-average(w113, w188, across utilities)
	W142d	Samples passing chlorine test (%)	Percentage of samples passing test against relevant standard for residual chlorine (%)	Derived	Water supply	average(w142, across utilities)
	W178	Consumer complaints, water and wastewater (number per residential connections)	Annual number of consumer complaints per connection for water and wastewater.	Derived	Water supply and sanitation	[W177] / [w152 + w136 + w124]
	W177	Consumer complaints, water and wastewater (number)	Annual number of consumer complaints for water and wastewater.	Raw	Water supply and sanitation	
	W113	Continuity of water service (hours per day)	Continuity of service in terms of average number of hours of water supply service.	Raw	Water supply	
	W142	Samples passing chlorine test (%)	Percentage of samples passing test against relevant standard for residual chlorine (%).	Raw	Water supply	
	W160	Wastewater receiving primary treatment (%)	Percentage of the total water collected that is subject to primary treatment.	Derived	Sanitation	[w175 x 100] / [w188]
	W161	Wastewater receiving secondary or tertiary treatment (%)	Percentage of the total water collected that is subject to secondary or tertiary treatment.	Derived	Sanitation	[w176 x 100] / [w188]
Technical	W227	Labor productivity, wastewater (connections per employee)	Number of wastewater connections per employee.	Derived	Sanitation	[w151 + w135] / [w121]
	W227d	Labor productivity, wastewater (connections per employee)	National average of the number of wastewater connections per employee.	Derived	Sanitation	average(w227, across utilities)
	W193	Labor productivity, water (connections per employee)	Number of water connections per employee.	Derived	Water supply	[w152 + w136 + w124] / [w121]
	W193d	Labor productivity, water (connections per employee)	National average of the number of water connections per employee.	Derived	Water supply	average(w193, across utilities)
	W133d	Connections with operational meter, water (% of total connections)	National average of percentage of total water connections with operating water meter.	Derived	Water supply	w-average(w133, w188, across utilities)
	W112d	Connections with operational meter, water (number)	Number of total connections with operating water meter at the national level.	Derived	Water supply	sum(w112, across utilities)

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Technical	W195d	Connections, wastewater (number)	Total number of residential and nonresidential (i.e., industrial, commercial, and government) wastewater connections at the national level.	Derived	Sanitation	sum(w195, across utilities)
	W135d	Connections, wastewater nonresidential (number)	Total number of nonresidential (i.e., industrial, commercial, and government) wastewater connections at the national level.	Derived	Sanitation	sum(w135, across utilities)
	W151d	Connections, wastewater residential (number)	Total number of residential wastewater connections at the national level.	Derived	Sanitation	sum(w151, across utilities)
	W194d	Connections, water (number)	Total number of residential and nonresidential (i.e., industrial, commercial, and government) water connections at the national level.	Derived	Water supply	sum(w194, across utilities)
	W136d	Connections, water nonresidential (number)	Total number of nonresidential (i.e., industrial, commercial, and government) water connections at the national level.	Derived	Water supply	sum(w136, across utilities)
	W152d	Connections, water residential (number)	Total number of residential water connections at the national level.	Derived	Water supply	sum(w152, across utilities)
	W137d	Non-revenue water (% of production)	National average of the percentage of the water produced that is not consumed.	Derived	Water supply	w-average(w137, w188, across utilities)
	W174d	Pipe blockages per km of wastewater network (number per km per year)	National average of the annual number of pipe blockages of the wastewater network per km.	Derived	Sanitation	average(w174, across utilities)
	W187d	Pipe breaks per km of water network (number per km per year)	National average of the annual number of pipe breaks in the water distribution mains per km.	Derived	Water supply	average(w187, across utilities)
	W125d	Wastewater collection system, length density, per population (km per 1000 people)	National average of the total length per capita of wastewater collection system in km.	Derived	Sanitation	average(w125, across utilities)
	W126d	Wastewater collection system, per connection (km per 1000 connection)	National average of the total length per capita of wastewater collection system in km.	Derived	Sanitation	average(w126, across utilities)
	W183d	Water consumption per capita (liters per capita per day)	National average of the volume of water consumption per capita per day (i.e., population living in the service area).	Derived	Water supply	average(w183, across utilities)
	W184d	Water consumption per capita served (liters per capita per day)	National average of the volume of water consumption per capita per day (i.e., population served by the utility).	Derived	Water supply	average(w184, across utilities)
	W185d	Water consumption per connection (m3 per connection per month)	National average of the volume of water consumption per connection per month.	Derived	Water supply	average(w185, across utilities)
	W104d	Water consumption, government (%)	National average of the percentage of the total water consumed by government and other institutions.	Derived	Water supply	average [w104, across utilities]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Technical	W128d	Water distribution mains, length density per connection (km per 1000 connection)	National average of the total length per connection of water distribution mains in km.	Derived	Water supply	average(w128, across utilities)
	W127d	Water distribution mains, length density, per population (km per 1000 people)	National average of the total length per capita of water distribution mains in km.	Derived	Water supply	average(w127, across utilities)
	W189d	Water production per capita (liters per capita per day)	National average of the volume of total annual water production per capita for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	average(w189, across utilities)
	W190d	Water production per capita served (liters per capita per day)	National average of the volume of total annual water production per capita served for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	average(w190, across utilities)
	W192d	Water production per connection (m3 per connection per month)	National average of the volume of total annual water production per connection for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	average(w192, across utilities)
	W133	Connections with operational meter, water (% of total connections)	Percentage of total water connections with operating water meter.	Derived	Water supply	[w112 x 100] / [w152 + w136 + w124]
	W112	Connections with operational meter, water (number)	Number of total connections with operating water meter.	Raw	Water supply	
	W195	Connections, wastewater (number)	Total number of residential and nonresidential (i.e., industrial, commercial, and government) wastewater connections.	Raw	Sanitation	
	W135	Connections, wastewater nonresidential (number)	Total number of nonresidential (i.e., industrial, commercial, and government) wastewater connections.	Derived	Sanitation	[W195 – W151]
	W151	Connections, wastewater residential (number)	Total number of residential wastewater connections.	Raw	Sanitation	
	W194	Connections, water (number)	Total number of residential and nonresidential (i.e., industrial, commercial, and government) water connections.	Raw	Water supply	
	W162	Connections, water nonresidential (% of total connections)	Percentage of total water connections that are nonresidential (i.e., industrial, commercial, and government).	Derived	Water supply	[w136] / [w152 + w136 + w124]
	W136	Connections, water nonresidential (number)	Total number of nonresidential (i.e., industrial, commercial, and government) water connections.	Derived	Water supply	[W194 – W152]
	W163	Connections, water residential (% of total connections)	Percentage of total water connections that are residential.	Derived	Water supply	[w152] / [w152 + w136 + w124]
	W152	Connections, water residential (number)	Total number of residential water connections.	Raw	Water supply	
	W159	Connections, water stand posts (% of total connections)	Percentage of total water connections that are stand posts.	Derived	Water supply	[w124] / [w152 + w136 + w124]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Technical	z120	Costs, energy (LCU per year)	Total annual expenditure on energy, expressed in LCU.	Raw	Water supply and sanitation	
	W120	Costs, energy (US$ per year)	Total annual expenditure on energy, expressed in US$.	Derived	Water supply and sanitation	[z120 / x003]
	W118	Efficiency of water consumption in the service area (ratio)	Ratio of water consumption per capita in the service area to water production per capita in the service area.	Derived	Water supply	[w184 x 100] / [w183]
	W157	Households with water connection that have a wastewater connection (%)	Percentage of households with a water connection that have a wastewater connection.	Derived	Sanitation	[w151 x 100] / [w152]
	W137	Non-revenue water (% of production)	Percentage of the water produced that is not consumed.	Derived	Water supply	[w188 – w182] / [w188]
	W138	Non-revenue water (m3 per year)	Nonrevenue water is water that has been produced and is not consumed (m3/year).	Raw	Water supply	
	W174	Pipe blockages per km of wastewater network (number per km per year)	Annual number of pipe blockages of the wastewater network per km.	Derived	Sanitation	[w143] / [w131]
	W143	Pipe blockages, wastewater (number per year)	Annual number of pipe blockages of the wastewater network.	Raw	Sanitation	
	W187	Pipe breaks per km of water network (number per km per year)	Annual number of pipe breaks in the water distribution mains per km.	Derived	Water supply	[w144] / [w132]
	W144	Pipe breaks, water (number per year)	Annual number of pipe breaks in the water distribution mains.	Raw	Water supply	
	W158	Stand posts providing utility water, functioning (% of total stand posts)	Percentage of total stand posts providing utility water that are functioning.	Derived	Water supply	[w122 x 100] / [w124]
	W165	Treated water (m3 per year)	Annual volume of total cubic meters of water production that is subject to treatment.	Raw	Sanitation	
	W171	Wastewater collected as a share of water consumed (%)	Percentage of the total water consumed that is collected.	Derived	Water supply	[w151 + w135] / [w152 + w136 + w124]
	W164	Wastewater collected in service area subject to any level of treatment (%)	Percentage of the total water collected that is subject to any level of treatment.	Derived	Water supply	[(w175 + w176) x 100] / [w182 X 0.8]
	W131	Wastewater collection system, length (kms)	Total length of wastewater collection system in km.	Raw	Sanitation	
	W126	Wastewater collection system, length density, per connection (km per 1000 connection)	Total length per connection of wastewater collection system in km.	Derived	Sanitation	[w131 x 1000] / [w151 + w135]
	W125	Wastewater collection system, length density, per population (km per 1000 people)	Total length per capita of wastewater collection system in km.	Derived	Sanitation	[w131 x 1000] / [w150]
	W175	Wastewater receiving primary treatment (m3 per year)	Annual volume of wastewater receiving primary treatment.	Raw	Sanitation	

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Technical	W176	Wastewater receiving secondary or tertiary treatment (m3 per year)	Volume of wastewater receiving secondary or tertiary treatment.	Raw	Sanitation	
	W212	Wastewater treatment plants, functioning (number)	Total number of functioning treatment plants.	Raw	Sanitation	
	W211	Wastewater treatment plants, installed (number)	Total number of installed treatment plants.	Raw	Sanitation	
	W134	Wastewater treatment plants, non-functioning (% of treatment plants)	Percentage of wastewater treatment plants that are nonfunctional.	Derived	Sanitation	[w212 X 100] / [w211]
	W182	Water consumption (m3 per year)	Volume of total annual water consumption by residential and nonresidential customers (i.e., industrial, commercial, and government).	Raw	Water supply	
	W183	Water consumption per capita (liters per capita per day)	Volume of water consumption per capita per day (i.e., population living in the service area).	Derived	Water supply	[w182 X 1000] / [w150 x 365]
	W184	Water consumption per capita served (liters per capita per day)	Volume of water consumption per capita served per day (i.e., population served by the utility).	Derived	Water supply	[w182 X 1000] / [w197 x 365]
	W185	Water consumption per connection (m3 per connection per month)	Volume of water consumption per connection per month.	Derived	Water supply	[w182] / [(w152 + w136 + w124) X 12]
	W104	Water consumption, government (%)	Percentage of the total water consumption accounted for by government and other institutions.	Derived	Water supply	[w104 X 100] / [w182]
	W145	Water consumption, government (m3 per year)	Volume of total annual water consumption by government and other institutions.	Derived	Water supply	[W182 – W220-W221]
	W198	Water consumption, residential (%)	Percentage of the total water consumed by residential customers.	Derived	Water supply	[w220 X 100] / [w182]
	W220	Water consumption, residential (m3 per year)	Volume of total annual water consumption by residential customers.	Raw	Water supply	
	W200	Water consumption, industrial and commercial (%)	Percentage of the total consumption by industrial and commercial customers (% of total consumption).	Derived	Water supply	[w221 X 100] / [w182]
	W221	Water consumption, industrial and commercial (m3 per year)	Volume of total annual water consumption by industrial and commercial customers.	Raw	Water supply	
	W132	Water distribution mains, length (kms)	Total length of water distribution mains in km.	Raw	Water supply	
	W128	Water distribution mains, length density per connection (km per 1000 connection)	Total length per connection of water distribution mains in km.	Derived	Water supply	[w132 x 1000] / [w152 + w136]
	W127	Water distribution mains, length density, per population (km per 1000 people)	Total length per capita of water distribution mains in km.	Derived	Water supply	[w132 x 1000] / [w150]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Technical	W188	Water production (m3 per year)	Volume of total annual water production for residential and nonresidential (i.e., industrial, commercial, and government) use.	Raw	Water supply	
	W189	Water production per capita (liters per capita per day)	Volume of total annual water production per capita for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	[w188 X 1000] / [w150 x 365]
	W190	Water production per capita served (liters per capita per day)	Volume of total annual water production per capita served for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	[w188 X 1000] / [w197 x 365]
	W192	Water production per connection (m3 per connection per month)	Volume of total annual water production per connection for residential and nonresidential (i.e., industrial, commercial, and government) use.	Derived	Water supply	[w188] / [(w152 + w136 + w124) X 12]
Institutional	W724	Reform: Decentralization, accountability level for sanitation provision (0= Central, 1= otherwise)	Positively score a sanitation sector where the level of government responsible for sanitation is not the central government.	Derived	Sanitation	[if (w723=0) then "0"; otherwise="1"]
	W723	Reform: Decentralization, accountability level for sanitation provision (0=Central, 1=Regional, 2=Local/Municipal)	Categorical value between 0 and 2 that characterizes the level of government responsible for sanitation supply.	Raw	Sanitation	nap
	W725	Reform: Decentralization, decentralization rural water (1=yes, 0=no)	Positively score a water sector where rural water provision has been decentralized to states and municipalities.	Raw	Water supply	nap
	W722	Reform: Decentralization, decentralization water (1=yes, 0=no)	Positively score a water sector where urban water provision has been decentralized to states and municipalities.	Raw	Water supply	nap
	W712	Reform: Legislation, hygiene promotion program (1=yes, 0=no)	Positively score a sanitation sector where there is an approved hygiene promotion program.	Raw	Sanitation	nap
	W710	Reform: Legislation, rural water policy (1=yes, 0=no)	Positively score a water sector where there is an approved rural water sector strategy.	Raw	Water supply	nap
	W711	Reform: Legislation, sanitation policy (1=yes, 0=no)	Positively score a sanitation sector where there is an approved sanitation sector strategy.	Raw	Sanitation	nap
	W709	Reform: Legislation, water policy (1=yes, 0=no)	Positively score a water sector where there is an approved water sector strategy	Raw	Water supply	nap
	W728	Reform: Market Structure, community providers rural water (1=yes, 0=no)	Positively score a water sector where community based service providers have any significant responsibilities in provision of rural water	Raw	Water supply	nap
	W729	Reform: Market Structure, community providers sanitation (1=yes, 0=no)	Positively score a sanitation sector where community based service providers have any significant responsibilities in provision of sanitation.	Raw	Sanitation	nap

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	W730	Reform: Market Structure, household providers sanitation (1=yes, 0=no)	Positively score a sanitation sector where households have any significant responsibilities in provision of sanitation.	Raw	Sanitation	nap
	W726	Reform: Market Structure, separation of water and electricity (1=yes, 0=no)	Positively scores a water sector where the provision of water and power is delivered by two or more different operators.	Raw	Water supply	nap
	W727	Reform: Market Structure, separation of water and wastewater services (1=yes, 0=no)	Positively scores a water sector where the provision of water and wastewater services is delivered by two or more different operators	Raw	Water supply and sanitation	nap
	W721	Reform: Policy oversight, accountability level for water provision (0= central, 1= otherwise)	Positively score a water sector where the level of government responsible for water provision is not the central government.	Derived	Water supply	[if (w720=0) then "0"; otherwise="1"]
	W720	Reform: Policy oversight, accountability level for water provision (0=central, 1=regional, 2=local/municipal)	Categorical value between 0 and 2 that characterizes the level of government responsible for water provision.	Raw	Water supply	nap
	W719	Reform: Policy oversight, monitoring water quality (0=line ministry, 1= otherwise)	Positively score a water sector where the agency that monitors water quality standards is an arm's length from the line ministry.	Derived	Water supply	[if (w718=0) then "0"; otherwise="1"]
	W718	Reform: Policy oversight, monitoring water quality (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)	Categorical value between 0 and 3 that characterizes the agency that monitors water quality standards.	Raw	Water supply	nap
	W715	Reform: Policy oversight, oversight of customer service (0=line ministry, 1= otherwise)	Positively score a water and sanitation sector where the agency that oversees customer service regulations is different from the line ministry.	Derived	Water supply and sanitation	[if (w714=0) then "0"; otherwise="1"]
	W714	Reform: Policy oversight, oversight of customer service (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)	Categorical value between 0 and 3 that characterizes the agency that oversights customer service regulations.	Raw	Water supply and sanitation	nap
	W717	Reform: Policy oversight, setting of water quality standards (0=line ministry, 1= otherwise)	Positively score a water sector where the agency that sets water quality standards is at an arm's length from line ministry.	Derived	Water supply	[if (w716=0) then "0"; otherwise="1"]
	W716	Reform: Policy oversight, setting of water quality standards (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)	Categorical value between 0 and 3 that characterizes the agency that sets water quality standards.	Raw	Water supply	nap

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	W768	Reform: WSS Decentralization, subindex (base 100)	Index that ranks whether the water and sanitation sector has decentralized. This implicitly assumes that is a desirable institutional objective. A score of 100 indicates the water and sanitation sector is fully decentralized.	Derived	Water supply and sanitation	average [w722, w724, w725] x 100
	W766	Reform: WSS Legislation, subindex (base 100)	Index that ranks whether a water and sanitation sector is able to recover some of the costs of providing the service (i.e., is only in need of partial subsidization). A score of 100 indicates reasonable cost recovery.	Derived	Water supply and sanitation	average [w709:w712] x 100
	W769	Reform: WSS Market structure, subindex (base 100)	Index that ranks whether the water and sanitation sector has competition. This implicitly assumes that competition is a desirable institutional objective. A score of 100 indicates the water and sanitation sector is largely competitive.	Derived	Water supply and sanitation	average [w726: w730] x 100
	W767	Reform: WSS Policy oversight, subindex (base 100)	Index that ranks whether the water and sanitation sector is able to provide reasonable oversight over quality of water and customer services. A score of 100 indicates the water and sanitation sector is largely competitive.	Derived	Water supply and sanitation	average[w715, w717, w719, w721] x 100
	W775	Regulation, WSS index (base 100)	Specific index for the regulation of the water supply and sanitation sector (base 100).	Derived	Water supply and sanitation	average [w771: w774] x 100
	W731	Regulation: Autonomy, regulatory body vulnerability to donors (Percent)	Percentage of water budget funded by donors.	Raw	Water supply and sanitation	nap
	W750	Regulation: Cost recovery, full recovery -on site sanitation (0=no, 1=yes)	Positively score a sanitation sector where there is effective full cost recovery of total costs incurred in the provision of on-site sanitation.	Derived	Sanitation	[if (w749 =”3”) then “1”; otherwise=”0”]
	W756	Regulation: Cost recovery, full recovery -rural water (0=no, 1=yes)	Positively score a water sector where there is effective full cost recovery of total costs incurred in the provision of rural water supply services.	Derived	Water supply	[if (w755 =”3”) then “1”; otherwise=”0”]
	W744	Regulation: Cost recovery, full recovery -wastewater (0=no, 1=yes)	Positively score a sanitation sector where there is effective full cost recovery of total costs incurred in the provision of wastewater services.	Derived	Sanitation	[if (w743 =”3”) then “1”; otherwise=”0”]
	W738	Regulation: Cost recovery, full recovery -water (0=no, 1=yes)	Positively score a water sector where there is effective full cost recovery of total costs incurred in the provision of water supply services.	Derived	Water supply	[if (w737 =”3”) then “1”; otherwise=”0”]
	W749	Regulation: Cost recovery, on site sanitation (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)	Positively score a sanitation sector where there is some type of cost recovery achieved in the provision of on-site sanitation services (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy).	Raw	Sanitation	nap

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	W748	Regulation: Cost recovery, required -on site sanitation (0=no, 1=yes)	Positively score a sanitation sector where cost recovery policy included in the regulation for on-site sanitation.	Raw	Sanitation	nap
	W754	Regulation: Cost recovery, required -rural water (0=no, 1=yes)	Positively score a water sector where cost recovery policy included in the regulation for rural water.	Raw	Water supply	nap
	W742	Regulation: Cost recovery, required -wastewater (0=no, 1=yes)	Positively score a sanitation sector where cost recovery policy included in the regulation for provision of waste sanitation services.	Raw	Sanitation	nap
	W736	Regulation: Cost recovery, required -water supply (0=no, 1=yes)	Positively score a water sector where cost recovery policy is included in the regulation for water supply provision.	Raw	Water supply	nap
	W755	Regulation: Cost recovery, rural water (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)	Categorical value between 0 and 3 that characterizes the policy on cost recovery for rural water services.	Raw	Water supply	nap
	W743	Regulation: Cost recovery, wastewater (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)	Categorical value between 0 and 3 that characterizes the policy on cost recovery for wastewater services in rural areas.	Raw	Sanitation	nap
	W737	Regulation: Cost recovery, water (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)	Categorical value between 0 and 2 that characterizes the policy on cost recovery for water services in rural areas.	Raw	Water supply	nap
	W762	Regulation: Environmental, dump site for sanitation disposal (1=yes, 0=no)	Positively scores if a sanitation sector has provisions for specified dump site for sanitary disposal of sludge from on-site sanitation.	Raw	Sanitation	nap
	W763	Regulation: Environmental, existence of regulation of dump site for sanitation disposal (1=yes, 0=no)	Positively score a water sector where there is regulation of the dump site.	Raw	Water supply and sanitation	nap
	W765	Regulation: Environmental, flooding (1=yes, 0=no)	Positively score a water and sanitation sector where there is no significant problem in flooding and/or erosion.	Raw	Water supply and sanitation	nap
	W761	Regulation: Environmental, lack of contamination of ground water from latrines (1=yes, 0=no)	Positively score a sanitation sector where lack of contamination of ground sanitation from latrines (it is not a problem).	Raw	Sanitation	nap
	W764	Regulation: Environmental, prevalence of storm water drainage (1=yes, 0=no)	Positively score a water and sanitation sector where there is extensive prevalence of storm water drainage system in the urban areas.	Raw	Water supply and sanitation	nap
	W752	Regulation: Full capital subsidy, on site sanitation (0=no, 1=yes)	Positively score a sanitation sector where full capital subsidy given for on-site sanitation services (0=no, 1=yes).	Derived	Sanitation	[if (w749 ="1") then "1"; otherwise="0"]

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	W758	Regulation: Full capital subsidy, rural water (0=no, 1=yes)	Positively score a water sector where full capital subsidy given for rural water services (0=no, 1=yes)	Derived	Water supply	[if (w755 =”1”) then “1”; otherwise=”0”]
	W746	Regulation: Full capital subsidy, wastewater (0=no, 1=yes)	Positively score a sanitation sector where full capital subsidy given for waste sanitation services (0=no, 1=yes)	Derived	Sanitation	[if (w743 =”1”) then “1”; otherwise=”0”]
	W740	Regulation: Full capital subsidy, water (0=no, 1=yes)	Positively score a water sector where full capital subsidy given for water supply services (0=no, 1=yes).	Derived	Water supply	[if (w737 =”1”) then “1”; otherwise=”0”]
	W751	Regulation: Full subsidy, on site sanitation (0=no, 1=yes)	Positively score a sanitation sector where full subsidy (i.e., capital and operational costs) given for on-site sanitation services (0=no, 1=yes).	Derived	Sanitation	[if (w749 =”0”) then “1”; otherwise=”0”]
	W757	Regulation: Full subsidy, rural water (0=no, 1=yes)	Positively score a water sector where full subsidy (i.e., capital and operational costs) given for rural water services (0=no, 1=yes).	Derived	Water supply	[if (w755 =”0”) then “1”; otherwise=”0”]
	W745	Regulation: Full subsidy, wastewater (0=no, 1=yes)	Positively score a sanitation sector where full subsidy (i.e., capital and operational costs) given for waste sanitation services (0=no, 1=yes).	Derived	Sanitation	[if (w743 =”0”) then “1”; otherwise=”0”]
	W739	Regulation: Full subsidy, water (0=no, 1=yes)	Positively score a water sector where full subsidy (i.e., capital and operational costs) given for water supply services (0=no, 1=yes).	Derived	Water supply	[if (w737 =”0”) then “1”; otherwise=”0”]
	W753	Regulation: Partial capital subsidy, on site sanitation (0=no, 1=yes)	Positively score a sanitation sector where partial capital subsidy given for on-site sanitation services.	Derived	Sanitation	[if (w749 =”2”) then “1”; otherwise=”0”]
	W759	Regulation: Partial capital subsidy, rural water (0=no, 1=yes)	Positively score a water sector where partial capital subsidy given for rural water services.	Derived	Water supply	[if (w755 =”2”) then “1”; otherwise=”0”]
	W747	Regulation: Partial capital subsidy, wastewater (0=no, 1=yes)	Positively score a sanitation sector where partial capital subsidy given for wastewater services.	Derived	Sanitation	[if (w743 =”2”) then “1”; otherwise=”0”]
	W741	Regulation: Partial capital subsidy, water (0=no, 1=yes)	Positively score a water sector where partial capital subsidy given for water supply services.	Derived	Water supply	[if (w737 =”2”) then “1”; otherwise=”0”]
	W732	Regulation: Social Accountability, consumers membership in regulatory body (1=yes, 0=no)	Positively score a water and sanitation sector where consumer associations have membership in the regulatory body.	Raw	Water supply and sanitation	nap
	W733	Regulation: Social Accountability, consumers right of appeal (1=yes, 0=no)	Positively score a water and sanitation sector where consumer associations have right to appeal regulatory decisions.	Raw	Water supply and sanitation	nap
	W734	Regulation: Social Accountability, consumers right of comment regulation (1=yes, 0=no)	Positively score a water and sanitation sector where consumer associations have rights to comments draft regulations.	Raw	Water supply and sanitation	nap

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	W735	Regulation: Social Accountability, consumers right of review tariffs (1=yes, 0=no)	Positively score a water and sanitation sector where consumer associations have rights to review tariff proposals.	Raw	Water supply and sanitation	nap
	W760	Regulation: Universal Service, funded by rural water community (%)	Percentage of rural water fund funded by community contributions.	Raw	Water supply	nap
	W773	Regulation: WSS Cost recovery, subindex (base 100)	Index that ranks whether a water and sanitation sector is able to have cost recovery. A score of 100 indicates cost recovery.	Derived	Water supply and sanitation	average [w736, w738, w742, w744, w748, w750, w754, w756] x100
	W774	Regulation: WSS Environmental, subindex (base 100)	Index that ranks whether the water and sanitation sector have been able to incorporate environmental factors in their policies -- A score of 100 indicates that environmental considerations have been set in place	Derived	Water supply and sanitation	average [w760: w765] x 100
	W771	Regulation: WSS Financial autonomy, subindex (base 100)	Index that ranks how autonomous a water and sanitation sector is from central government and donors transfers and funding. A score of 100 indicates mostly autonomous.	Derived	Water supply and sanitation	[if (w731 > 90%), then "100"; otherwise= "0"]
	W772	Regulation: WSS Social Accountability, subindex (base 100)	Index that ranks whether the water and sanitation sector considers and promotes the participation of customers in the regulatory body. A score of 100 indicates the water and sanitation sector has developed social accountability.	Derived	Water supply and sanitation	average [w732: w7365] x 100
	GOV012	Governance: Accounting and Disclosure and Performance Monitoring: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to account, monitor, and disclose key performance indicators. A score of 100 indicates key mechanisms are in place.	Derived		See Chapter 4: Institutions
	GOV009	Governance: Capital Market Discipline: Subindex Sector (base 100)	Index that ranks how intense capital discipline is established for operators through various capital market mechanisms within a sector. A score of 100 indicates the capital market discipline is in place.	Derived		See Chapter 4: Institutions
	GOV008	Governance: General index Sector (base 100)	Index that ranks how independent and self-regulating is the environment for infrastructure operators in a specific sector. A score of 100 indicates the most pro-self-regulating environment for operators.	Derived		See Chapter 4: Institutions
	GOV010	Governance: Labor Market Discipline: Subindex Sector (base 100)	Index that ranks how intense labor discipline is established for operators through various free labor market mechanisms within a sector. A score of 100 indicates that labor market discipline is in place.	Derived		See Chapter 4: Institutions

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	GOV013	Governance: Managerial and Board Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to avoid interference of governments in operators' managerial decisions. A score of 100 indicates the operator board is substantially autonomous.	Derived		See Chapter 4: Institutions
	GOV011	Governance: Outsourcing: Subindex Sector (base 100)	Index that ranks whether outsourcing mechanisms are introduced to improve operators' governance within a sector. A score of 100 indicates key outsourcing elements are allowed.	Derived		See Chapter 4: Institutions
	GOV014	Governance: Ownership and Shareholder Quality: Subindex Sector (base 100)	Index that ranks whether a sector within a country has in place mechanisms for ownership and shareholder quality. A score of 100 indicates highest quality.	Derived		See Chapter 4: Institutions
	REF006	Reform: General index Sector (base 100)	Compounded index that ranks the level of effort that a sector within a country has in incepting modern reforms to foster competition, private sector participation, and independent institutions across all utility infrastructures. A score of 100 indicates the most advanced reform setting.	Derived		See Chapter 4: Institutions
	REF041	Reform: Legislation: 10 or more years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms.	Derived		See Chapter 4: Institutions
	REF037	Reform: Legislation: Existence of reform (1=yes, 0=no)	Positively scores a sector within a country that has undertaken at least one key reform of the sector.	Derived		See Chapter 4: Institutions
	REF040	Reform: Legislation: Last 10 years (1=yes, 0=no)	Positively scores a sector within a country that has undergone reforms during past ten years.	Derived		See Chapter 4: Institutions
	REF036	Reform: Legislation: Legal reform (1=yes, 0=no)	Positively scores a sector within a country where sector legislation has been passed within the past 10 years.	Derived		See Chapter 4: Institutions
	REF010	Reform: Legislation: Subindex Sector (base 100)	Index that ranks whether modern legislation has been recently introduced to support the functioning of the providers within a specific sector, private participation, and adequate support of vulnerable users.	Derived		See Chapter 4: Institutions
	REF019	Reform: Policy Oversight: Dispute Arbitration Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on dispute resolution is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Derived		See Chapter 4: Institutions
	REF022	Reform: Policy Oversight: Investment Plan Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight of investment plans is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Derived		See Chapter 4: Institutions

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	REF020	Reform: Policy Oversight: Regulation Monitoring Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight of regulatory monitoring is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Derived		See Chapter 4: Institutions
	REF008	Reform: Policy Oversight: Subindex Sector (base 100)	Index that ranks how effective is the oversight of the functioning of the provision of a specific infrastructure service. A score of 100 indicates optimal policy oversight.	Derived		See Chapter 4: Institutions
	REF023	Reform: Policy Oversight: Tariff Approval Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on tariff approval is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Derived		See Chapter 4: Institutions
	REF021	Reform: Policy Oversight: Technical Standard Oversight (1=yes, 0=no)	Positively scores a sector within a country whose oversight on technical standards is carried out by a special entity within the ministry, an interministerial committee, or the regulator.	Derived		See Chapter 4: Institutions
	REF007	Reform: Private Sector Involvement: Subindex Sector (base 100)	Index that ranks how friendly and effective a country is to allow for private participation in a specific sector. A scare of 100 indicates the most private participation in the investment environment.	Derived		See Chapter 4: Institutions
	REF009	Reform: Restructuring: Subindex Sector (base 100)	Index that ranks whether the country is fostering independent operators and vertical separation of the industry. This implicitly assumes that vertical separation and corporatization are desirable institutional objectives. A score of 100 indicates the country has fully corporatized and restructured its infrastructure sectors.	Derived		See Chapter 4: Institutions
	REG017	Regulation: Accountability: Full Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows the possibility to appeal regulatory decisions to independent arbitration.	Derived		See Chapter 4: Institutions
	REG018	Regulation: Accountability: Partial Independence of Appeal (1=yes, 0=no)	Positively scores a sector within a country that allows appeal of regulatory decisions to bodies other than government/line ministries.	Derived		See Chapter 4: Institutions
	REG008	Regulation: Accountability: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms for the operators and the users to appeal regulatory decision taken by the regulatory bodies. A score of 100 indicates that good mechanisms to regulate the regulator are in place.	Derived		See Chapter 4: Institutions
	REG028	Regulation: Autonomy: Formal autonomy – fire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory authorities cannot be fired by government/line ministry	Derived		See Chapter 4: Institutions

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Institutional	REG029	Regulation: Autonomy: Formal autonomy – hire (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body is not directly appointed by government/line ministry officials	Derived		See Chapter 4: Institutions
	REG026	Regulation: Autonomy: Full Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget fully funded through fees.	Derived		See Chapter 4: Institutions
	REG024	Regulation: Autonomy: Full Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where government agencies, line ministry, or any other state body can veto a regulatory decision.	Derived		See Chapter 4: Institutions
	REG027	Regulation: Autonomy: Partial Financial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where the regulatory body has a budget that is at least partially funded through fees and/or donors.	Derived		See Chapter 4: Institutions
	REG025	Regulation: Autonomy: Partial Managerial Autonomy (1=yes, 0=no)	Positively scores a sector within a country where entities other than the government or ministries can veto regulatory decisions,	Derived		See Chapter 4: Institutions
	REG010	Regulation: Autonomy: Subindex Sector (base 100)	Index that ranks whether a sector within a country has a regulatory body able to work independently, minimizing its capture by different interest groups or the possibility of a government revoke. A score of 100 indicates the regulatory body is independent.	Derived		See Chapter 4: Institutions
	REG006	Regulation: General index Sector (base 100)	Index that ranks the level of effort that a sector within a country is devoting to the inception of modern and not invasive regulations to foster transparency, autonomy, and provide adequate tools for regulation across all utility infrastructures. A score of 100 indicates the most advanced regulatory setting.	Derived		See Chapter 4: Institutions
	REG011	Regulation: Tools: Length Regulatory Review (1=yes, 0=no)	Positively scores a sector within a country that has tariff reviews in periods not longer than 3 years.	Derived		See Chapter 4: Institutions
	REG007	Regulation: Tools: Subindex Sector (base 100)	Index that ranks whether a sector within a country has modern, flexible, and transparent mechanisms for tariff setting in infrastructure sectors. A score of 100 indicates good tools.	Derived		See Chapter 4: Institutions
	REG012	Regulation: Tools: Tariff Methodology (1=yes, 0=no)	Positively scores a sector within a country that has a clear tariff methodology set in place.	Derived		See Chapter 4: Institutions
	REG009	Regulation: Transparency: Subindex Sector (base 100)	Index that ranks whether a sector within a country has mechanisms to make regulatory decisions public and easily available to operators and users. A score of 100 indicates information on regulation is easily available.	Derived		See Chapter 4: Institutions

Policy	SERIES CODE	Indicator Name	Definition	Raw/ Derived	Sector	Formula
Fiscal	F063	Investment – off-budget (% of GDP)	Sum of capital spending for SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F017	Investment – off-budget (US$)	Sum of capital spending for SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F060	Investment – on-budget (% of GDP)	Sum of capital spending for government for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F014	Investment – on-budget (US$)	Sum of capital spending for government for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F057	Investment – public sector (% of GDP)	Sum of capital spending for government and SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F011	Investment – public sector (US$)	Sum of capital spending for government and SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F064	Recurrent spending (mostly O&M) – off-budget (% of GDP)	Sum of recurrent spending for SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F018	Recurrent spending (mostly O&M) – off-budget (US$)	Sum of recurrent spending for SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F061	Recurrent spending (mostly O&M) – on-budget (% of GDP)	Sum of recurrent spending for government for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F015	Recurrent spending (mostly O&M) – on-budget (US$)	Sum of recurrent spending for government for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F058	Recurrent spending (mostly O&M) – public sector (% of GDP)	Sum of recurrent spending for government and SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F012	Recurrent spending (mostly O&M) – public sector (US$)	Sum of recurrent spending for government and SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F062	Total spending – off-budget (% of GDP)	Sum of capital and recurrent spending for SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F016	Total spending – off-budget (US$)	Sum of capital and recurrent spending for SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F059	Total spending – on-budget (% of GDP)	Sum of capital and recurrent spending for government for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F013	Total spending – on-budget (US$)	Sum of capital and recurrent spending for government for the sector (US$).	Derived		See Chapter 5: Fiscal Spending
	F056	Total spending – public sector (% of GDP)	Sum of capital and recurrent spending for government and SOEs for the sector (% of GDP).	Derived		See Chapter 5: Fiscal Spending
	F010	Total spending – public sector (US$)	Sum of capital and recurrent spending for government and SOEs for the sector (US$).	Derived		See Chapter 5: Fiscal Spending

Note: GDP = gross domestic product; LCU = local currency unit; SOE = state-owned enterprise; nap = not applicable.

Annex A7.2 Sector-specific benchmarks

For the water supply and sanitation sector, countries are classified in two categories:

- *High water scarcity*, meaning that the renewable internal freshwater resources per capita is less or equal to 3,000 m3 per year
- *Low water scarcity*, meaning that the renewable internal freshwater resources per capita is greater than 3,000 m3 per year

Country Name	Water Scarcity: Mutually Exclusive		Renewable internal freshwater resources per capita
	High Water Scarcity	Low Water Scarcity	
Algeria	0	1	
Angola	0	1	10,513
Benin	0	1	3,815
Botswana	0	1	6,819
Burkina Faso	1	0	933
Burundi	1	0	1,774
Cameroon	0	1	17,520
Cape Verde	1	0	634
Central African Republic	0	1	36,912
Chad	0	1	4,857
Comoros	1	0	1,519
Congo, Republic	0	1	217,915
Côte d'Ivoire	0	1	4,802
Congo, Dem. Rep. of	0	1	23,577
Egypt	0	1	
Equatorial Guinea	0	1	51,282
Eritrea	1	0	1,466
Ethiopia	1	0	1,685
Gabon	0	1	121,392
Gambia, The	0	1	5,472
Ghana	1	0	2,489
Guinea	0	1	26,218
Guinea-Bissau	0	1	20,156
Kenya	1	0	947
Lesotho	1	0	1,679
Liberia	0	1	66,533
Libya	0	1	
Madagascar	0	1	18,826
Malawi	1	0	1,401
Mali	0	1	7,458
Mauritania	0	1	3,826

Country Name	Water Scarcity: Mutually Exclusive		Renewable internal freshwater resources per capita
	High Water Scarcity	Low Water Scarcity	
Mauritius	1	0	2,231
Mayotte	–	–	–
Morocco	0	1	
Mozambique	0	1	11,318
Namibia	0	1	8,809
Niger	1	0	2,100
Nigeria	1	0	2,710
Rwanda	1	0	1,120
São Tomé and Príncipe	0	1	13,212
Senegal	0	1	3,753
Seychelles	–	–	–
Sierra Leone	0	1	30,690
Somalia	1	0	1,377
South Africa	1	0	1,106
Sudan	1	0	1,879
Swaziland	0	1	4,164
Tanzania	1	0	2,035
Togo	1	0	2,930
Tunisia	0	1	
Uganda	1	0	2,472
Zambia	0	1	9,630
Zimbabwe	1	0	1,547

Source: FAO.

Note: High water scarcity if < 3,000 m3 per year.

Annex A7.3 Unit conversions and technical parameters

Temporary code	Indicator Name	Policy	Raw/Derived	Country	For all years
y006	Costs, water supply capital (US$ per m3)	Financial	Raw	all countries	0.4

Annex A7.4 Target institutions

Table A7.4a Key water and sanitation sector institutions in each country

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Algeria					
Angola					
Benin	Ministry of Mines, Energy and Water	None	Water General Directorate (WGH)	SONEB	Société Nationale des Eaux du Bénin
Botswana				DWA WUC	Department of Water Affairs Water Utility Corporation
Burkina Faso	Ministry of Agriculture, Hydraulics, and Fishery – General Directorate of Water Resources	None	General Directorate for Safe Water supply (DGAEP)	ONEA	Office National de l'Eau et de l'Assainissement
Cameroon	Ministry of Energy and Water	None		CDE	Camerounaise d'Eaux
				CAMWATER	Cameroon Water Utilities Corporation
Cape Verde	Ministry of Environment, Agriculture and Fisheries	None		ELECTRA	Empresa de Electricidade e Agua
Central African Republic				SODECA	Société de Distribution d'Eau de Centrafrique
Chad	Ministère de l'Environnement et de l'Eau	None	Comité de Gestion de Point d'Eau	STEE	Societé Tchadienne d'Eau et d'Electricité
Congo, Rep.				SDNE	Societé Nationale de Distribution d'Eau Republique du Congo
Côte d'Ivoire	Ministry of Economic Infrastructure	None	Directorate of Human Water	SODECI	Societé de Distribution d'Eau de la Côte d'Ivoire
Congo, Dem. Rep. of	National Committee of Water and Sanitation Ministry of Energy Ministry of Health	None	None	REDIGESO	Régie de Distribution d'Eau de la Republique Démocratique du Congo
Egypt	Ministry of Housing, Utilities and Urban Development	National Organization of Potable Water and Sanitary Drainage The Holding Company for Potable Water and Sanitary Drainage	District Water and Sanitation Companies		
Ethiopia	Ministry of Water Resources	None	Woredas / Community Based Organizations	ADAMA	Adamawa State
				AWSA	Awassa
				DIRE DAWA	Dire Dawa
Gabon				SEEG	Société d'Energie et d'Eau du Gabon

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Ghana	Ministry of Water Resources, Works & Housing	The Water Resources Commission (WRC) PURC (Public Utilities Regulatory Commission)	The Community Water and Sanitation Agency District Water and Sanitation Teams	GWC	Ghana Water Company Limited
Guinea	Ministere de l'Energie et de l'Hydraulique Ministere de l'Environnement et du Développement Durable Ministere de l'Habitat et de l'Urbanisme Ministere de l'Administration du Territoire et de la Décentralisation	None	Service National d'Aménagement des Points d'Eau (SNAPE)	SEG DNACV DNH/DA SPTD	Société des Eaux de Guinea Direction Nationale de l'Assainissement et du Cadre de Vie Direction Nationale de l'Habitat/ Division Assainissement Service Public de Transfer des Déchets
Kenya	Ministry of Water and Irrigation	Water Services Regulatory Board (WSRB)	NWCPC (15%) / Ministries (48%)	KIWASCO	Kisumu Water and Sewerage Company
				MWSC	Malindi Water and Sewerage Corporation
				NWASCO	Nanyuki Water & Sewerage Company Ltd
Lesotho	Ministry of Natural Resources	None		WASA	Water and Sewage Authority
Liberia				LWSR	Liberia Water and Sewer Corporation
Libya					
Madagascar	Ministry of Water	None	Water point committees	JIRAMA	JIRAMA
Malawi	Ministry of Irrigation and Water Development	None	NWCPC (15%) / Ministries (48%)	BWB CRWB LWB	Blantyre Water Board Central Region Water Board Lilongwe Water Board
				NRWB	Northern Region Water Board
Mali				EDM	Energie du Mali
Mauritania				MSNE	Mauritania Société Nationale des Eaux
Mauritius				CWA WWMA	Central Water Authority Waste Water Management Authority (www.wwma.gov.mu)
Morocco					

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Mozambique	Ministry of Public Works and Housing	Conselho de Regulação do Abastecimento de Água (CRA)	Provincial Directorate of Housing and Public Works	Adem Beira Adem Maputo Adem Nampula Adem Pemba Adem Quilimane	Aguas de Mozambique Beira Aguas de Mozambique Maputo Aguas de Mozambique Nampula Aguas de Mozambique Pemba Aguas de Mozambique Quilimane
Namibia	Ministry of Agriculture, Water and Forestry	None	Directorate of Rural Water Supply	Oshakati Municipality Walvis Bay Municipality Windhoek Municipality	Oshakati Municipality Walvis Bay Municipality Windhoek Municipality
Niger	Ministry of Water	Autorité de Régulation Multisectorielle du Niger – ARM		SPEN	Societe de Patrimoine des Eaux du Niger
	National Committee on Sanitation				
Nigeria	Ministry of Water	None		Abia SWB Adamawa SWB Anambra SWC Bauchi SWB Benue SWB Borno Cross River SWB Edo State UWB Ekiti SWC FCT Gombe SWB Imo State WC Kaduna Katsina Lagos Nasarawa SWB Niger SWB Ondo WC Osun WC Plateau River SWB Sokoto SWB Taraba SWSA Yobe SWC Zamfara SWB	Abia State Water Board Adamawa State Anambra State Water Corporation Bauchi State Water Board Benue State Water Board Borno Cross River Water Board Edo state Urban Water Board Ekiti State Water Corporation Federal Capital Territory Water Board Gombe State Water Board Imo State Water Corporation (Owerri) Kaduna Katsina Lagos Nasarawa State Water Board Niger State Water Board Ondo State Water Corporation Osun State Water Corporation Plateau Rivers State Water Board Sokoto State Water Board Taraba State water Supply Agency Yobe State Water Corporation Zamfara State Water Board

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Rwanda	Ministry of Environment and Lands Ministry of, Forestry and Mines Ministry of Infrastructure Ministry of Water	Rwanda Utilities Regulatory Authority (RURA)		EWSA	EWSA
Senegal	Ministère de l'Habitat, de la Construction et de l'Hydraulique Ministere de l'Urbanisme et de l'Assainissement	None	Direction de l'Hydraulique Urbaine Direction de l'Hydraulique Rural Direction de la Gestion et de la Planification des Ressources en Eau Direction de l'Exploitation et de la Maintenance (DEM) Office du Lac de Guier Direction de l'Assainissement Urbaine Direction de l'Assainissement Rurale	ONAS SDE SONES	Office National de l'Assainissement du Sénégal Senegalaise des Eaux Societe Nationale des Eaux du Senegal
Seychelles				PUC	Public Utilities Corporation
Sierra Leone	Ministry of Energy and Water Resources (Water Supply) Ministry of Local Government (Sanitation)	None None		SALWACO GVWC WSD	Sierra Leone Water Company Guma Valley Water Company Water Supply Division
South Africa	Department of Water	None		Cape Town Drakenstein eThekwini Joburg	City of Cape Town Metropolitan Municipality Drakenstein Municipality eThekwini Municipality City of Johannesburg Metropolitan Municipality
Sudan				G-SWC H.WC Khartoum Water Corporation South Darfur Water Corporation Upper Nile Water Corporation	Gadarif State Water Corporation Hawata Water Corporation Khartoum Water Corporation South Darfur Water Corporation Upper Nile Water Corporation

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Swaziland	Ministry of Natural Resources and Energy	None	Department of Water Affairs	SWSC-Swaziland	Swaziland Water Services Corporation
Tanzania	Ministry of Water and Fishery	Electricity and Water Utility Regulatory Authority (EWURA)	District Councils (DCs)/Water User Associations and Community Based Organizations (WUA/CBOs)	Arusha Babati Bukoba DAWASCO DAWASA Dodoma Iringa Kigoma Lindi Mbeya Morogoro Moshi Mtwara Musoma MWSA Shinyanga Singida Songea Sumbawanga Tabora Tanga	Arusha Urban Water Supply and Sewerage Authority Babati Urban Water Supply and Sewerage Authority Bukoba Urban Water Supply and Sewerage Authority Dar es Salaam Water Supply and Sewerage Company Dar es Salaam Water Supply and Sanitation Authority Dodoma Urban Water Supply and Sewerage Authority Iringa Urban Water Supply and Sewerage Authority Kigoma Urban Water Supply and Sewerage Authority Lindi Urban Water Supply and Sewerage Authority Mbeya Urban Water Supply and Sewerage Authority Morogoro Urban Water Supply and Sewerage Authority Moshi Urban Water Supply and Sewerage Authority Mtwara Urban Water and Sewerage Authority Musoma Urban Water Supply and Sewerage Authority Mwanza Urban Water Supply and Sewerage Authority Shinyanga Urban Water Supply and Sewerage Authority Singida Urban Water Supply and Sewerage Authority Songea Urban Water Supply and Sewerage Authority Sumbawanga Urban Water Supply and Sewerage Authority Tabora Urban Water Supply and Sewerage Authority Tanga Urban Water Supply and Sewerage Authority
Togo	Ministere de l'Eau et de l'Assainissement et de l'Hydraulique	NA	Hydraulique Villageoise	TdE	Société Togolaise des Eaux

Country	WSS line ministry	Water regulatory entity	Rural water agencies	UTILITIES	
				Short Name	Full Name
Tunisia	Ministere de l'Agriculture des Ressources Hydrauliques et de la Pêche	Direction Generale du Génie Rural et de l'Exploitation des Eaux		SONED ONAS	Societe Nationale d'Exploitation et de Distribution des Eaux Office National de l'Assainissement
Uganda	Ministry of Water, Lands, and Environment	Directorate of Water Development	Directorate of Water Development, District Administration	NWSC-Uganda	National Water and Sewerage Corporation
Zambia	Ministry of Local Government and Housing	National Water and Sanitation Council (NWASCO)		AHC-MMS Chambeshi WSC Chipata WSC Kafubu WSC Lukanga WSC Lusaka WSC Mulonga WSC Nkana WSC North Western WSC Southern WSC Western WSC	Asset Holding Company-Mining Municipal Services Ltd. Chambeshi Water and Sewerage Company Ltd. Chipata Water and Sewerage Company Ltd. Kafubu Water and Sewerage Company Ltd. Lukanga Water and Sewerage Company Ltd. Lusaka Water and Sewerage Company Ltd. Mulonga Water and Sewerage Company Ltd. Nkana Water and Sewerage Company Ltd. North Western Water and Sewerage Company Ltd. Southern Water and Sewerage Company Ltd. Western Water and Sewerage Company Ltd.
Zimbabwe				ZINWA	Zimbabwe National Water Authority

Annex A7.5 Data collection templates

WSS template A. National-level institutions

Country:
Sector: Water and Sanitation
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Temp Code	Indicator Name	New	History
			2011	2010
Reform	W709	Reform: Legislation, water policy (1=yes, 0=no)		
	W710	Reform: Legislation, rural water policy (1=yes, 0=no)		
	W711	Reform: Legislation, sanitation policy (1=yes, 0=no)		
	W712	Reform: Legislation, hygiene promotion program (1=yes, 0=no)		
	W714	Reform: Policy oversight, oversight of customer service (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)		
	W716	Reform: Policy oversight, setting of water quality standards (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)		
	W718	Reform: Policy oversight, monitoring water quality (0=line ministry,1=special entity within ministry, 2= autonomous regulatory board, 3=other institution, 4=unregulated)		
	W720	Reform: Policy oversight, accountability level for water provision (0=central, 1=regional, 2=local/municipal)		
	W722	Reform: Decentralization, decentralization water (1=yes, 0=no)		
	W723	Reform: Decentralization, accountability level for sanitation provision (0=central, 1=regional, 2=local/municipal)		
	W725	Reform: Decentralization, decentralization rural water (1=yes, 0=no)		
	W726	Reform: Market Structure, separation of water and electricity (1=yes, 0=no)		
	W727	Reform: Market Structure, separation of water and wastewater services (1=yes, 0=no)		
	W728	Reform: Market Structure, community providers rural water (1=yes, 0=no)		
	W729	Reform: Market Structure, community providers sanitation (1=yes, 0=no)		
	W730	Reform: Market Structure, household providers sanitation (1=yes, 0=no)		
Regulation	W731	Regulation: Autonomy, regulatory body vulnerability to donors (Percent)		
	W732	Regulation: Social Accountability, consumers membership in regulatory body (1=yes, 0=no)		
	W733	Regulation: Social Accountability, consumers right of appeal (1=yes, 0=no)		
	W734	Regulation: Social Accountability, consumers right of comment regulation (1=yes, 0=no)		
	W735	Regulation: Social Accountability, consumers' right of review tariffs (1=yes, 0=no)		
	W736	Regulation: Cost recovery, required—water supply (0=no, 1=yes)		
	W737	Regulation: Cost recovery, water (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)		

Policy Category	Temp Code	Indicator Name	New	History
			2011	2010
Regulation	W742	Regulation: Cost recovery, required -wastewater (0=no, 1=yes)		
	W743	Regulation: Cost recovery, wastewater (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)		
	W748	Regulation: Cost recovery, required -on site sanitation (0=no, 1=yes)		
	W749	Regulation: Cost recovery, on site sanitation (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)		
	W754	Regulation: Cost recovery, required—rural water (0=no, 1=yes)		
	W755	Regulation: Cost recovery, rural water (0=full subsidy, 1=full capital subsidy, 2=partial capital subsidy, 3=no subsidy)		
	W760	Regulation: Universal Service, funded by rural water community (%)		
	W761	Regulation: Environmental, lack of contamination of ground water from latrines (1=yes, 0=no)		
	W762	Regulation: Environmental, dump site for sanitation disposal (1=yes, 0=no)		
	W763	Regulation: Environmental, existence of regulation of dump site for sanitation disposal (1=yes, 0=no)		
	W764	Regulation: Environmental, prevalence of storm water drainage (1=yes, 0=no)		
	W765	Regulation: Environmental, flooding (1=yes, 0=no)		

WSS template B. Utility-level data variables

Country: Water and Sanitation
Sector:
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Access	W122	Stand posts providing utility water, functioning (number)					
	W124	Stand posts providing utility water, installed (number)					
	W148	Population served by direct supply and shared taps (number)					
	W149	Population served by stand posts providing utility water (number)					
	W150	Population resident in the utility service area (number)					
	W196	Population served by sewerage (number)					
	W209	Population served by private residential connections (number)					
	W210	Population served by residential water connection from neighbors and shared taps (number)					
Financial	W121	Employees, full-time (number)					
	W170	Wastewater billed and collected (m3 per year)					
	W179	Water billed and collected (m3 per year)					
	W180	Billing cycle, water (days)					
	z106	Billing for water and wastewater (LCU per year)					
	z107	Billing for water and wastewater, government entities (LCU per year)					
	z109	Gross fixed assets, water, and wastewater—book value (LCU)					
	z114	Cost of PVC pipe (LCU per linear meter)					
	z116	Costs, debt service (LCU per year)					
	z130	Costs, labor (LCU per year)					
	z141	Costs, operational (LCU per year)					
	z166	Costs, services contracted out (LCU per year)					
	z167	Gross fixed assets, wastewater—book value (LCU)					
	z168	Gross fixed assets, water—book value (LCU)					
	z172	Connection charge, wastewater (LCU per connection)					
	z181	Connection charge, water (LCU per connection)					
	z186	Revenue, water (LCU per year)					
	z191	Accounts receivable, end of the year (LCU)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	z203	Billing for water and wastewater, residential customers(LCU per year)					
	z208	Billing for water and wastewater, industrial and commercial customers (LCU per year)					
	z231	Revenue, water and wastewater (LCU per year)					
Pricing	z214	Fixed charge, water (LCU per month)					
	z215	Fixed charge, wastewater (LCU per month)					
	z300	Tariff, average effective water (LCU per m3)					
	z304	Tariff, average effective wastewater residential (LCU cents per m3)					
Quality	W113	Continuity of water service (hours per day)					
	W142	Samples passing chlorine test (%)					
	W177	Consumer complaints, water and wastewater (number)					
Technical	W112	Connections with operational meter, water (number)					
	W131	Wastewater collection system, length (kms)					
	W132	Water distribution mains, length (kms)					
	W138	Non-revenue water (m3 per year)					
	W143	Pipe blockages, wastewater (number per year)					
	W144	Pipe breaks, water (number per year)					
	W151	Connections, wastewater residential (number)					
	W152	Connections, water residential (number)					
	W165	Treated water (m3 per year)					
	W175	Wastewater receiving primary treatment (m3 per year)					
	W176	Wastewater receiving secondary or tertiary treatment (m3 per year)					
	W182	Water consumption (m3 per year)					
	W188	Water production (m3 per year)					
	W194	Connections, water (number)					
	W195	Connections, wastewater (number)					
	W211	Wastewater treatment plants, installed (number)					
	W212	Wastewater treatment plants, functioning (number)					
	W220	Water consumption, residential (m m3 per year)					
	W221	Water consumption, industrial and commercial (m3 per year)					
	z120	Costs, energy (LCU per year)					

8. Information and Communication Technology

8.1 Motivation

During the decade 2000–2010, Africa underwent a major information and communication technology (ICT) revolution. The main driver of this revolution was widespread market liberalization in the mobile sector, which led to massive private investment amounting to a cumulative total of $28 billion in new networks (World Bank's Private Participation in Infrastructure database). As a result, 300 million new mobile subscribers were added over the period 2000–2009, almost all of them on prepaid telephones. Over the same period, the share of the African population living within range of a mobile signal mushroomed from 20 percent to around 70 percent. About half of Africa's improved growth performance in the early 2000s was attributable to this wireless revolution: an extra percentage point of growth per person per year.[19]

Due to other remaining regulatory barriers, the mobile market has yet to reach its full potential. The cost of mobile telephone services remains high: a monthly basket of prepaid mobile telephone services costs $10 in Sub-Saharan Africa but less than $2 in South Asia. Further competition among mobile operators would help drive prices down: most markets could support more than three operators, but one-third have yet to reach that mark today. Furthermore, mobile signal coverage could profitably be expanded to cover over 95 percent of Africa's population (without public subsidy), simply by reducing regulatory barriers and intensifying competition.

19 Calderon, C. (2009), Infrastructure and Growth in Africa, Policy Research Working Paper No 4914, World Bank, Washington, DC.

In contrast to the burgeoning mobile sector, growth in the number of fixed lines has stagnated in most countries and even turned negative in some; a substantial share of fixed-line operators remain in public hands. One of the few countries to buck this trend has been Nigeria, which has successfully introduced competition among fixed-line providers.

Many countries in Africa still lack direct access to submarine cables, or indirect access via fiber-optic backbones. As a result, the cost of international phone calls and Internet access remains high; indeed, international calls within Africa can be even more expensive than calls to the United States. The momentous expansion of submarine infrastructure under way around Africa's coasts, as well as terrestrial fiber-optic backbone networks, will give many more African countries the opportunity to connect to this infrastructure. This has the potential to reduce the costs of international calls and Internet access by more than one-half, but these savings will only be passed on to consumers to the extent that there is competition in the international gateway.

Broadband service is still in its infancy in Africa due to the limited availability of fiber-optic infrastructure and regulatory hurdles that are holding back network development. A number of countries are undertaking national fiber-optic backbone projects, but a key issue is the extent to which these backbones can be developed by the private sector without government subsidy.

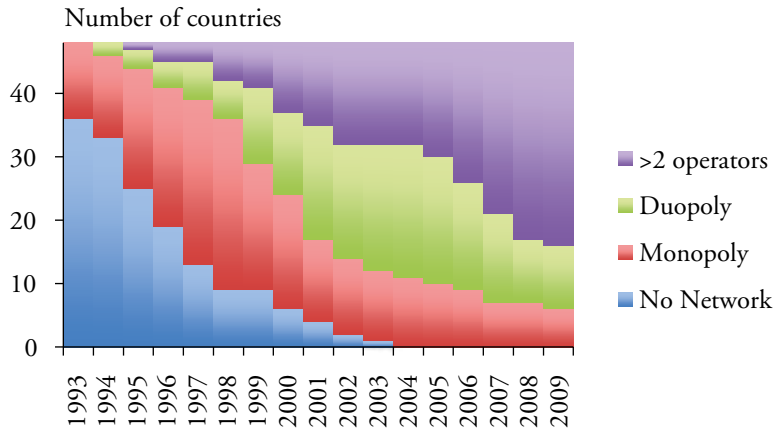
8.2 Tracking Performance

This sector synopsis highlights some of the key policy issues facing the ICT sector. To track sector performance over time, indicators are needed to shed light on each of a number of key policy themes. By way of introduction, submarine cables and satellite systems provide interconnection between continents, and are connected to national systems via international gateways. Domestic backbones provide connectivity throughout the country and to international gateways. A range of technologies is used for national backbone connectivity, including fiber-optic cable, microwave, and domestic satellite systems. Multiple public access networks may exist at the country level, and some parts of the network may be leased as dedicated lines to non-facility based providers such as internet service providers (ISPs). Local distribution to business, government, and residential subscribers may be done either through fixed or wireless networks.

Institutional

These indicators capture the extent to which the ICT sector in any given country has undergone the reform measures necessary to modernize the sector, provide regulatory oversight, and improve enterprise governance. The institutions chapter (Chapter 4) has already discussed these indicators in some detail.

Figure 8.1 African mobile markets have rapidly become more competitive



Source: Africa Infrastructure Country Diagnostic 2009.

In addition, there are some sector-specific ICT institutional indicators that are relevant to collect. These cover areas such as licensing arrangements, the extent of competition in different market segments, forms of price regulation, the framework for spectrum administration, and the nature of any universal service obligations.

For example, a key policy issue is the extent of competition in Africa's mobile telephony markets. Experience suggests that most African markets can support at least three mobile operators, and that the full benefits of competition will not become apparent until the third operator enters the market. In this sense, it is encouraging to see how rapidly competition has spread across Africa's mobile telephony sector. Back in 2000, only half the countries had competition, whereas by 2009 only half a dozen countries did not have a competitive mobile market and a majority had more than two operators (Figure 8.1).

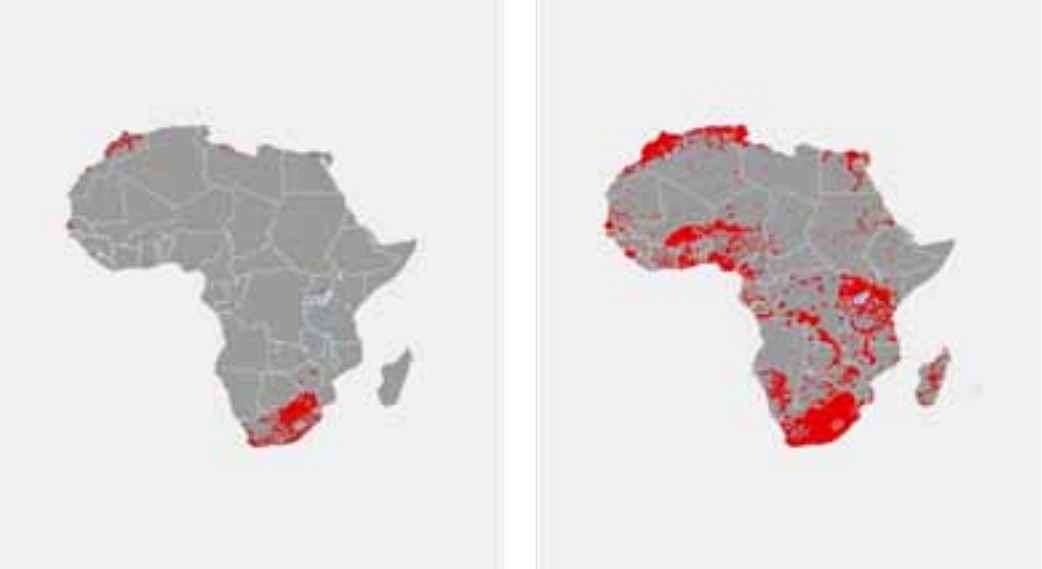
Access

ICTs bring socioeconomic benefits that can only be realized if users have access. There are a number of ways in which access to ICT can be tracked:

- Telecommunications operators report the number of subscriptions that they serve in the fixed telephone line, mobile, and internet market segments. These indicators are typically expressed as penetration rates in terms of subscriptions per hundred people. These data are not usually broken down between residential and nonresidential, so they do not provide a picture of actual household access. Furthermore, in the case of mobile subscriptions, one person may hold more than one subscription.
- Mobile operators typically provide data on the percentage of the population that lives within range of their wireless signal, sometimes known as the "mobile footprint." Given that there are public access models for mobile telephony, it is not necessary to be a subscriber to make a call. It is thus important to understand how many people have the opportunity to use mobile telephony.
- Household surveys collect information about whether individual households have a telephone or other ICT services and devices. This is the only accurate way to determine household access to ICT services. Traditionally, household surveys focused on connections to a fixed telephone line. But, increasingly, household surveys also ask whether anyone in the household is a mobile telephone subscriber. Most also inquire about the availability of broadcast equipment and a few collect data on the penetration of computers and internet. The household survey chapter (Chapter 13) describes this source of data and the many ways one can analyze it.

It is important to note that each of the methods of capturing access provides a different perspective, since they are capturing three distinctive concepts of access. Penetration rates look at the prevalence of the service in the overall economy, while mobile signal coverage captures the population that could potentially make use of the service, and household survey indicators look at access from homes. The case of Senegal provides an example of different views of mobile access. In 2009 the aggregate mobile penetration rate was 56.7 subscriptions per 100 people, whereas over 85 percent of the population resided in areas where there was a mobile signal. The penetration of mobile phones in households was 76.5 percent, yet only 48 percent of the population over the age of 12 reported actual uses of cell phones. The relatively large size of households in Senegal suggests that the rate of population access to mobile phones is more than one-third higher than the penetration rate would suggest. Figure 8.2 presents a picture of the evolution of mobile subscription in Africa.

Figure 8.2 Evolution of Africa's mobile footprint between 1999 and 2009



Source: GSMA 2010b; CIESIN and others 2004.

Note: Data for some countries are not available.

Beyond the household sector, it is also relevant to consider access to ICT services by firms. Although operators provide data on the number of subscriptions, they rarely distinguish between residential and nonresidential subscriptions, and few African countries carry out censuses of ICT availability in firms and institutions. One possible source of information on nonresidential access to ICT is enterprise surveys, which provide a picture of the extent to which businesses experience delays in obtaining a fixed-line connection and find ICT to be a constraint on their operations.

Affordability

Due to the high costs of ICT in Africa and the relatively low income of households, the affordability of ICT services is a key policy issue. Affordability is typically measured by the share of the household's budget dedicated to the purchase of ICT services. One source for this information is household surveys (covered in Chapter13). It is also possible to use ICT price data to derive a synthetic measure of affordability.

Pricing

Both fixed and mobile operators, as well as ISPs, typically apply complex tariff schedules that vary according to different types of payment plans and packages. Tariffs can also vary according to the type of call being made (for example, within a particular mobile network, or "on-net"; across two different mobile networks, or "off-net"; or from a mobile to a fixed network). For that reason, there is no single easily measurable "price" of telephony services. Nevertheless, using a standard monthly basket of services, it is possible to make meaningful comparisons across countries. Three ICT sector price baskets generate affordability measures (see Figure 8.3).

In addition, it is relevant to consider the cost of international fixed-line calls. Prices are collected for a three-minute call to the United States, and to each of the other countries in Africa. For mobile telephony, it is also relevant to measure the cost of calls when subscribers roam in neighboring countries, although it was not possible to include this information in the database.

Finally, wholesale prices are relevant to understanding the functioning of competition within the sector. High wholesale charges for terminating calls on mobile networks (that is, mobile termination rates) stifle competition, negatively impact fixed-line providers, and raise retail prices for consumers.

This kind of price information can be very useful as countries seek to benchmark mobile telephone charges against one another. For example, in 2009 the price of a standardized monthly basket of mobile telephony services in Sub-Saharan Africa ranged from less than $3 per month in Ethiopia to $19 per month in Equatorial Guinea (Figure 8.4). The Sub-Saharan Africa average, $10 per month, is well above the price of a basket of monthly mobile services in South Asia, which stood at less than $1 as of 2009.

Financial

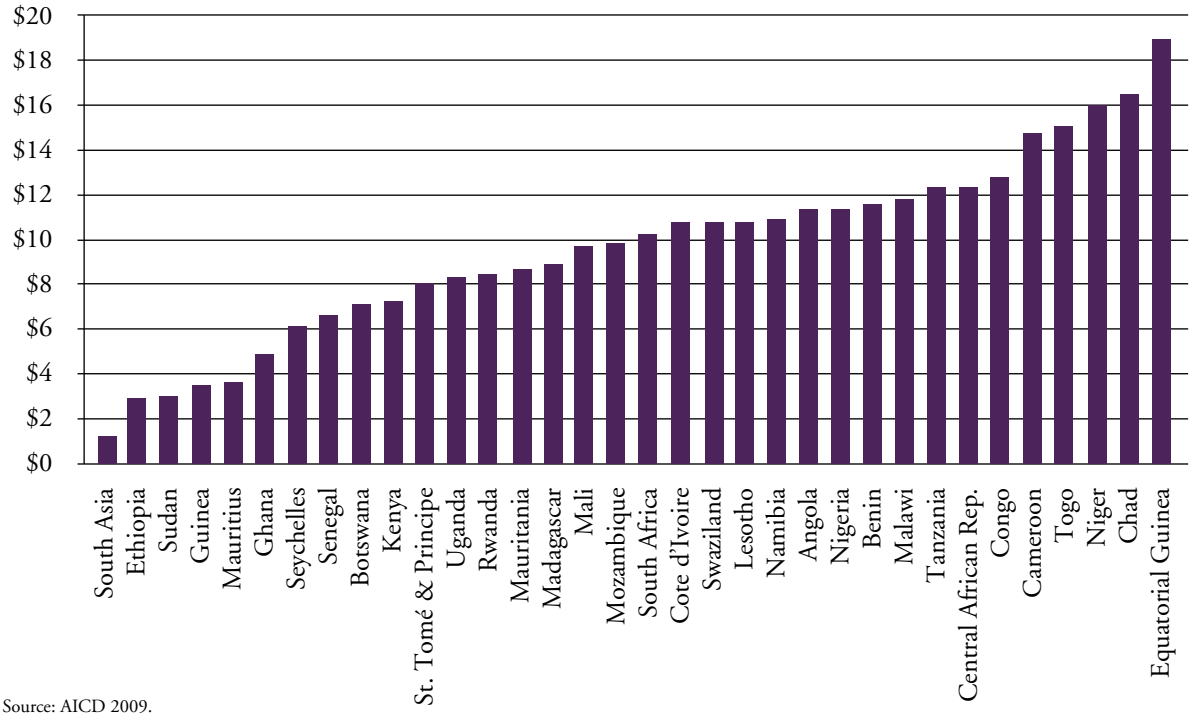
Revenue and investment data are important for measuring the sustainability and growth of the sector.

Figure 8.3 Composition of monthly price baskets

Fixed (postpaid, PSTN)	Mobile (prepaid)	Broadband (fixed minimum 256 kbps download)
•Monthly subscription •15 peak-rate local calls of 3 minutes each •15 off-peak-rate local calls of 3 minutes each	•30 outgoing calls: •5.32 * price of one minute on-net peak 4.9 * price of one minute on-net off-peak 3.78 * price of one minute on-net weekend 2.39 * price of one minute off-net peak 2.21 * price of one minute off-net off-peak 1.7 * price of one minute off-net weekend 6.38 * price of one minute fixed peak 5.88 * price of one minute fixed off-peak 4.54 * price of one minute fixed weekend •100 SMS	•Montly subscription •If there is a cap, then extra charges are added to equal 1GB of monthly use

Source: AICD adapted from the OECD, World Bank, and ITU. 2008

Figure 8.4: The price of a monthly basket of mobile telephony services varies widely across Africa



Source: AICD 2009.

Note: "South Asia" refers to Bangladesh, India, and Pakistan.

- Costs are typically broken down between operating costs (including labor costs, fuel costs, maintenance costs, and so on) and capital expenditure. The database does not include data on operating costs but focuses rather on capital expenditure, since the ICT sector requires significant ongoing investment to ensure reliable and modern networks with sufficient capacity. This information can be disaggregated by market segment. The key financial ratio on the cost side is the average operating cost, which can be used to evaluate whether ICT tariffs are high enough to cover the recurrent costs of a business. Capital costs are not typically reliably measured in utility financial ac-

counts, due to deficient and/or heterogeneous accounting norms. Where capital costs are needed, for example, to understand the extent to which tariffs may fall short of cost recovery, these are best estimated based on standardized unit replacement costs, multiplied by the number of lines.

- Revenues in the ICT sector are typically compared in terms of average revenue per user (ARPU). This is the total revenue of the operator divided by the average number of subscriptions over the period.

The ARPU typically gives a measure of the maturity of the market. For example, when mobile services are first introduced, the ARPU tends to be quite high as wealthier users dominate the market. As competition intensifies and prices fall, mobile penetration spreads to less affluent segments of the population and the ARPU starts to come down. For example, in the year 2000 the ARPU in both Sub-Saharan Africa and South Asia stood at around $40 per month. During the years that followed, the ARPU declined steeply in both regions, though much faster in South Asia. By 2008 the ARPU in Sub-Saharan Africa had reached $13 per month versus $4 per month in South Asia (Figure 8.5)

Technical

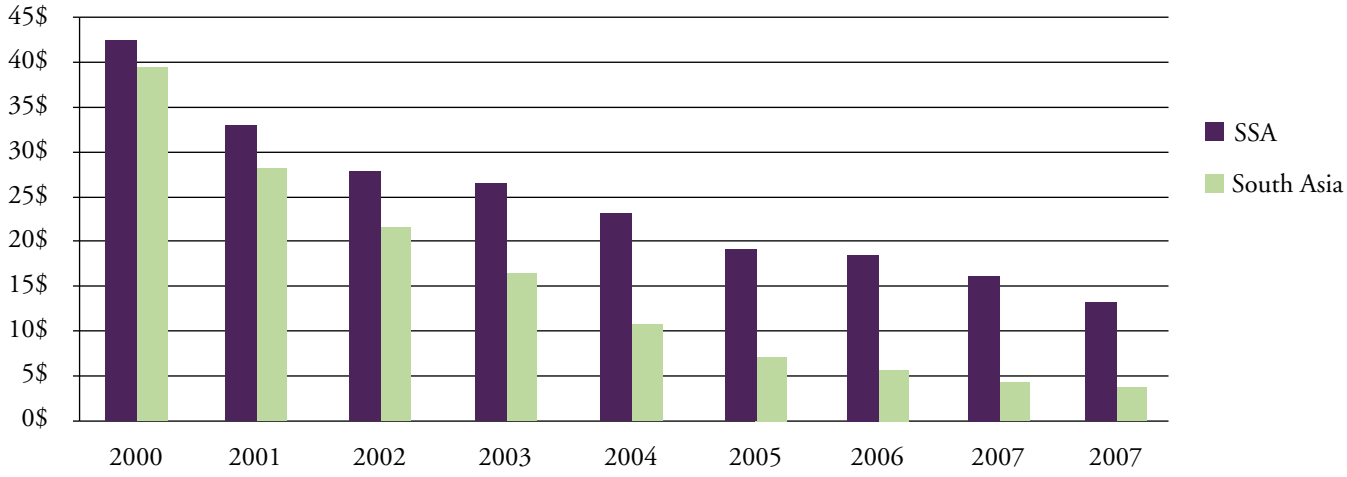
Technical indicators are helpful in highlighting the performance of ICT operators in terms of the efficiency and quality of their operations.

- The main efficiency indicator for telephone operators is labor productivity, which looks at the relationship between the number of personnel and the overall output of the operator, usually measured in terms of the number of subscriptions (for example, staff per subscription).
- There are few indicators of service quality for the ICT sector, and data availability is limited. Perhaps the most widely used indicator is the number of dropped calls, which captures the extent to which calls fail to be completed or are disconnected in mid-flow. But this information is not always readily obtainable from operators, and could not be included in the database.

By bringing different types of indicators together, it is possible to analyze critical policy questions. For example, by comparing labor productivity in fixed-line telephone operators against international best-practice levels, it is possible to gauge the extent of over-employment. Box 8.1 provides an outline of the methodology involved. The analysis reveals a number of countries where the cost of over-employment by the fixed-line operator is significant either in absolute terms (as in Chad, where the costs are more than $200 per subscriber) or relative to the size of the economy (as in Tanzania, where the costs represent 0.24 percent of the gross domestic product [GDP]).

For more discussion and illustration of the use of ICT sector indicators to inform policy analysis, the reader is referred to the following publication:

Figure 8.5 Evolution of the ARPU in Sub-Saharan Africa over time and in comparison to South Asia



Source: Africa Infrastructure Country Diagnostic.2009

Note: SSA = Sub-Saharan Africa.

Box 8.1 Calculating the hidden costs of over-employment by fixed telephone operators

A monetary value can be attributed to observable operational inefficiencies, such as labor productivity, by using the opportunity costs of such inefficiencies. Hidden costs of over-employment are calculated by comparing the average number of employees per fixed-line connection against that operational parameter in a well-functioning utility. The difference is a measure of inefficiency, and by multiplying that difference by the extra labor opportunity costs one gets its monetary value. The resulting cost is considered hidden as it is not explicitly captured by the financial flows of the operator.

The formula for calculating the hidden costs of over-employment is:

- Hidden cost of over-employment = Number of connections * (employees per connection - normative employees per connection) * average wage per employee.

Where normative employees per connection is the average for that parameter in well-functioning fixed-line operators.

Source: Adapted from Briceño-Garmendia and others, 2009, "Financing Public Infrastructure in Sub-Saharan Africa: Patterns and Emerging Issues," AICD Background Paper 15.

- Williams and others. 2011. Africa's ICT Infrastructure. World Bank: Washington, DC.

8.3 Indicator Overview

Annex A8.1 provides a comprehensive list of all indicators needed to track and monitor ICT services sector trends, together with their corresponding technical definitions. The definitions provided are consistent with those of the International Telecommunications Union (see www.itu.int/ITU-D/ict/handbook.html). Annex A8.2 also provides a list of standard conversions between commonly used technical indicators in the ICT sector. While the full list of indicators amounts to almost 200 items, the indicators can be grouped around a smaller number of some 50 primary indicators. A synthetic overview of these primary indicators is provided in Table 8.1.

Table 8.1 clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators that are related to the primary one. It also indicates whether the indicator originates at the national level or at the level of the operator, and in the latter case whether it is desirable to aggregate the variable across operators to provide a national picture. Finally, the table gives the source of the data, whether it comes from data reported in the sector templates or one of the secondary sources, such as household or enterprise surveys. The process for obtaining data from both of these sources will be described in greater detail later.

For example, the access indicator "population with access to cell phone" can be broken down into numerous subcategories by geographic area (urban, rural) or according to the purchasing power of the household (first quintile, second quintile, and so on). In addition, different normalizations can be used for a given variable. For example, to make meaningful cross-country comparisons of mobile penetration, it is necessary to normalize to per capita terms. Thus, South Africa has 104 mobile subscriptions per 100 people compared with only 4 mobile subscriptions per 100 people in Ethiopia.

Table 8.1 Overview of primary indicators for ICT

	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Source
Access	Population access to cell phone		National Capital city Urban Rural Quintile 1/5		National	HH surveys
	Population access to landline telephone					
	Population access to Internet					
	Population access to radio					
	Population access to TV					
	Public payphones			Per '000 pop.		ICT template C
	Fixed telephone lines	A	In operation	Per '00 pop.		
	Internet subscriptions		Broadband			
	Internet users					
	Mobile telephone subscriptions	B	Prepaid			
	Internet international bandwidth			Per capita		
	Mobile network coverage			% pop.		
	Telephone subscriptions total	=A+B		Per '00 pop.		
Affordability	Household spending on cell phone		National Urban/Rural Quintiles 1/5	$ % HH spending	National	HH surveys
	Household spending on landline					
	Household spending on network services					
	Household spending on non-network services					
	Price of monthly basket		Fixed Mobile Internet	% per capita income		

	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Source
Financial	Average Revenue Per User (ARPU)		Fixed Mobile	$/subscriber	National	ICT template C
	Investment		Mobile Telecom	$		
	Revenue		Fixed Mobile Total	$		
Pricing	License application fee		Fixed Mobile Int'l voice gateway Int'l data gateway	$	National	ICT templates B, E, F, and G
	License initial fee					
	License annual fee					
	Price of monthly basket		Fixed Mobile prepaid	$/month	Operator (largest only, which is used as national data. Size of operator defined in terms of number of subscriptions)	
	Price of a 3-minute fixed local call		Peak/off-peak	$/3 min.		
	Price of a 3-minute call to USA					
	Price of a 3-minute call to African country X		Country			
	Price of a 1-minute international call within Africa			$/min.		
	Price of a 1-minute mobile to fixed call		Peak Evening Weekend			
	Price of a 1-minute off-net mobile call					
	Price of a 1-minute on-net mobile call					
	Price of a national SMS			$/SMS		
	Price of connection fee		Fixed Broadband internet	$		
	Price of monthly subscription			$/mo.		
	Price wholesale mobile termination rate			$/minute		
	Price monthly cap for broadband services					
	Price speed to which broadband price data refer					
Quality	Fixed telephone line faults				National	ICT template C
	Fixed telephone line waiting list					
Technical	Labor productivity		Fixed Mobile Total		National	ICT template C
	Staff					
Usage	International telephone traffic		Incoming Outgoing Both ways		National	ICT template C

	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Source
Institutional	Regulation competition		Complexity of license process Convergence of license framework Fixed-line exclusivity (de facto/jure) Fixed-line full competition Mobile exclusivity (de facto/jure) Mobile full competition Mobile virtual network operators Int'l voice gateway exclusivity Int'l data gateway exclusivity ISP full competition Leased line exclusivity Herfindahl Index fixed Herfindahl Index mobile Herfindahl Index Internet	Base 100	National	ICT template A
	Regulation interconnection		Interconnection Publication interconnection prices			
	Regulation price		Fixed Mobile ISP			
	Regulation spectrum allocation		Unlicensed Competitive allocation			
	Regulation universal service		Definition Scope Financing			

Source: Author's own compilation.

Note: HH = household; ICT = information and communication technology; ISP = Internet service provider.

Where relevant, we can calculate benchmarks to facilitate cross-country comparisons. The earlier chapter on data processing introduced these generic benchmark groupings. Table 8.2, which compares Ethiopia's ICT sector to African low-income-country benchmarks, provides an example of how indicators can be used to inform sector policy analysis. The analysis shows that Ethiopia, which is one of the few African countries with only one (state-owned) mobile operator, is a long way behind its low-income peers in mobile telephony. The percentage of the population covered by a global system for mobile communications (GSM) signal is only one- fifth of that in other low-income countries, while mobile phone penetration is about a tenth of that in the peer group. This is despite the relatively low mobile phone charges practiced in the country, suggesting that revenues are insufficient for the necessary investment to expand the network.

Table 8.2 Example of benchmarking ICT indicators for Ethiopia, 2008

	Unit	Ethiopia	Low-income countries
GSM coverage	% population	**10.6**	56
International internet bandwidth	Mbps/capita	**6.7**	24
Internet	subscribers/100 people	**0.0**	1.0
Landline	subscribers/100 people	**1.2**	4.6
Mobile phone	subscribers/100 people	**2.6**	28.5
Prices ($)	**Ethiopia**	**Sub-Saharan Africa**	**Low-income countries**
Price of monthly mobile basket	**3.37**	11.80	10.0
Price of monthly fixed-line basket	**2.00**	11.60	9.0
Price of a 3-minute call to the United States	**3.33**	2.59	2.0
Price of inter-Africa telephone calls, mean	**1.27**	0.72	—

Source: AICD. 2009.

Note: Mbps = megabits per second; GSM = global system for mobile communications.

— = Not available.

8.4 Data Collection

The following Box summarizes the generic cross-cutting guidelines and procedures for data collection discussed in Chapter 2, and it is essential to spend some time to understand their importance before embarking on the actual the data collection exercise.

Target institutions

This section identifies the ICT sector data that are to be collected to create the indicators presented earlier. Annex A8.3 provides a comprehensive list of the relevant ICT sector institutions across Africa that need to be approached for data collection in this sector. The list is accurate as of March 2011; however, because the sector is constantly evolving, and changes will take place over time, the list provided is intended as general guidance, and should be reviewed and updated, in consultation with sector specialists, before any future data collection exercise.

The target institutions can essentially be divided into four categories:

- *Line ministries* refer to the government ministries responsible for overseeing the ICT sector. They may be a useful source of national-level data on the ICT sector, though they many not necessarily have detailed information at the operator level.
- *Regulators* are public institutions established in countries to oversee service provision. Where they exist, regulators are typically the best single source of information about ICT services at the national level, and may even be able to provide operator-level data.
- *Telecommunications incumbents* refer to the historical fixed-line telephone operators, typically a state-owned enterprise or formerly state-owned enterprise that held a monopoly over national telecommunications services. They are usually the main source of operator-level information on fixed-line telephone services not found elsewhere.
- *Mobile operators* refer to the companies licensed to provide mobile telephony services in the country. They are the main source of operator-level information on mobile telephone services that cannot be found elsewhere. But due to issues of commercial confidentiality, it may not be possible to obtain very detailed data from these operators.

Data templates

Annex A8.4 provides a complete set of data collection templates. The data collection process for the ICT sector divides into a number of parts:

- *National level*. Institutional and quantitative variables are collected at the national level following ICT templates A, B, and C. The best source for this information is the regulator, or the line ministry:
  - ICT template A asks detailed institutional questions that complement more general institutional questions on the ICT institutional framework, defined in Chapter 4.

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the comma-dot or dot-comma convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

Note: For details refer to chapter 2 of the Handbook on Infrastructure Statistics.

  - ICT template B asks institutional questions related to pricing, such as the cost of different types of licenses and wholesale termination prices.
  - ICT template C collects data variables relating to access, technical aspects, and quality.

- *Operator level*. The number of subscribers and staff of each operator (fixed line, mobile, and Internet) are collected following ICT template D. Pricing variables are collected from the largest operator in each of the three main service segments, following ICT templates E (fixed line), F (mobile), and G (internet). Charging structures for telecommunication services are highly complex and vary widely across operators, types of services, times of day, and so on. The pricing indicators aim to cover the most important features of the tariff structure. The best source for this information is the Web site of the respective operator.

Turning to ICT Template A in some detail, there are five blocks of questions covering each of the five sector-specific institutional indices:

- *Competition*: The competition index is composed of the following series of subindices, each of which is based on a specific set of questions.
  - *Licensing*: The components of this subindex explore the extent to which the licensing process is transparent and streamlined.
  - *Competition*: The components of this subindex explore the degree of competition in various market segments such as fixed telephone lines, mobile, and internet.

- *Price regulation*: The price regulation index explores whether there is retail price oversight for fixed telephone, mobile, or internet services.
- *Interconnection*: The interconnection index explores whether there is ex ante regulation of interconnection or whether the regulator only intervenes in response to a formal complaint. It also covers whether interconnection prices are published by either the regulator or by operators through reference interconnection offers (RIOs).
- *Spectrum allocation*: The spectrum allocation index consists of indicators identifying whether spectrum is allocated on a competitive basis and how unlicensed spectrum is treated.
- *Universal service*: The universal service index covers policies for enhancing ICT access such as whether an official definition exists, whether universal service only applies to the incumbent fixed-line operators, and how universal service is financed.

ICT template B covers two groups of institutional indicators that relate to administrative fees and wholesale pricing:

- *License fees*: Most countries license operators to provide telecommunications services. The licenses set out the terms and conditions for the service to be provided. There are a number of fees associated with a license. These include an application fee for applying for the license, an initial up-front one-time fee upon award of the license, and an annual recurring fee.
- *Mobile termination rate*: A growing number of African regulators establish an ex ante ceiling rate for the cost of wholesale termination of calls over voice networks due to market failure among the operators to agree to cost-based rates.

ICT template C covers ICT performance variables. The first block of indicators in ICT template C relates to *access* across the three market segments of fixed telephony, mobile communications, and Internet services:

- *Fixed telephony*: There are two indicators relating to fixed telephone access. One is the number of fixed telephone lines in service. This is the number of fixed telephone subscribers and not the total capacity of the fixed-line telephone network. Fixed telephone lines have traditionally been based on copper wires running to the subscriber's premises. A number of African countries have launched fixed wireless telephone service based on CDMA[20] 2000 1x technology where subscribers can use a portable handset. If use of the handset is restricted to a certain geographical area (that is, allowing only limited mobility) then it is classified as a fixed telephone service. If there is no mobility restriction, then subscribers should be included under mobile subscriptions and not fixed-line subscriptions. The second indicator is the number of public payphones. These include coin- and card-operated public telephones as well as public call offices or telephone centers. In many African countries, public payphone services are also available using mobile communications. In many instances these are provided on an informal basis and there are no administrative records about them. But if records are kept about public mobile telephones, then this should be noted in a comment, including the number of telephones.
- *Mobile communications*: Mobile phones are generally the prevalent method of access to electronic communications. The number of subscriptions and breakdown by modality (that is, prepaid) are important indicators.
- *Internet services*: Refers to indicators associated with access to the internet. This includes the number of subscribers disaggregated by various categories including fixed broadband subscriptions. Another important indicator is the capacity of international bandwidth, expressed in megabits per second (Mbps). The number of users is also important; but in the absence of surveys, this will invariably be an estimate.

The second block of indicators in ICT template C relates to financial aspects of the ICT sector:

- *Revenue*: Refers to revenues earned from the provision of retail telecommunication services.
- *Investment*: Refers to the annual capital expenditure associated with acquiring plant, property, and equipment.

20 Code division multiple access.

The third block of indicators in ICT template C relates to the fixed telephone quality of services:

- *Fixed telephone line faults*: The quality of fixed telephone lines is important in terms of both voice usage and access to the internet.
- *Fixed telephone waiting list*: The length of time to obtain a fixed telephone can be an impediment for business. Although mobile communications are much more prevalent, some consumers, enterprises in particular, desire fixed telephone lines because of their capability to support internet access and because usage tariffs tend to be cheaper than for mobile networks.

The fourth block of indicators in ICT template C relates to technical aspects. The indicators refer to staff for various ICT services that can be used to derive productivity ratios:

- *Staff*: The set of indicators refer to total staff in the telecommunications sector as well as staff supporting fixed-line services and staff supporting mobile services. These refer to staff directly employed by the telecommunications operators.

The fifth block of indicators in ICT template C relates to ICT usage, specifically international telephone traffic.

- *International telephone traffic*: The indicators refer to the volume of incoming and outgoing telephone traffic in minutes of use.

ICT template D covers subscription and staff indicators referring to specific operators. These indicators serve a number of purposes, including the construction of market concentration indexes and, in the absence of national-level statistics compiled by government agencies, aggregation to countrywide indicators. But these uses require the data of all operators providing fixed telephone, mobile, and internet services.

- *Access*: Indicators referring to the number of subscriptions for fixed-line, mobile, and internet operators.
- *Technical*: Indicators referring to the number of staff for fixed-line, mobile, and internet operators.

ICT template E covers retail pricing for fixed telephone services. It refers to the data of the largest operator (measured by the number of subscribers) and is used to represent the country-level data:

- *Pricing*: Fixed telephone line prices consist of one-time, monthly, and usage charges. The pricing data should refer to usage of the copper-wire network for a postpaid user. If there is a difference between residential and business users, then the prices for residential users should be used. Prices should include any applicable taxes.

ICT template F covers retail pricing for mobile prepaid services. It refers to the data of the largest operator (measured by the number of subscribers) and is used to represent the country-level data:

- *Pricing*: Mobile prepaid pricing variables are important indicators for gauging affordability, since the majority of subscribers tend to be prepaid. Pricing structures vary from simple to complex. If there is more than one prepaid plan, the most typical plan should be selected that is aimed at personal (rather than business) users. The tariffs refer to the regular one-minute price (including taxes) charged for different types of calls and therefore should not include discounted calls to friends and family. If there is only one tariff regardless of the destination, then this should be entered for all call types: on-net (to the same mobile network), off-net (to another mobile network), and fixed (to the fixed network). If there is no separate off-peak (for example, evening) or weekend price, then the same price should be entered for peak, evening, and weekend. Discounted prices for different time periods should be entered according to whether they are for the evening or weekend. The price of a single text message sent from a mobile phone to another domestic mobile user should be used. If there are different prices for an SMS depending on peak or off-peak periods or the destination network, then these should be averaged.

ICT template G refers to retail prices for internet access service. It covers fixed broadband services:

- *Price of connection for broadband service*: This refers to the one-off installation charge for fixed broadband service. This should only be entered if it is a mandatory charge and is not refundable.
- *Price of monthly subscription for broadband service*: This refers to the monthly payment for fixed broadband services. If there are multiple packages available, then the cheapest package providing at least 256 kbps download speed should be used.
- *Price-speed to which broadband price data refer (Kbps):* This refers to the download speed of the fixed broadband tariff selected, expressed in kilobits per second (Kbps).

- *Price-monthly cap for broadband service (Mb):* This refers to any monthly cap (limit) on the amount of data that can be downloaded in relation to the fixed broadband plan selected, expressed in megabits (Mb). Explain the procedure for exceeding the cap in the comments (for example, additional applicable charges, reduced download speed, suspended service, and so on). If there are different caps for national and international data (that is, information downloaded from sites hosted within or outside the country), then use the cap for international downloads.

Supporting documents

Important source documents for the completion of the templates include the annual reports of the regulatory authority and telecommunications operators. Given that many operators across Africa belong to multinational groups (for example, France Telecom, MTN, Vodacom, and so on), many individual mobile operators do not publish annual reports. Instead, you can obtain data about the mobile operators from the annual reports of the parent entity. It is valuable to collect and archive these annual reports as supporting documentation for the templates themselves.

Two additional sources that support completion of the templates include:

- *Regulator Web site*. The regulator's web site will in some countries contain institutional information about the licensing process and fees, licenses issued, price regulation and interconnection practices, spectrum administration, and universal services that can be helpful in completing ICT templates A and B. Some regulators also have sector statistics on their web sites that will be helpful in completing ICT template C.
- *Published tariff schedules*. Most operators publish tariff information on their web sites. The tariff of the largest operator (measured by the number of subscriptions) is used to complete the tariff templates for fixed, mobile, and internet retail prices.

Data from secondary sources

Much of the data needed to produce ICT indicators come directly from the field, but a number of variables are also available directly from secondary sources. Table 8.3 identifies these variables and their corresponding sources. They relate to household and enterprise surveys and provide an important complement to data reported directly by regulators or operators. The ITU also publishes information on the ICT sector (www.itu.int/ITU-D/icteye/) that can be used to supplement or verify the data.

Table 8.3 List of ICT sector complementary data variables and sources

Policy Code	Variable	Source
Access	Population with access to fixed-line telephone	Demographic and Health Surveys Multiple Indicator Cluster Surveys National Household Surveys (http://www.measuredhs.com) (http://www.childinfo.org/mics3_surveys.html)
Access	Population with access to cellular telephone	
Affordability	Household spending on ICT	Living Standards Measurement Surveys (Household Budget Surveys) (http://iresearch.worldbank.org/lsms/lsmssurveyFinder.htm)
Technical	Delay in obtaining a connection (days)	World Bank Investment Climate Assessment Surveys (http://www.enterprisesurveys.org)
Technical	Firms that find ICT a constraint for business (% firms)	

Source: Author's own compilation.

Note: ICT = information and communication technology.

A8. Annexes to Chapter 8: Information and Communication Technology

Annex A8.1 Comprehensive list of indicators and definitions—ICT

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Access	i013	Population access to cell phone—Capital city (% population)	Share of the population living in the capital city that has access to a cell phone.	National	HH Database	
	i010	Population access to cell phone—National (% population)	Share of the national population that has access to a cell phone.	National	HH Database	
	i014	Population access to cell phone—Quintile 1 (% population)	Population in the first budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i015	Population access to cell phone—Quintile 2 (% population)	Population in the second budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i016	Population access to cell phone—Quintile 3 (% population)	Population in the third budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i017	Population access to cell phone—Quintile 4 (% population)	Population in the fourth budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i018	Population access to cell phone—Quintile 5 (% population)	Population in the fifth budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i011	Population access to cell phone—Rural (% population)	Share of the population living in rural areas that has access to a cell phone.	National	HH Database	
	i012	Population access to cell phone—Urban (% population)	Share of the population living in urban areas that has access to a cell phone.	National	HH Database	
	i004	Population access to landline telephone—Capital city (% population)	Share of the population living in the capital city that has access to a landline telephone.	National	HH Database	
	i001	Population access to landline telephone—National (% population)	Share of the population that has access to a landline telephone.	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Access	i005	Population access to landline telephone—Quintile 1 (% population)	Population in the first budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i006	Population access to landline telephone—Quintile 2 (% population)	Population in the second budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i007	Population access to landline telephone—Quintile 3 (% population)	Population in the third budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i008	Population access to landline telephone—Quintile 4 (% population)	Population in the fourth budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i009	Population access to landline telephone—Quintile 5 (% population)	Population in the fifth budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i002	Population access to landline telephone—Rural (% population)	Share of the population living in rural areas that has access to a landline telephone.	National	HH Database	
	i003	Population access to landline telephone—Urban (% population)	Share of the population living in urban areas that has access to a landline telephone.	National	HH Database	
	i162	Population take-up of landline telephones—Urban (% population)	Share of the urban population living in communities or clusters where landline telephone is available that actually is connected and uses the service.	National	HH Database	
	HHICT 013	HH with computer—National (% of HH)	Percentage of households with a computer (in the entire country).	National	National Statistical Office	
	HHICT 015	HH with computer— Rural (% of HH)	Percentage of households with a computer (in rural areas).	National	National Statistical Office	
	HHICT 014	HH with computer—Urban (% of HH)	Percentage of households with a computer (in urban areas).	National	National Statistical Office	
	HHICT 007	HH with fixed telephone — National (% of HH)	Percentage of households with a fixed telephone (in the entire country).	National	National Statistical Office	
	HHICT 009	HH with fixed telephone — Rural (% of HH)	Percentage of households with a fixed telephone (in rural areas).	National	National Statistical Office	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Access	HHICT 008	HH with fixed telephone — Urban (% of HH)	Percentage of households with a fixed telephone (in urban areas).	National	National Statistical Office	
	HHICT 016	HH with Internet access — National (% of HH)	Percentage of households with Internet access at home (in the entire country).	National	National Statistical Office	
	HHICT 018	HH with Internet access — Rural (% of HH)	Percentage of households with Internet access at home (in rural areas).	National	National Statistical Office	
	HHICT 017	HH with Internet access — Urban (% of HH)	Percentage of households with Internet access at home (in urban areas).	National	National Statistical Office	
	HHICT 010	HH with mobile phone—National (% of HH)	Percentage of households with a mobile phone (in the entire country).	National	National Statistical Office	
	HHICT 012	HH with mobile phone—Rural (% of HH)	Percentage of households with a mobile phone (in rural areas).	National	National Statistical Office	
	HHICT 011	HH with mobile phone—Urban (% of HH)	Percentage of households with a mobile phone (in urban areas).	National	National Statistical Office	
	HHICT 001	HH with radio—National (% of HH)	Percentage of households with a radio (in the entire country).	National	National Statistical Office	
	HHICT 003	HH with radio—Rural (% of HH)	Percentage of households with a radio (in rural areas).	National	National Statistical Office	
	HHICT 002	HH with radio—Urban (% of HH)	Percentage of households with a radio (in urban areas).	National	National Statistical Office	
	HHICT 004	HH with TV—National (% of HH)	Percentage of households with a television (in the entire country).	National	National Statistical Office	
	HHICT 006	HH with TV—Rural (% of HH)	Percentage of households with a television (in rural areas).	National	National Statistical Office	
	HHICT 005	HH with TV—Urban (% of HH)	Percentage of households with a television (in urban areas).	National	National Statistical Office	
	AFNAT 169	Public payphones (% of main lines)	Public telephones divided by fixed telephone lines.	National	See formula	AFNAT170/ AFNAT146
	AFNAT 170	Public payphones (number)	Number of public payphones available in the country.	National	ICT Template C	
	AFNAT 171	Public payphones (per 1,000 inhabitants)	Public payphones divided by population multiplied by 1,000.	National	See formula	AFNAT170/ x001*1000
	AFUT146	Fixed telephone lines (number)	Number of main telephone lines (or fixed lines) that are in operation.	Operator	ICT Template D	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Access	AFNAT 143	Fixed telephone lines (per 100 inhabitants)	Fixed telephone lines divided by population multiplied by 100.	National	See formula	AFNAT146/ population*100
	AFNAT 146	Fixed telephone lines in operation (number)	Number of main telephone lines (or fixed lines) that are in operation.	National	ICT Template C	
	AFNAT 183	Internet broadband subscriptions (per 100 inhabitants)	Fixed Internet broadband subscriptions divided by population multiplied by 100.	National	See formula	AFNAT185/ x001*100
	AFNAT 185	Internet fixed broadband subscriptions (number)	Number of subscriptions to Internet service using high-speed broadband connections.	National	ICT Template C	
	AFNAT 186	Internet international bandwidth (Mbps)	Total capacity of international Internet bandwidth. If capacity is asymmetric—that is, more incoming calls than outgoing—the incoming capacity should be provided.	National	ICT Template C	
	AFNAT 187	Internet international bandwidth (per capita)	International Internet bandwidth divided by population. As Internet bandwidth is expressed in Mbps it should be multiplied by 1,000,000 before carrying out calculation.	National	See formula	AFNAT 186*1000000/ x001
	AFUT191	Internet subscriptions (number)	Number of subscriptions to Internet service.	Operator	ICT Template D	
	AFNAT 191	Internet subscriptions (people)	Number of subscriptions to Internet service.	National	ICT Template C	
	AFNAT 192	Internet subscriptions (per 100 inhabitants)	Internet subscriptions divided by population multiplied by 100.	National	See formula	AFNAT191/ x001*100
	AFNAT 193	Internet users (Number)	Number of Internet users, including those that do not hold a subscription but access through public facilities such as Internet cafés and telecenters, often estimated through national surveys.	National	ICT Template C	
	AFNAT 193n	Internet users (per 100 inhabitants)	Number of Internet users, including those that do not hold a subscription but access through public facilities such as Internet cafés and telecenters, often estimated through national surveys.	National	See formula	AFNAT193/ x001*100
	AFNAT 137	Mobile network coverage (% of population)	Percentage of the population able to receive a mobile cellular network signal where they live.	National	GSM Association	
	AFNAT 163	Mobile subscriptions—Prepaid (number)	Number of subscriptions to mobile telephone service using prepaid cards.	National	ICT Template C	
	AFNAT 155	Mobile subscriptions (% of total telephone subscriptions)	Mobile subscriptions divided by sum of fixed and mobile telephone subscriptions.	National	See formula	AFNAT157/ (AFNAT157 +AFNAT146)
	AFNAT 158	Mobile subscriptions (per 100 inhabitants)	Mobile subscriptions divided by population multiplied by 100.	National	See formula	AFNAT157/ x001*100
	AFNAT 162	Mobile subscriptions, prepaid (% of total mobile subscriptions)	Prepaid mobile subscriptions divided by total mobile subscriptions.	National	See formula	AFNAT163/ AFNAT157

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Access	AFNAT 157	Mobile telephone subscriptions (number)	Number of subscriptions to mobile telephone services.	National	ICT Template C	
				Operator	ICT Template C	
	AFNAT 179	Telephone subscriptions total (per 100 inhabitants)	Fixed and mobile telephone subscriptions divided by population multiplied by 100.	National	See formula	(AFNA T157+ AFNAT146)/ x001 *100
Affordability	i099	HH spending on cell phone—National (% HH spending)	Household spending on cell phone as a share of monthly household spending.	National	HH Database	
	i020	HH spending on cell phone—National (2002 US$)	Monthly household spending on a cell phone at the national level, expressed in US$.	National	HH Database	
	i019	HH spending on cell phone—National (local currency unit, LCU)	Monthly household spending on a cell phone at the national level, expressed in LCUs.	National	HH Database	
	i102	HH spending on cell phone—Quintile 1 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i026	HH spending on cell phone—Quintile 1 (2002 US$)	Monthly household spending on a cell phone by the first (and poorest) budget quintile of the population.	National	HH Database	
	i025	HH spending on cell phone—Quintile 1 (LCU)	Household spending on a cell phone in the first (poorest) quintile, expressed in LCUs.	National	HH Database	
	i103	HH spending on cell phone—Quintile 2 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i028	HH spending on cell phone—Quintile 2 (2002 US$)	Monthly household spending on a cell phone by the second budget quintile of the population.	National	HH Database	
	i027	HH spending on cell phone—Quintile 2 (LCU)	Household spending on a cell phone in the second budget quintile, expressed in LCUs.	National	HH Database	
	i104	HH spending on cell phone—Quintile 3 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i030	HH spending on cell phone—Quintile 3 (2002 US$)	Monthly household spending on a cell phone by the third budget quintile of the population.	National	HH Database	
	i029	HH spending on cell phone—Quintile 3 (LCU)	Household spending on a cell phone in the third budget quintile, expressed in LCUs.	National	HH Database	
	i105	HH spending on cell phone—Quintile 4 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i032	HH spending on cell phone—Quintile 4 (2002 US$)	Monthly household spending on a cell phone by the fourth budget quintile of the population.	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Affordability	i031	HH spending on cell phone—Quintile 4 (LCU)	Household spending on a cell phone in the fourth budget quintile, expressed in LCUs.	National	HH Database	
	i106	HH spending on cell phone—Quintile 5 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i034	HH spending on cell phone—Quintile 5 (2002 US$)	Monthly household spending on a cell phone by the fifth (and richest) budget quintile of the population.	National	HH Database	
	i033	HH spending on cell phone—Quintile 5 (LCU)	Household spending on a cell phone in the fifth (richest) quintile, expressed in LCUs.	National	HH Database	
	i100	HH spending on cell phone—Rural (% HH spending)	Household spending on cell phone as a share of monthly household spending in rural areas.	National	HH Database	
	i024	HH spending on cell phone—Rural (2002 US$)	Monthly household spending on a cell phone in rural areas, expressed in US$.	National	HH Database	
	i023	HH spending on cell phone—Rural (LCU)	Monthly household spending on a cell phone in rural areas, expressed in LCUs.	National	HH Database	
	i101	HH spending on cell phone—Urban (% HH spending)	Household spending on cell phone as a share of monthly household spending in urban areas.	National	HH Database	
	i022	HH spending on cell phone—Urban (2002 US$)	Monthly household spending on a cell phone in urban areas, expressed in US$.	National	HH Database	
	i021	HH spending on cell phone—Urban (LCU)	Monthly household spending on a cell phone in urban areas, expressed in LCUs.	National	HH Database	
	i115	HH spending on landline telephone—National (% HH spending)	Household spending on landline telephone as a share of monthly household spending.	National	HH Database	
	i164	HH spending on landline telephone—National (2002 US$)	Monthly household spending on a landline telephone for the national level, expressed in US$.	National	HH Database	
	i163	HH spending on landline telephone—National (LCU)	Monthly household spending on a landline telephone at the national level, expressed in LCUs.	National	HH Database	
	i118	HH spending on landline telephone—Quintile 1 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i170	HH spending on landline telephone—Quintile 1 (2002 US$)	Monthly household spending on a landline telephone by the first (and poorest) budget quintile of the population.	National	HH Database	
	i169	HH spending on landline telephone—Quintile 1 (LCU)	Household spending on a landline telephone in the first (poorest) quintile, expressed in LCUs.	National	HH Database	
	i119	HH spending on landline telephone—Quintile 2 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i172	HH spending on landline telephone—Quintile 2 (2002 US$)	Monthly household spending on a landline telephone by the second budget quintile of the population.	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Affordability	i171	HH spending on landline telephone—Quintile 2 (LCU)	Household spending on a landline telephone in the second budget quintile, expressed in LCUs.	National	HH Database	
	i120	HH spending on landline telephone—Quintile 3 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i174	HH spending on landline telephone—Quintile 3 (2002 US$)	Monthly household spending on a landline telephone by the third budget quintile of the population.	National	HH Database	
	i173	HH spending on landline telephone—Quintile 3 (LCU)	Household spending on a landline telephone in the third budget quintile, expressed in LCUs.	National	HH Database	
	i121	HH spending on landline telephone—Quintile 4 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i176	HH spending on landline telephone—Quintile 4 (2002 US$)	Monthly household spending on a landline telephone by the fourth budget quintile of the population.	National	HH Database	
	i175	HH spending on landline telephone—Quintile 4 (LCU)	Household spending on a landline telephone in the fourth budget quintile, expressed in LCUs.	National	HH Database	
	i122	HH spending on landline telephone—Quintile 5 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i178	HH spending on landline telephone—Quintile 5 (2002 US$)	Monthly household spending on a landline telephone by the fifth (and richest) budget quintile of the population.	National	HH Database	
	i177	HH spending on landline telephone—Quintile 5 (LCU)	Household spending on a landline telephone in the fifth (richest) quintile, expressed in LCUs.	National	HH Database	
	i116	HH spending on landline telephone—Rural (% HH spending)	Household spending on landline telephone as a share of monthly household spending in rural areas.	National	HH Database	
	i168	HH spending on landline telephone—Rural (2002 US$)	Monthly household spending on a landline telephone in rural areas, expressed in US$.	National	HH Database	
	i167	HH spending on landline telephone—Rural (LCU)	Monthly household spending on a landline telephone in rural areas, expressed in LCUs.	National	HH Database	
	i117	HH spending on landline telephone—Urban (% HH spending)	Household spending on landline telephone as a share of monthly household spending in urban areas.	National	HH Database	
	i166	HH spending on landline telephone—Urban (2002 US$)	Monthly household spending on a landline telephone in urban areas, expressed in US$.	National	HH Database	
	i165	HH spending on landline telephone—Urban (LCU)	Monthly household spending on a landline telephone in urban areas, expressed in LCUs.	National	HH Database	
	i123	HH spending on network services—National (% HH spending)	Household spending on network services as a share of monthly household spending.	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Affordability	i052	HH spending on network services—National (2002 US$)	Monthly household spending network services for the national level, expressed in US$.	National	HH Database	
	i051	HH spending on network services—National (LCU)	Monthly household spending on network services at the national level, expressed in LCUs.	National	HH Database	
	i126	HH spending on network services—Quintile 1 (% HH spending)	Household spending on network services as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i058	HH spending on network services—Quintile 1 (2002 US$)	Monthly household spending on network services by the first (and poorest) budget quintile of the population.	National	HH Database	
	i057	HH spending on network services—Quintile 1 (LCU)	Household spending on network services in the first (poorest) quintile, expressed in LCUs.	National	HH Database	
	i127	HH spending on network services—Quintile 2 (% HH spending)	Household spending on network services as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i060	HH spending on network services—Quintile 2 (2002 US$)	Monthly household spending on network services by the second budget quintile of the population.	National	HH Database	
	i059	HH spending on network services—Quintile 2 (LCU)	Household spending on network services the second budget quintile, expressed in LCUs.	National	HH Database	
	i128	HH spending on network services—Quintile 3 (% HH spending)	Household spending on network services as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i062	HH spending on network services—Quintile 3 (2002 US$)	Monthly household spending on network services by the third budget quintile of the population.	National	HH Database	
	i061	HH spending on network services—Quintile 3 (LCU)	Household spending on network services in the third budget quintile, expressed in LCUs.	National	HH Database	
	i129	HH spending on network services—Quintile 4 (% HH spending)	Household spending on network services as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i064	HH spending on network services—Quintile 4 (2002 US$)	Monthly household spending on network services by the fourth budget quintile of the population.	National	HH Database	
	i063	HH spending on network services—Quintile 4 (LCU)	Household spending on network services in the fourth budget quintile, expressed in LCUs.	National	HH Database	
	i130	HH spending on network services—Quintile 5 (% HH spending)	Household spending on network services as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i066	HH spending on network services—Quintile 5 (2002 US$)	Monthly household spending on network services by the fifth (and richest) budget quintile of the population.	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Affordability	i065	HH spending on network services—Quintile 5 (LCU)	Household spending on network services in the fifth (richest) quintile, expressed in LCUs.	National	HH Database	
	i124	HH spending on network services—Rural (% HH spending)	Household spending on network services as a share of monthly household spending in rural areas.	National	HH Database	
	i056	HH spending on network services—Rural (2002 US$)	Monthly household spending on network services in rural areas, expressed in US$.	National	HH Database	
	i055	HH spending on network services—Rural (LCU)	Monthly household spending on network services in rural areas, expressed in LCUs.	National	HH Database	
	i125	HH spending on network services—Urban (% HH spending)	Household spending on network services as a share of monthly household spending in urban areas.	National	HH Database	
	i054	HH spending on network services—Urban (2002 US$)	Monthly household spending on network services in urban areas, expressed in US$.	National	HH Database	
	i053	HH spending on network services—Urban (LCU)	Monthly household spending on network services in urban areas, expressed in LCUs.	National	HH Database	
	i131	HH spending on non-network services—National (% HH spending)	Household spending on non-network services as a share of monthly household spending.	National	HH Database	
	i068	HH spending on non-network services—National (2002 US$)	Monthly household spending on non-network services at the national level, expressed in US$.	National	HH Database	
	i067	HH spending on non-network services—National (LCU)	Monthly household spending on non-network services at the national level, expressed in LCUs.	National	HH Database	
	i134	HH spending on non-network services—Quintile 1 (% HH spending)	Household spending on non-network services as a share of total household spending for people in the first budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i074	HH spending on non-network services—Quintile 1 (2002 US$)	Monthly household spending on non-network services by the first (and poorest) budget quintile of the population.	National	HH Database	
	i073	HH spending on non-network services—Quintile 1 (LCU)	Household spending on non-network services in the first (poorest) quintile, expressed in LCUs.	National	HH Database	
	i135	HH spending on non-network services—Quintile 2 (% HH spending)	Household spending on non-network services as a share of total household spending for people in the second budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i076	HH spending on non-network services—Quintile 2 (2002 US$)	Monthly household spending on non-network services by the second budget quintile of the population.	National	HH Database	
	i075	HH spending on non-network services—Quintile 2 (LCU)	Household spending on non-network services by the second budget quintile, expressed in LCUs.	National	HH Database	
	i136	HH spending on non-network services—Quintile 3 (% HH spending)	Household spending on non-network services as a share of total household spending for people in the third budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Affordability	i078	HH spending on non-network services—Quintile 3 (2002 US$)	Monthly household spending on non-network services by the third budget quintile of the population.	National	HH Database	
	i077	HH spending on non-network services—Quintile 3 (LCU)	Household spending on non-network services in the third budget quintile, expressed in LCUs.	National	HH Database	
	i137	HH spending on non-network services—Quintile 4 (% HH spending)	Household spending on non-network services as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i080	HH spending on non-network services—Quintile 4 (2002 US$)	Monthly household spending on non-network services by the fourth budget quintile of the population.	National	HH Database	
	i079	HH spending on non-network services—Quintile 4 (LCU)	Household spending on non-network services in the fourth budget quintile, expressed in LCUs.	National	HH Database	
	i138	HH spending on non-network services—Quintile 5 (% HH spending)	Household spending on non-network services as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest; fifth budget quintile: richest).	National	HH Database	
	i082	HH spending on non-network services—Quintile 5 (2002 US$)	Monthly household spending on non-network services by the fifth (and richest) budget quintile of the population.	National	HH Database	
	i081	HH spending on non-network services—Quintile 5 (LCU)	Household spending on non-network services in the fifth (richest) quintile, expressed in LCUs.	National	HH Database	
	i132	HH spending on non-network services—Rural (% HH spending)	Household spending on non-network services as a share of monthly household spending in rural areas.	National	HH Database	
	i072	HH spending on non-network services—Rural (2002 US$)	Monthly household spending on non-network services in rural areas, expressed in US$.	National	HH Database	
	i071	HH spending on non-network services—Rural (LCU)	Monthly household spending on non-network services in rural areas, expressed in LCUs.	National	HH Database	
	i133	HH spending on non-network services—Urban (% HH spending)	Household spending on non-network services as a share of monthly household spending in urban areas.	National	HH Database	
	i070	HH spending on non-network services—Urban (2002 US$)	Monthly household spending on non-network services in urban areas level, expressed in US$.	National	HH Database	
	i069	HH spending on non-network services—Urban (LCU)	Monthly household spending on non-network services in urban areas, expressed in LCUs.	National	HH Database	
	AFNAT 177	Price basket fixed telephone (% of per capita income)	Fixed telephone basket divided by per capita income/12.	National	See formula	AFNAT-168bis*12/(x002/x001)
	AFNAT 188	Price basket Internet (% of per capita income)	Internet price basket divided by per capita income/12.	National	See formula	AFNAT-187bis*12/(x002/x001)
	AFNAT 154	Price basket mobile (% of per capita income)	Mobile basket divided by per capita income/12.	National	See formula	AFNAT-161bis*12/(x002/x001)

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Financial	AFNAT 138	Fixed line: Average revenue per user (ARPU) (US$ per user)	Fixed telephone revenue divided by fixed telephone subscriptions/12.	National	See formula	AFNAT175/ AVERAGE (AFNAT-146year, AFNAT-146year-1)/ x003
	AFNAT 151	Mobile: ARPU (US$ per user)	Mobile revenues divided by mobile subscriptions/12 (US$).	National	See formula	AFNAT174/ AVERAGE(AFNAT-157year, AFNAT-157year-1)/ x003
	AFNAT 152	Investment—Mobile communications (LCU)	Annual investment on equipment for mobile communication networks, expressed in LCUs.	National	ICT Template C	
	AFNAT 152-d	Investment—Mobile communications (US$)	Annual investment on equipment for mobile communication networks, expressed in US$.	National	See formula	[AFNAT152/ x003]
	AFNAT-add212	Investment in telecom (LCU)	Annual gross annual investment (or capital expenditure) in telecommunications (including fixed, mobile, and other services) for acquiring property and network intended for public use, expressed in LCUs.	National	ICT Template C	
	AFNAT add212-d	Investment in telecom (US$)	Annual gross annual investment (or capital expenditure) in telecommunications (including fixed, mobile, and other services) for acquiring property and networks intended for public use, expressed in US$.	National	See formula	[AFNAT-add212/x003]
	AFNAT-add215	Revenue—Telecommunication total (% of GDP)	Telecommunications revenues divided by gross domestic product.	National	See formula	AFNATadd216/ x002
	AFNAT-add216	Revenue from all telecom services (LCU)	Annual (gross) telecommunications revenue earned from all (fixed, mobile, and data) services, excluding revenues from non-telecommunications services, expressed in LCUs.	National	ICT Template C	
	AFNAT add216-d	Revenue from all telecom services (US$)	Annual (gross) telecommunications revenue earned from all (fixed, mobile, and data) services, excluding revenues from non-telecommunications services, expressed in US$.	National	See formula	[AFNAT-add216/x003]
	AFNAT 174	Revenue from mobile communications (LCU)	Annual revenue received from of all types of mobile communications services, including cellular, private trunked radio, and radio paging, expressed in LCUs.	National	ICT Template C	
	AFNAT 174-d	Revenue from mobile communications (US$)	Annual revenue received from of all types of mobile communications services, including cellular, private trunked radio, and radio paging, expressed in US$.	National	See formula	[AFNAT174/ x003]
	AFNAT 175	Revenue from telephone service (LCU)	Annual revenue received from fixed telephone connection, subscription, and calls, expressed in LCUs.	National	ICT Template C	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Financial	AFNAT 175-d	Revenue from telephone service (US$)	Annual revenue received from fixed telephone connections, subscription, and calls, expressed in US$.	National	See formula	[AFNAT175/x003]
Pricing	ti032	License annual fee—fixed (LCU)	Fee charged annually by authorities for holding fixed service license.	National	ICT Template B	
	ti032d	License annual fee—fixed (US$)	Fee charged annually by authorities for holding fixed service license.	National	See formula	ti032/x003
	ti041	License annual fee—International data gateway (LCU)	Fee charged annually by authorities for holding international voice gateway license.	National	ICT Template B	
	ti041d	License annual fee—International data gateway (US$)	Fee charged annually by authorities for holding international voice gateway license.	National	See formula	ti041/x003
	ti038	License annual fee—International voice gateway (LCU)	Fee charged annually by authorities for holding international voice gateway license.	National	ICT Template B	
	ti038d	License annual fee—International voice gateway (US$)	Fee charged annually by authorities for holding international voice gateway license.	National	See formula	ti038/x003
	ti035	License annual fee—Mobile (LCU)	Fee charged annually by authorities for holding mobile service license.	National	ICT Template B	
	ti035d	License annual fee—Mobile (US$)	Fee charged annually by authorities for holding mobile service license.	National	See formula	ti035/x003
	ti030	License application fee—fixed (LCU)	Fee charged by authorities to apply for a fixed service license.	National	ICT Template B	
	ti030d	License application fee—fixed (US$)	Fee charged by authorities to apply for a fixed service license.	National	See formula	ti030/x003
	ti039	License application fee—International data gateway (LCU)	Fee charged by authorities to apply for an international voice gateway license.	National	ICT Template B	
	ti039d	License application fee—International data gateway (US$)	Fee charged by authorities to apply for an international voice gateway license.	National	See formula	ti039/x003
	ti036	License application fee—International voice gateway (LCU)	Fee charged by authorities to apply for an international voice gateway license.	National	ICT Template B	
	ti036d	License application fee—International voice gateway (US$)	Fee charged by authorities to apply for an international voice gateway license.	National	See formula	ti036/x003
	ti033	License application fee—Mobile (LCU)	Fee charged by authorities to apply for a mobile service license.	National	ICT Template B	
	ti033d	License application fee—Mobile (US$)	Fee charged by authorities to apply for a mobile service license.	National	See formula	ti033/x003
	ti031	License initial fee—Fixed (LCU)	Fee charged by authorities when fixed service license is first awarded.	National	ICT Template B	
	ti031d	License initial fee—Fixed (US$)	Fee charged by authorities when fixed service license is first awarded.	National	See formula	ti031/x003
	ti040	License initial fee—International data gateway (LCU)	Fee charged by authorities when international voice gateway license is first awarded.	National	ICT Template B	
	ti040d	License initial fee—International data gateway (US$)	Fee charged by authorities when international voice gateway license is first awarded.	National	See formula	ti040/x003
	ti037	License initial fee—International voice gateway (LCU)	Fee charged by authorities when international voice gateway license is first awarded.	National	ICT Template B	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	ti037d	License initial fee—International voice gateway (US$)	Fee charged by authorities when international voice gateway license is first awarded.	National	See formula	ti037/x003
	ti034	License initial fee—Mobile (LCU)	Fee charged by authorities when mobile service license is first awarded.	National	ICT Template B	
	ti034d	License initial fee—Mobile (US$)	Fee charged by authorities when mobile service license is first awarded.	National	See formula	ti034/x003
	AFNAT-161bis	Prepaid mobile monthly price basket (LCU)	Price for 25 calls per month spread over the same mobile network, other mobile networks, and mobile to fixed calls, and during peak, off-peak, and weekend times. The basket also includes the price of 30 text messages per month, expressed in LCUs. Based on the original OECD low user basket methodology.	National	ICT Template E	
	AFNAT 161	Prepaid mobile monthly price basket (US$)	Price for 25 calls per month spread over the same mobile network, other mobile networks, and mobile to fixed calls, and during peak, off-peak, and weekend times. The basket also includes the price of 30 text messages per month, expressed in US$. Based on the original OECD low user basket methodology.	National	See formula	AFNAT161bis /x003
	AFNAadd217a1	Price of a 3-minute call to Algeria (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA ad d217a1-d	Price of a 3-minute call to Algeria (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a1/x003]
	AFNAadd217a2	Price of a 3-minute call to Angola (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNAadd 217a2-d	Price of a 3-minute call to Angola (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a2/x003]
	AFNAadd217a3	Price of a 3-minute call to Benin (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNAadd 217a3-d	Price of a 3-minute call to Benin (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a3/x003]
	AFNAadd217a4	Price of a 3-minute call to Botswana (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a4-d	Price of a 3-minute call to Botswana (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a4/x003]
	AFNA add 217a5	Price of a 3-minute call to Burkina Faso (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a5-d	Price of a 3-minute call to Burkina Faso (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a5/x003]
	AFNA add 217a6	Price of a 3-minute call to Burundi (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a6-d	Price of a 3-minute call to Burundi (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a6/x003]
	AFNA add 217a7	Price of a 3-minute call to Cameroon (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a7-d	Price of a 3-minute call to Cameroon (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a7/x003]
	AFNA add 217a8	Price of a 3-minute call to Cape Verde (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a8-d	Price of a 3-minute call to Cape Verde (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a8/x003]
	AFNA add 217a9	Price of a 3-minute call to Central African Republic (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a9-d	Price of a 3-minute call to Central African Republic (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a9/x003]
	AFNA add 217a10	Price of a 3-minute call to Chad (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a10-d	Price of a 3-minute call to Chad (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a10/x003]
	AFNA add 217a11	Price of a 3-minute call to Comoros (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a11-d	Price of a 3-minute call to Comoros (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a11/x003]
	AFNA add 217a12	Price of a 3-minute call to the Democratic Republic of Congo (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a12-d	Price of a 3-minute call to the Democratic Republic of Congo (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a12/x003]
	AFNA add 217a13	Price of a 3-minute call to the Republic of Congo (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a13-d	Price of a 3-minute call to the Republic of Congo (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a13/x003]
	AFNA add 217a14	Price of a 3-minute call to Côte d'Ivoire (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a14-d	Price of a 3-minute call to Côte d'Ivoire (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a14/x003]
	AFNA add 217a15	Price of a 3-minute call to Djibouti (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a15-d	Price of a 3-minute call to Djibouti (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a15/x003]
	AFNA add 217a16	Price of a 3-minute call to Egypt (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a16-d	Price of a 3-minute call to Egypt (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a16/x003]
	AFNA add 217a17	Price of a 3-minute call to Equatorial Guinea (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a17-d	Price of a 3-minute call to Equatorial Guinea (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a17/x003]
	AFNA add 217a18	Price of a 3-minute call to Eritrea (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a18-d	Price of a 3-minute call to Eritrea (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a18/x003]
	AFNA add 217a19	Price of a 3-minute call to Ethiopia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a19-d	Price of a 3-minute call to Ethiopia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a19/x003]
	AFNA add 217a20	Price of a 3-minute call to Gabon (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a20-d	Price of a 3-minute call to Gabon (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a20/x003]
	AFNA add 217a22	Price of a 3-minute call to Ghana (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a22-d	Price of a 3-minute call to Ghana (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a22/x003]
	AFNA add 217a23	Price of a 3-minute call to Guinea (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a23-d	Price of a 3-minute call to Guinea (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a23/x003]
	AFNA add 217a24	Price of a 3-minute call to Guinea-Bissau (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a24-d	Price of a 3-minute call to Guinea-Bissau (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a24/x003]
	AFNA add 217a25	Price of a 3-minute call to Kenya (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a25-d	Price of a 3-minute call to Kenya (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a25/x003]
	AFNA add 217a26	Price of a 3-minute call to Lesotho (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a26-d	Price of a 3-minute call to Lesotho (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a26/x003]
	AFNA add 217a27	Price of a 3-minute call to Liberia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a27-d	Price of a 3-minute call to Liberia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a27/x003]
	AFNA add 217a28	Price of a 3-minute call to Libya (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a28-d	Price of a 3-minute call to Libya (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a28/x003]
	AFNA add 217a29	Price of a 3-minute call to Madagascar (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a29-d	Price of a 3-minute call to Madagascar (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a29/x003]
	AFNA add 217a30	Price of a 3-minute call to Malawi (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a30-d	Price of a 3-minute call to Malawi (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a30/x003]
	AFNA add 217a31	Price of a 3-minute call to Mali (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a31-d	Price of a 3-minute call to Mali (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a31/x003]
	AFNA add 217a32	Price of a 3-minute call to Mauritania (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a32-d	Price of a 3-minute call to Mauritania (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a32/x003]
	AFNA add 217a33	Price of a 3-minute call to Mauritius (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a33-d	Price of a 3-minute call to Mauritius (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a33/x003]
	AFNA add 217a35	Price of a 3-minute call to Morocco (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a35-d	Price of a 3-minute call to Morocco (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a35/x003]
	AFNA add 217a36	Price of a 3-minute call to Mozambique (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a36-d	Price of a 3-minute call to Mozambique (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a36/x003]
	AFNA add 217a37	Price of a 3-minute call to Namibia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a37-d	Price of a 3-minute call to Namibia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a37/x003]
	AFNA add 217a38	Price of a 3-minute call to Niger (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a38-d	Price of a 3-minute call to Niger (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a38/x003]
	AFNA add 217a39	Price of a 3-minute call to Nigeria (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a39-d	Price of a 3-minute call to Nigeria (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a39/x003]
	AFNA add 217a40	Price of a 3-minute call to Rwanda (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a40-d	Price of a 3-minute call to Rwanda (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a40/x003]
	AFNA add 217a41	Price of a 3-minute call to São Tomé and Principe (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a41-d	Price of a 3-minute call to São Tomé and Principe (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a41/x003]
	AFNA add 217a42	Price of a 3-minute call to Senegal (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a42-d	Price of a 3-minute call to Senegal (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a42/x003]
	AFNA add 217a43	Price of a 3-minute call to Seychelles (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a43-d	Price of a 3-minute call to Seychelles (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a43/x003]
	AFNA add 217a44	Price of a 3-minute call to Sierra Leone (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a44-d	Price of a 3-minute call to Sierra Leone (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a44/x003]
	AFNA add 217a45	Price of a 3-minute call to Somalia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a45-d	Price of a 3-minute call to Somalia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a45/x003]
	AFNA add 217a46	Price of a 3-minute call to South Africa (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a46-d	Price of a 3-minute call to South Africa (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a46/x003]
	AFNA add 217a47	Price of a 3-minute call to Sudan (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a47-d	Price of a 3-minute call to Sudan (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a47/x003]
	AFNA add 217a48	Price of a 3-minute call to Swaziland (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNA add 217a48-d	Price of a 3-minute call to Swaziland (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a48/x003]
	AFNA add 217a49	Price of a 3-minute call to Tanzania (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a49-d	Price of a 3-minute call to Tanzania (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a49/x003]
	AFNA add 217a21	Price of a 3-minute call to The Gambia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a21-d	Price of a 3-minute call to The Gambia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a21/x003]
	AFNA add 217a50	Price of a 3-minute call to Togo (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a50-d	Price of a 3-minute call to Togo (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a50/x003]
	AFNA add 217a51	Price of a 3-minute call to Tunisia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a51-d	Price of a 3-minute call to Tunisia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a51/x003]
	AFNA add 217a52	Price of a 3-minute call to Uganda (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a52-d	Price of a 3-minute call to Uganda (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a52/x003]
	AFNAT 164	Price of a 3-minute call to the United States (US$)	Price of a 3-minute telephone call to the United States, expressed in US$.	National	See formula	AFNAT165/x003
	AFNAT 165	Price of a 3-minute call to the United States (LCU)	Price of a peak-rate 3-minute fixed-line telephone call to the United States.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNAT 165-d	Price of a 3-minute call to the United States (US$)	Price of a peak-rate 3-minute fixed-line telephone call to the United States.	National	See formula	[AFNAT165/x003]
	AFNA add 217a53	Price of a 3-minute call to Zambia (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a53-d	Price of a 3-minute call to Zambia (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a53/x003]
	AFNA add 217a54	Price of a 3-minute call to Zimbabwe (LCU)	Retail price of a 3-minute peak-rate telephone call, expressed in LCUs. Collected for only the largest fixed-line operator and considered representative of the country.	National	ICT Template E	
	AFNA add 217a54-d	Price of a 3-minute call to Zimbabwe (US$)	Retail price of a 3-minute peak-rate telephone call, expressed in US$. Collected for only the largest fixed-line operator and considered representative of the country.	National	See formula	[AFNAadd217a54/x003]
	AFNAT 166	Price of a 3-minute local call (off-peak rate) (LCU)	Price of a local 3-minute fixed-line telephone call at an off-peak rate.	National	ICT Template E	
	AFNAT 166-d	Price of a 3-minute local call (off-peak rate) (US$)	Price of a local 3-minute fixed-line telephone call at an off-peak rate.	National	See formula	[AFNAT166/x003]
	AFNAT 167	Price of a 3-minute local call (peak rate) (LCU)	Price of a local 3-minute fixed-line telephone call at a peak rate.	National	ICT Template E	
	AFNAT 167-d	Price of a 3-minute local call (peak rate) (US$)	Price of a local 3-minute fixed-line telephone call at a peak rate.	National	See formula	[AFNAT167/x003]
	ICT-PM010	Price of a national SMS (LCU)	Price of sending a text message.	National	ICT Template F	
	ICT-PM010-d	Price of a national SMS (US$)	Price of sending a text message.	National	See formula	[ICTPM010/x003]
	ICT-PM008	Price of a 1-minute mobile to fixed call, evening (LCU)	Price for calls from the mobile to fixed network.	National	ICT Template F	
	ICT-PM008-d	Price of a 1-minute mobile to fixed call, evening (US$)	Price for calls from the mobile to fixed network.	National	See formula	[ICTPM008/x003]
	ICT-PM007	Price of a 1-minute mobile to fixed call, peak (LCU)	Price for calls from the mobile to fixed network.	National	ICT Template F	
	ICT-PM007-d	Price of a 1-minute mobile to fixed call, peak (US$)	Price for calls from the mobile to fixed network.	National	See formula	[ICTPM007/x003]
	ICT-PM009	Price of a 1-minute mobile to fixed call, weekend (LCU)	Price for calls from the mobile to fixed network.	National	ICT Template F	
	ICT-PM009-d	Price of a 1-minute mobile to fixed call, weekend (US$).	Price for calls from the mobile to fixed network.	National	See formula	[ICTPM009/x003]

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	ICT-PM005	Price of a 1-minute off-net mobile call, evening (LCU)	Price for calls to a different mobile network.	National	ICT Template F	
	ICT-PM005-d	Price of a 1-minute off-net mobile call, evening (US$)	Price for calls to a different mobile network.	National	See formula	[ICTPM005/x003]
	ICT-PM004	Price of a 1-minute off-net mobile call, peak (LCU)	Price for calls to a different mobile network.	National	ICT Template F	
	ICT-PM004-d	Price of a 1-minute off-net mobile call, peak (US$)	Price for calls to a different mobile network.	National	See formula	[ICTPM004/x003]
	ICT-PM006	Price of a 1-minute off-net mobile call, weekend (LCU)	Price for calls to a different mobile network.	National	ICT Template F	
	ICT-PM006-d	Price of a 1-minute off-net mobile call, weekend (US$)	Price for calls to a different mobile network.	National	See formula	[ICTPM006/x003]
	ICT-PM002	Price of a 1-minute on-net mobile call, evening (LCU)	Price for calls within the same mobile network.	National	ICT Template F	
	ICT-PM002-d	Price of a 1-minute on-net mobile call, evening (US$)	Price for calls within the same mobile network.	National	See formula	[ICTPM002/x003]
	ICT-PM001	Price of a 1-minute on-net mobile call, peak (LCU)	Price for calls within the same mobile network.	National	ICT Template F	
	ICT-PM001-d	Price of a 1-minute on-net mobile call, peak (US$)	Price for calls within the same mobile network.	National	See formula	[ICTPM001/x003]
	ICT-PM003	Price of a 1-minute on-net mobile call, weekend (LCU)	Price for calls within the same mobile network.	National	ICT Template F	
	ICT-PM003-d	Price of a 1-minute on-net mobile call, weekend (US$)	Price for calls within the same mobile network.	National	See formula	[ICTPM003/x003]
	AFNAT 136	Price of connection fee for residential telephone service (LCU)	Installation (or connection) refers to the one-off charge involved in applying for residential basic telephone service. Where there are different charges for different exchange areas, the charge for the largest urban area should be used and specified in a note.	National	ICT Template E	
	AFNAT 136-d	Price of connection fee for residential telephone service (US$)	Installation (or connection) refers to the one-off charge involved in applying for residential basic telephone service. Where there are different charges for different exchange areas, the charge for the largest urban area should be used and specified in a note.	National	See formula	[AFNAT136/x003]
	IC-TPI001	Price of connection for broadband service (LCU)	One-time connection fee when broadband service is first installed.	National	ICT Template G	
	ICT-PI001-d	Price of connection for broadband service (US$)	One-time connection fee when broadband service is first installed.	National	See formula	[ICTPI001/x003]

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNAT-add217	Price of international long-distance peak tariff per minute to different African countries (LCU)	Price of a peak-rate 3-minute fixed-line telephone call to each African country.	National	See formula	sum (price of 1-minute call to each African country [AFNAadd217a…/3])
	AFNAT add217-d	Price of international long-distance peak tariff per minute to different African countries (US$)	Price of a peak-rate 3-minute fixed-line telephone call to each African country.	National	See formula	[AFNAT-add217/x003]
	AFNAT-add265	Price of international long distance peak tariff per minute, to African countries (US$)	Mean price of a 1-minute telephone call to African countries, expressed in US$.	National	See formula	AFNATadd217/x003
	IC-TPI002	Price of monthly subscription for broadband service (LCU)	Monthly subscription for broadband service.	National	ICT Template G	
	ICT-PI002-d	Price of monthly subscription for broadband service (US$)	Monthly subscription for broadband service.	National	See formula	[ICTPI002/x003]
	AFNAT 159	Price of monthly subscription for residential telephone service (LCU)	Monthly fee (or subscription) is the recurring fixed charge for subscribing to the public switched telephone network (PSTN), covering the rental of the line, but not the rental of the terminal (for example, telephone set) where the terminal equipment market is liberalized. Separate charges should be stated, where appropriate, for first and subsequent lines. If the rental charge includes any allowance for free or reduced rate call units, this should be indicated. If there are different charges for different exchange areas, the largest urban area should be used and specified in a note.	National	ICT Template E	
	AFNAT 159-d	Price of monthly subscription for residential telephone service (US$)	Monthly fee (or subscription) is the recurring fixed charge for subscribing to the PSTN, covering the rental of the line, but not the rental of the terminal (for example, telephone set) where the terminal equipment market is liberalized. Separate charges should be stated, where appropriate, for first and subsequent lines. If the rental charge includes any allowance for free or reduced rate call units, this should be indicated. If there are different charges for different exchange areas, the largest urban area should be used and specified in a note.	National	See formula	[AFNAT159/x003]
	AFNAT-168bis	Price of the fixed telephone monthly price basket (LCU)	Monthly price basket for a fixed line, calculated based on a portion of the installation charge (one-fifth prorated to monthly), monthly subscription charge, and cost of local calls (15 peak and 15 off-peak calls of 3 minutes each) (1/5 telephone installation charge + monthly subscription charge+15 3-minute local peak calls+15 3-minute local off-peak calls), expressed in LCUs.	National	ICT Template E	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Pricing	AFNAT 168	Price of the fixed telephone monthly price basket (US$)	Monthly price basket for a fixed line, calculated based on a portion of the installation charge (one-fifth prorated to monthly), monthly subscription charge, and cost of local calls (15 peak and 15 off-peak calls of three minutes each) (1/5 telephone installation charge + monthly subscription charge+15 3-minute local peak calls+15 3-minute local off- peak calls), expressed in US$.	National	See formula	AFNAT168bis/x003
	ti042	Price wholesale—Mobile termination rate (LCU)	Wholesale price of mobile termination, expressed in LCUs.	National	ICT Template B	
	ti042$	Price wholesale—Mobile termination rate (US$)	Wholesale price of mobile termination, expressed in US$.	National	See formula	ti042/x003
	IC-TPI004	Price—Monthly cap for broadband service (Mb)	The monthly cap on data usage associated with the monthly fee; if there is no cap, enter zero.	National	ICT Template G	
	IC-TPI003	Price—Speed to which broadband price data refer (kbps)	The speed (download) of the broadband service to which the price data refer.	National	ICT Template G	
Quality	AFNAT 160	Fixed telephone line faults (per 100 main lines per year)	Number of faults to main (or fixed-line) telephone service reported in a year divided by the total number of fixed telephone lines.	National	ICT Template C	
	AFNAT 182	Fixed telephone waiting list	Number of unmet applications for connection to the PSTN due to a lack of technical facilities (equipment, lines, and so on).	National	ICT Template C	
Technical	AFNAT 150	Fixed telephone lines (number per employee)	The number of fixed telephone lines divided by the number of fixed telephone line staff.	National	See formula	AFNAT146/AFNAT178
	AFNAT 156	Mobile subscriptions (number per employee)	The number of mobile subscriptions divided by the number of mobile staff.	National	See formula	AFNAT157/AFNAT153
	AFNAT 180	Telephone subscriptions total per employee (number per employee)	The total number of telephone subscriptions (fixed + mobile) divided by the total number of telephone staff (fixed + mobile).	National	See formula	(AFNAT146 +AFNAT157)/AFNATadd213
	AFNAT-add213	Staff full-time in telecommunications (people)	Number of full-time equivalent staff employed by telecommunication network operators in the country for the provision of public telecommunication services, including mobile services.	Raw data is national or utility level?	ICT Template C	
	AFU-Tadd213	Staff full-time in telecommunications (persons)	Number of full-time equivalent staff employed by telecommunication network operators in the country for the provision of public telecommunication services, including mobile services.	Operator	ICT Template D	
	AFNAT 153	Staff mobile communications (people)	Number of full-time equivalent staff directly employed by mobile cellular network operators, exclusive of staff employed by resellers.	Raw data is national or utility level?	ICT Template C	
	AFNAT 178	Staff telephone (people)	Number of full-time equivalent staff directly employed by fixed-line network operators.	Raw data is national or utility level?	ICT Template C	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Technical	AFUT 178	Staff—Fixed telephone line (persons)	Number of full-time equivalent staff directly employed by fixed-line network operators.	Operator	ICT Template D	
	AFUT 153	Staff—Mobile communications (persons)	Number of full-time equivalent staff directly employed by mobile cellular network operators, exclusive of staff employed by resellers.	Operator	ICT Template D	
Usage	AFNAT 141	International incoming telephone traffic (minutes)	Volume of calls coming into the country originating outside of the country.	National	ICT Template C	
	AFNAT 142	International outgoing telephone traffic (minutes)	Volume of calls originating from inside the country with destinations outside of the country.	National	ICT Template C	
	AFNAT 139	Telephone traffic: International both-way telephone traffic (minutes per inhabitant)	Incoming and outgoing international telephone traffic (in minutes) divided by the population.	National	See formula	(AFNAT141 +AFNAT142)/ x001
Institutional	ti025	Regulation, ICT competition, subindex (base 100)	Index that ranks whether the ICT sector has competition. This implicitly assumes that competition is a desirable institutional objective—a score of 100 indicates the ICT sector is largely competitive.	National	See formula	[100*average (ti001:ti014)]
	ti001	Regulation: Convergence license framework (1=yes, 0=no)	Whether the license system uses one or two categories for all (infrastructure and service) licenses, as opposed to requiring separate licenses for each market segment.	National	ICT Template A	
	ti004	Regulation: Fixed-line exclusivity (de facto) (1=yes, 0=no)	Whether more than one operator competes in fixed-line service.	National	ICT Template A	
	ti003	Regulation: Fixed-line exclusivity (de jure) (1=yes, 0=no)	Whether competition in fixed-line telephony is legally allowed.	National	ICT Template A	
	ti005	Regulation: Fixed-line full competition (1=yes, 0=no)	Whether more than two operators compete in fixed-line services.	National	ICT Template A	
	ti007	Regulation: Mobile exclusivity (de facto) (1=yes, 0=no)	Whether more than one operator competes in mobile services.	National	ICT Template A	
	ti006	Regulation: Mobile exclusivity (de jure) (1=yes, 0=no)	Whether competition in mobile telephony is legally allowed.	National	ICT Template A	
	ti008	Regulation: Mobile full competition (1=yes, 0=no)	Whether more than two operators compete in mobile services.	National	ICT Template A	
	ti009	Regulation: Mobile virtual network operators (MVNOs) operational (1=yes, 0=no)	Whether mobile virtual network operators (MVNOs) are operational.	National	ICT Template A	
	ti002	Regulation: Complexity of license process (1=yes, 0=no)	Whether there is a clear process for awarding licenses (for example, forms available online, no government invitation required, and so on).	National	ICT Template A	
	ti012	Regulation: International data gateway exclusivity (1=yes, 0=no)	Whether facilities-based competition is allowed for international data gateways.	National	ICT Template A	
	ti011	Regulation: International voice gateway exclusivity (1=yes, 0=no)	Whether facilities-based competition is allowed for international voice gateways.	National	ICT Template A	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Institutional	ti010	Regulation: Internet service provider (ISP) full competition (1=yes, 0=no)	Whether more than two ISPs compete.	National	ICT Template A	
	ti013	Regulation: Leased line exclusivity (1=yes, 0=no)	Whether more than one provider competes to provide leased lines.	National	ICT Template A	
	AFF-HHI	Regulation: Herfindahl-Hirschman Index (HHI) fixed lines (index base 10,000)	Fixed lines HHI (sum of the squares of the market shares of each operator).	National	See formula	((AFUT146/ SUM (afUT 146 [operator 1]))*100)2+ ((AFUT146/ SUM (afUT146 [operator 2]))*100)2+ ((AFUT146/ SUM (afUT146 [operatorn])) *100)2
	AFIHHI	Regulation: HHI Internet subscriptions (index base 10,000)	Internet subscriber HHI (sum of the squares of the market shares of each operator).	National	See formula	((AFUT157/ SUM (afUT 157 [operator 1])) *10 0)2+ ((AFU T157/ SUM (afUT157 [operator 2]))*100)2 +((AF UT157 / SUM (afUT 157 [operatorn])) *100)4
	AFM-HHI	Regulation: HHI mobile subscriptions (index base 10,000)	Mobile subscriber HHI (sum of the squares of the market shares of each operator).	National	See formula	((AFUT157/ SUM (afUT 157 [operator 1]))*1 00)2+ ((AFUT157/ SUM (afUT15 7 [operator 2])) *100) 2+ ((AFUT15 7/ SUM (afUT 157 [operatorn]))*100)3
	ti027	Regulation: ICT interconnection, subindex (base 100)	Index that ranks whether an ICT sector has modern, flexible, and transparent mechanisms for third-party access and interconnection. A score of 100 indicates good interconnection regulation.	National	See formula	[100*averag e (ti018:ti019)]
	ti018	Regulation: Price regulation—Interconnection regime (1=yes, 0=no)	Whether there is an ex ante regulatory scheme for interconnection.	National	ICT Template A	

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Institutional	ti026	Regulation: ICT price, subindex (base 100)	Index that ranks whether an ICT sector has modern, flexible, and transparent mechanisms for tariff setting and third-party access. A score of 100 indicates good pricing regulation.	National	See formula	[100*average (ti015:ti017)]
	ti019	Regulation: Prices—Publication of interconnection prices (1=yes, 0=no)	Whether operators required to publish reference interconnection offer.	National	ICT Template A	
	ti015	Regulation: Price regulation—fixed line (1=yes, 0=no)	Whether there is price regulation for fixed-line services.	National	ICT Template A	
	ti017	Regulation: Price regulation—ISPs (1=yes, 0=no)	Whether there is price regulation for Internet access services.	National	ICT Template A	
	ti016	Regulation: Price regulation–mobile (1=yes, 0=no)	Whether there is price regulation for mobile cellular services.	National	ICT Template A	
	ti028	Regulation: ICT spectrum allocation, subindex (base 100)	Index that ranks whether an ICT sector has modern and competitive spectrum allocation. A score of 100 indicates good spectrum allocation regulation.	National	See formula	[100*average (ti020:ti021)]
	ti021	Regulation: Spectrum—Unlicensed (1=yes, 0=no)	Whether unlicensed spectrum (for example, wi-fi) can be freely used as opposed to being subject to regulatory restrictions.	National	ICT Template A	
	ti020	Regulation: Spectrum allocation competition (1=yes, 0=no)	Whether spectrum allocated through competitive process (such as auction) as opposed to on a fixed-price basis.	National	ICT Template A	
	ti029	Regulation: ICT universal service, subindex (base 100)	Index that ranks whether an ICT sector has modern, flexible, and transparent mechanisms for providing support to universal service. A score of 100 indicates good universal service regulation.	National	See formula	[100*average (ti022:ti024)]
	ti022	Regulation: Universal service definition (1=yes, 0=no)	Whether an official definition of universal service exists.	National	ICT Template A	
	ti023	Regulation: Universal service scope (1=yes, 0=no)	Whether universal service obligation applies to various operators as opposed to only the incumbent.	National	ICT Template A	
	ti024	Regulation: Universal service financing (1=yes, 0=no)	Whether universal service obligation is financed by methods other than direct government subsidy or cross-subsidy.	National	ICT Template A	
	ti014	Regulation: Voice over Internet protocol (1=yes, 0=no)	Whether VOIP calls are allowed.	National	ICT Template A	
	REF006	Reform: General index sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF041	Reform: Legislation—10 or more years (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF037	Reform: Legislation—Existence of reform (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF040	Reform: Legislation—Last 10 years (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Institutional	REF036	Reform: Legislation—Legal reform (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF010	Reform: Legislation—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF019	Reform: Policy oversight — Dispute arbitration oversight (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF022	Reform: Policy oversight —Investment plan oversight (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF020	Reform: Policy oversight —Regulation monitoring oversight (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF008	Reform: Policy oversight — Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF023	Reform: Policy oversight —Tariff approval oversight (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF021	Reform: Policy oversight — Technical standard oversight (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF007	Reform: Private sector involvement—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REF009	Reform: Restructuring—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG006	Regulation: General index sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG017	Regulation: Accountability—Full independence of appeal (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG018	Regulation: Accountability—Partial independence of appeal (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG008	Regulation: Accountability—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG028	Regulation: Autonomy—Formal autonomy, hire (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG029	Regulation: Autonomy— Formal autonomy, hire (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG026	Regulation: Autonomy—Full financial autonomy (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Institutional	REG024	Regulation: Autonomy—Full managerial autonomy (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG027	Regulation: Autonomy—Partial financial autonomy (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG025	Regulation: Autonomy—Partial managerial autonomy (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG010	Regulation: Autonomy—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG011	Regulation: Tools—Length regulatory review (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG007	Regulation: Tools—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG012	Regulation: Tools—Tariff methodology (1=yes, 0=no)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	REG009	Regulation: Transparency—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 012	Governance: Accounting and disclosure and performance monitoring —Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 009	Governance: Capital market discipline—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 008	Governance: General index sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 010	Governance: Labor market discipline—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 013	Governance: Managerial and board autonomy—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 011	Governance: Outsourcing—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
	GOV 014	Governance: Ownership and shareholder quality—Subindex sector (base 100)	See Handbook, chapter 4: Institutions.	Sector	See formula	See Chapter 4: Institutions
Fiscal	F063	Investment—off-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F017	Investment—off-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F060	Investment—on-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending

Policy	Series code	Indicator name	Definition	Level	Source	Formula
Fiscal	F014	Investment—on-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F057	Investment—public sector (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F011	Investment—public sector (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F064	Recurrent spending (mostly O&M)—off-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F018	Recurrent spending (mostly O&M)—off-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F061	Recurrent spending (mostly O&M)—on-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F015	Recurrent spending (mostly O&M)—on-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F058	Recurrent spending (mostly O&M)—public sector (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F012	Recurrent spending (mostly O&M)—public sector (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F062	Total spending—off-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F016	Total spending—off-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F059	Total spending—on-budget (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F013	Total spending—on-budget (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F056	Total spending—public sector (% of GDP)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending
	F010	Total spending—public sector (US$)	See Handbook, chapter 5: Fiscal Spending.	Sector	See formula	See Chapter 5: Fiscal Spending

Note: GDP = gross domestic product; HH = household; ICT = information and communication technology; Kbps = kilobits per second; LCU = local currency unit; Mbps = megabits per second; OECD= Organisation of Economic Cooperation and Development; O&M = operations and maintenance.

Annex A8.2 Unit conversions

Speed of transmitting one bit per second:
Kilobit per second (kbit/s) = 1,000 bits
Megabit per second (Mbit/s) = 1,000,000 bits
Gigabit per second (Gbit/s) = 1,000,000,000 bits

Size of data volume:
Byte = 8 bits
Kilobyte (KB) = 1,000 bytes
Megabyte (MB) = 1,000,000 bytes
Gigabyte (GB) = 1,000,000,000 bytes

Annex A8.3 Target institutions

Country	Organization	Type	Web site
Algeria	Ministère de la Poste et des Technologies de l'Information et de la Communication	MIN	www.mptic.dz
	Autorité de Régulation de la Poste et des Télécommunications (ARPT)	REG	www.arpt.dz
	Algérie Télécom	TO	www.algerietelecom.dz
	Lacom	TO	www.lacom.dz
	Djezzy	TO	www.djezzygsm.com
	Nedjma	TO	www.nedjma.dz
Angola	Ministério dos Correios e Telecomunicações	MIN	
	Instituto Angolano das Comunicações (INACOM)	REG	www.inacom.og.ao
	Angola Telecom	TO	www.angolatelecom.com
	Movicel	TO	www.movicel.co.ao
	Mundo Startel	TO	www.startel.co.ao
	Unitel	TO	www.unitel.co.ao
Benin	Ministère de la Communication et de la Promotion des Technologies Nouvelles	MIN	www.communication.gouv.bj
	Bénin Télécom	TO	www.benintelecoms.bj
	Bell Benin Communications	TO	www.groupebellbenin.com
	Moov	TO	www.moov.bj
	MTN	TO	www.areeba.com.bj
Botswana	Ministry of Communications, Science and Technology	MIN	www.mcst.gov.bw
	Botswana Telecommunications Authority	REG	www.bta.org.bw
	Botswana Telecommunications Corporation	TO	www.btc.bw
	Mascom	TO	www.mascom.bw
	Orange	TO	www.orange.co.bw

Country	Organization	Type	Web site
Burkina Faso	Ministère des Postes et Technologies de l'Infrastructure et de la Communication	MIN	www.mpt.bf
	Autorité de Régulation des Communication Electroniques (ARCE)	REG	www.arce.bf
	Onatel	TO	www.onatel.bf
	Telmob	TO	www.telmob.bf
	Zain Burkina	TO	www.bf.zain.com
	Telecel Faso	TO	www.telecelfaso.bf
Burundi	Ministère des Transports, Postes et Télécommunications	MIN	www.burundi.gov.bi
	Agence de Régulation et de Contrôle des Télécommunications (ARCT)	REG	www.arct.bi
	Office National des Télécommunications (ONATEL)	TO	www.onatel.com
	Africell	TO	www.africell.bi
	Econet Wireless Burundi	TO	www.econet.bi
	Telecel Burundi	TO	
Cameroon	Ministère des Postes et Télécommunications	MIN	www.minpostel.gov.cm
	Agence de Régulation des Télécommunications (ART)	REG	www.art.cm
	Camtel	TO	www.camtel.cm
	MTN Cameroon	TO	www.mtncameroon.net
	Orange	TO	www.orange.cm
Cape Verde	Ministério das Infraestruturas, Transportes e Telecomunicações	MIN	
	Agência Nacional de Comunicações (ANAC)	REG	www.anac.cv
	CVTelecom	TO	www.cvtelecom.cv
	T+ Telecomunicações	TO	www.tmais.cv
Central African Republic	Ministère des Postes et des Télécommunications chargé des Nouvelles Technologies	MIN	
	Agence de Régulation des Télécommunications (ART)	REG	www.art-rca.org
	Socatel	TO	www.socatel.cf
	Atlantique Cellulaire RCA (A-Cell)	TO	
	Nationlink Telecom	TO	www.nationlinktelecom.com
	Orange	TO	www.orange.cf
	Telecel Centrafrique	TO	
Chad	Ministère des Postes, et des Nouvelles Technologies de la Communication	MIN	www.primature-tchad.org
	Office Tchadien de Régulation des Télécommunications (OTRT)	REG	www.otrt.td
	Société des Télécommunications (SOTEL)		www.sotel.td
	Celtel Tchad		www.td.celtel.com
	Millicom (Tigo)		www.millicom.com
Comoros	Ministère des Transports, des Postes et Télécommunications et du Tourisme	MIN	www.beit-salam.km
	Comores Telecom	TO	www.comorestelecom.km

Country	Organization	Type	Web site
Congo	Ministère des Postes et Télécommunications chargé des Nouvelles Technologies de la Communication	MIN	www.postelntic.gouv.cg
	Direction Générale de l'Administration Centrale des Postes et Télécommunications (DGACPT)	REG	www.dgacpt.com
	SOTELCO	TO	
	Celtel Congo	TO	www.cg.celtel.com
	MTN Congo (Libertis Telecom)	TO	www.mtncongo.net
	Warid Congo	TO	www.waridtel.cg
Côte d'Ivoire	Ministère des Nouvelles Technologies de l'Information et de la Communication	MIN	www.gouv.ci
	Agence des Télécommunications de Côte d'Ivoire	REG	www.atci.ci
	Arobase	TO	www.arobasetelecom.ci
	Côte d'Ivoire Telecom	TO	www.citelecom.ci
	Orange Côte d'Ivoire	TO	www.orange.ci
	KoZ	TO	www.koz.ci
	Moov (A-Cell)	TO	www.moov.com
	MTN Côte d'Ivoire	TO	www.mtn.ci
Congo, Dem. Rep. of	Ministère des Postes, Téléphones et Télécommunications	MIN	
	Autorité de Régulation de la Poste et des Télécommunications du Congo (ARPTC)	REG	www.arptc.cd
	Office Congolais des Postes et des Télécommunications (OCPT)	TO	www.ocpt.cd
	Congo Chine Telecom	TO	www.cct.cd
	AfriTel	TO	
	Airtel Congo	TO	www.cd.celtel.com
	Tigo	TO	www.tigo.cd
	Standard	TO	
	Tatem Telecom	TO	tatemtelecom.com
	Vodacom Congo	TO	www.vodacom.cd
Djibouti	Ministère de la Communication et de la Culture, chargé des Postes et Télécommunications	MIN	www.mccpt.dj
	Direction des Postes et Télécommunications	REG	www.mccpt.dj
	Djibouti Télécom	TO	www.adjib.dj
Egypt	Ministry of Communications and Information Technology	MIN	www.mcit.gov.eg
	National Telecommunication Regulatory Authority (NTRA)	REG	www.tra.gov.eg
	Telecom Egypt	TO	www.telecomegypt.com.eg
	ETISALAT	TO	www.etisalat.com
	MOBINIL	TO	www.mobinil.com
	Vodafone	TO	www.vodafone.com.eg

Country	Organization	Type	Web site
Equatorial Guinea	Ministerio de Comunicaciones y Transporte Dirección General de Correos y de Telecomunicaciones	MIN	
	Dirección General de Correos y de Telecomunicaciones	REG	
	GETESA	TO	www.getesa.gq
Eritrea	Ministry of Transport and Communications	MIN	
	Communications Department	REG	
	ERITEL	TO	
Ethiopia	Ministry of Transport and Communication	MIN	www.motac.gov.et
	Ethiopian Telecommunications Agency	REG	www.eta.gov.et
	Ethiopian Telecommunications Corporation	TO	www.ethionet.et
Gabon	Ministère de la Communication, des Postes, des Télécommunications et des Nouvelles Technologies de l'Information	MIN	
	Agence de Régulation des Télécommunications (ARTEL)	REG	www.artel.ga
	Gabon Télécom	TO	
	Celtel Gabon	TO	
	Moov	TO	www.moov.ga
Gambia, The	Ministry of Information and Communication Infrastructure	MIN	www.doscit.gm
	Public Utilities Regulatory Authority	REG	www.pura.gm
	Gamtel	TO	www.gamtel.gm
	Africell	TO	www.africell.gm
	Comium	TO	www.comium.com
Ghana	MIN of Communications	MIN	www.moc.gov.gh
	National Communications Authority (NCA)	REG	www.nca.org.gh
	Ghana Telecom	TO	www.ghanatelecom.com.gh
	Western Telesystems (Westel)	TO	www.westelgh.com
	Expresso Telecom	TO	
	Tigo	TO	www.tigo.com.gh
	MTN	TO	www.mtn.com.gh
Guinea	Agence de Régulation des Postes et Télécommunications Ministère de la Communication et des Nouvelles Technologies de l'Information	REG MIN	www.guinee.gov.gn
	Direction Nationale des Postes et Télécommunications	REG	
	Sotelgui	TO	www.sotelgui.net
	Areeba	TO	www.areeba-guinea.com
	Intercel Guinée	TO	www.intercal.us
	Orange Guinée	TO	www.orange.com
	Cellcom Guinea	TO	www.gn.cellcomgsm.com

Country	Organization	Type	Web site
Guinea-Bissau	Ministro das Infra-estruturas, Transportes e Comunicações	MIN	
	Instituto das Comunicações da Guiné-Bissau (ICGB)	REG	
	Guiné Telecom	TO	
	Areeba	TO	
	Orange Bissau	TO	
Kenya	Ministry of Information and Communications	MIN	www.information.go.ke
	Communications Commission of Kenya	REG	www.cck.go.ke
	Telkom Kenya	TO	www.telkom.co.ke
	Celtel Kenya	TO	www.ke.celtel.com
	EM Communications	TO	www.popotewireless.co.ke
	Flashcom	TO	www.flashcom.co.ke
	Safaricom	TO	www.safaricom.co.ke
Lesotho	Ministry of Communications, Science and Technology	MIN	
	Lesotho Communications Authority	REG	www.lca.org.ls
	Telecom Lesotho	TO	www.telecom.co.ls
	Vodacom Lesotho	TO	www.vodacom.co.ls
Liberia	Ministry of Posts and Telecommunications	MIN	www.emansion.gov.lr
	Liberia Telecommunications Authority (LTA)	REG	www.lta.org.lr
	Liberia Telecommunications	TO	
	Corporation (LIBTELCO)	TO	
	Cellcom	TO	www.cellcomgsm.com
	Comium Liberia	TO	www.comium.com.lr
	LiberCell	TO	www.libercell.info
	Lonestar Cell	TO	www.lonestarcell.com
Libya	General Directorate of Posts and Telecommunications (GDPT)	MIN	
	General Post and Telecommunication Company (GPTC)	TO	www.gptc.ly
	Al Madar	TO	www.almadar.ly
	Libyana Mobile Phone	TO	www.libyana.ly
Madagascar	Ministère des Télécommunications, des Postes et de la Communication	MIN	www.mtpc.gov.mg
	Office Malagasy d'Etudes et de Régulation des Télécommunications (OMERT)	REG	www.omert.mg
	Telma	TO	www.telma.mg
	Airtel Madagascar	TO	www.mg.airtel.com
	Orange Madagascar	TO	www.orange.mg
Malawi	Ministry of Information and Civic Education	MIN	
	Malawi Communications Regulatory Authority (MACRA)	REG	www.mtl.mw
	Celtel Malawi	TO	www.mw.celtel.com
	Telekom Networks Malawi	TO	www.tnm.co.mw

Country	Organization	Type	Web site
Mali	Ministère de la Communication et des Nouvelles Technologies	MIN	www.mcnt.gov.ml
	Comité de Régulation des Télécommunications (CRT)	REG	mali-reforme-telecom.mctmtl.com
	SOTELMA	TO	www.sotelma.ml
	SOTELMA/Malitel	TO	www.malitel.com.ml
	Orange Mali	TO	www.orangemali.com
Mauritania	Ministère de l'Intérieur, des Postes et Télécommunications	MIN	www.interieur.gov.mr
	Autorité de Régulation (ARE)	REG	www.are.mr
	Mauritel	TO	www.mauritel.mr www.eljawal.mr
	Chinguitel	TO	www.chinguitel.mr
	Mattel	TO	www.mattel.mr
Mauritius	Ministry of Information Technology and Telecommunications	MIN	telecomit.gov.mu
	Information and Communication Technologies Authority (ICTA)	REG	www.icta.mu
	Mauritius Telecom	TO	www.mauritiustelecom.com
	Cellplus	TO	www.cellplus.mu
	MTML	TO	www.mahanagartelephone.com/mt ml/
	Emtel	TO	www.emtel-ltd.com
Morocco	Ministère de l'Industrie, du Commerce et des Nouvelles Technologies	MIN	www.mcinet.gov.ma; www.technologies.gov.ma
	Agence Nationale de Réglementation des Télécommunications (ANRT)	REG	www.anrt.ma
	Maroc Telecom	TO	www.elmanzil.ma; www.mobileiam.ma
	Méditel	TO	www.meditel.ma
	Wana	TO	www.wana.ma
Mozambique	Ministério dos Transportes e Comunicação	MIN	www.mtc.gov.mz
	Instituto Nacional das Comunicações de Moçambique (INCM)	REG	www.incm.gov.mz
	TDM	TO	www.tdm.mz
	mCel	TO	www.mcel.co.mz
	Vodacom Moçambique	TO	www.vm.co.mz
Namibia	Ministry of Works, Transport and Communication	MIN	www.grnnet.gov.na
	Namibian Communications Commission (NCC)	REG	www.ncc.org.na
	Telecom Namibia	TO	www.telecom.na
	Cell One	TO	www.cellone.com.na
	MTC	TO	www.mtc.com.na

Country	Organization	Type	Web site
Niger	Ministère de la Communication	MIN	www.communication-gouv-niger.ne
	Autorité de Régulation Multisectorielle (ARM)	REG	niger.arm-niger.org
	Sonitel	TO	www.sonitel.ne
	SahelCom	TO	www.sahelcom.ne
	Airtel Niger	TO	www.airtel.ne
	Moov Niger	TO	www.moov.ne
	Orange Niger	TO	www.orange.ne
Nigeria	Ministry of Information and Communications	MIN	www.nigeria.gov.ng
	Nigerian Communications Commission	REG	www.ncc.gov.ng
	Nitel	TO	www.nitelnet.com
	Globacom	TO	www.gloworld.com
	Celtel	TO	www.ng.celtel.com
	MTN Nigeria	TO	www.mtnonline.com
Rwanda	Ministry of Infrastructure	MIN	www.mininfra.gov.rw
	Rwanda Utilities Regulatory Agency (RURA)	REG	www.rura.gov.rw
	RwandaTel	TO	www.rwandatel.rw
	MTN Rwanda	TO	www.mtn.co.rw
São Tomé and Principe	Ministerio de Obras Publicas e Recursos Naturais	MIN	
	Autiridade Geral de Regulacao	REG	www.ager-stp.org
	Companhia Santomense de Telecomunicações (CST)	TO	www.cstome.net
Senegal	Ministère des Télécommunications et des Technologies de l'Information et de la Communication	MIN	www.telecom.gouv.sn
	Agence de Régulation des Télécommunications et des Postes	REG	www.artp-senegal.org
	Sonatel	TO	www.sonatel.sn
	Tigo	TO	www.tigo.sn
	Expresso	TO	www.expressotelecom.com
Seychelles	Ministry of National Development: Department of Information Communications Technology	MIN	www.ict.gov.sc
	AIRTEL	TO	www.airtel.sc
	Cable and Wireless	TO	www.cwseychelles.com
	SMARTCOM	TO	www.smartcomgsm.com
Sierra Leone	Ministry of Information and Communications	MIN	
	National Telecommunications Commission	REG	
	SierraTel	TO	www.stcg.net
	Africell	TO	www.africell.sl
	Celtel	TO	www.sl.celtel.com
	Comium	TO	www.comium.com.sl

Country	Organization	Type	Web site
Somalia	Nationlink Telecom	TO	www.nationlinktelecom.com
	Telcom Somalia	TO	www.telcom-somalia.com
	Golis Telecom	TO	www.golistelecom.com
	HorTel	TO	www.hortel.net
	Somafone	TO	www.somafone.com
	Telsom Mobile	TO	www.telesom.net
South Africa	Department of Communications	MIN	www.doc.gov.za
	Independent Communications Authority of South Africa (ICASA)	REG	www.icasa.org.za
	Telkom	TO	www.telkom.co.za
	Cell C	TO	www.cellc.co.za
	MTN	TO	www.mtn.co.za
	Neotel	TO	www.neotel.co.za
	Vodacom	TO	www.vodacom.co.za
Sudan	Ministry of Information and Communications	MIN	www.sudan.gov.sd
	National Telecommunication Corporation	REG	www.ntc.org.sd
	Canartel	TO	www.canar.sd
	Sudatel	TO	www.sudatel.net
	MobiTel	TO	www.sdn-mobitel.com
	MTN	TO	www.mtn.sd
Swaziland	Ministry of Information, Communication and Technology	MIN	www.gov.sz/home.asp?pid=5556
	Swaziland Posts and Telecommunications Corporation (SPTC)	TO	www.sptc.co.sz
	Mobile Telephone Network (MTN), Swaziland	TO	www.mtn.co.sz
Tanzania	Ministry of Communication, Science and Technology	MIN	www.mst.go.tz
	Tanzania Communications Regulatory Authority	REG	www.tcra.go.tz
	TTCL	TO	www.ttcl.co.tz
	Zanzibar Telecom	TO	www.zantel.co.tz
	Benson	TO	www.bolmobile.co.tz
	Airtel Tanzania	TO	www.africa.airtel.com/tanzania
	Mobitel Togo	TO	www.tigo.co.tz
	Vodacom Tanzania	TO	www.vodacom.co.tz
	Sasatel Tanzania	TO	www.sasatel.co.tz
Togo	Ministère des Postes et des Télécommunications et des Innovations Technologiques	MIN	
	Autorité de Réglementation des Secteurs de Postes et de Télécommunications (ART&P)	REG	www.artp.tg
	Togo Telecom	TO	www.togotelecom.tg
	MOOV	TO	www.moov.tg

Country	Organization	Type	Web site
Tunisia	Ministère des Technologies de la Communication	MIN	www.infocom.tn
	Instance Nationale des Télécommunications	REG	www.intt.tn
	Tunisie Telecom	TO	www.tunisietelecom.tn
	Tunisiana	TO	www.tunisiana.com
	Orange	TO	www.orange.tn
Uganda	Ministry of Information and Communications Technology	MIN	www.ict.go.ug
	Uganda Communications Commission	REG	www.ucc.co.ug
	Uganda Telecom	TO	www.utl.co.ug
	MTN	TO	www.mtn.co.ug
	Airtel	TO	www.ug.airtel.com
	Warid Telecom	TO	www.waridtel.co.ug
	Orange	TO	www.orange.ug
Zambia	Ministry of Communications and Transport	MIN	www.mct.gov.zm
	Zambia Information and Communication Technology Authority	REG	www.caz.zm
	Zamtel	TO	www.zamtel.zm
	Celtel	TO	www.zm.celtel.com
	MTN	TO	www.mtnzambia.co.zm
Zimbabwe	Ministry of Transport and Communications	MIN	
	Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ)	REG	www.potraz.gov.zw
	Tel*One	TO	www.telone.co.zw
	Net*One	TO	www.netone.co.zw
	ECONET	TO	www.econet.co.zw
	TELECEL	TO	www.telecel.co.zw

Note: For "Type," MIN = Ministry, REG = Regulator, TO = Telecom operator. Organizations, names, and links are valid as of March 2011.

Annex A8.4 Data collection templates

ICT template A: National-level institutions

Country:
Sector: Information and Communication Technology
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New	History
			2011	2010
Institutional	**ti002**	Complexity of license process (1=yes, 0=no)		
	ti001	Convergence license framework (1=yes, 0=no)		
	ti004	Fixed-line exclusivity (de facto) (1=yes, 0=no)		
	ti003	Fixed-line exclusivity (de jure) (1=yes, 0=no)		
	ti005	Fixed-line full competition (1=yes, 0=no)		
	ti012	International data gateway exclusivity (1=yes, 0=no)		
	ti011	International voice gateway exclusivity (1=yes, 0=no)		
	ti010	Internet service provider (ISP) full competition (1=yes, 0=no)		
	ti013	Leased line exclusivity (1=yes, 0=no)		
	ti007	Mobile exclusivity (de facto) (1=yes, 0=no)		
	ti006	Mobile exclusivity (de jure) (1=yes, 0=no)		
	ti008	Mobile full competition (1=yes, 0=no)		
	ti009	Mobile virtual network operators (MVNOs) operational (1=yes, 0=no)		
	ti018	Price regulation—Interconnection regime (1=yes, 0=no)		
	ti015	Price regulation—Fixed line (1=yes, 0=no)		
	ti017	Price regulation—ISPs (1=yes, 0=no)		
	ti016	Price regulation—Mobile (1=yes, 0=no)		
	ti019	Prices—Publication of interconnection prices (1=yes, 0=no)		
	ti021	Spectrum—Unlicensed (1=yes, 0=no)		
	ti020	Spectrum allocation competition (1=yes, 0=no)		
	ti022	Universal service definition (1=yes, 0=no)		
	ti023	Universal service scope (1=yes, 0=no)		
	ti024	Universal service financing (1=yes, 0=no)		
	ti014	Voice over Internet protocol (1=yes, 0=no)		

ICT template B: National-level pricing regulation

Country:
Sector: Information and Communication Technology
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Pricing	**ti032**	License annual fee—Fixed (LCU)					
	ti041	License annual fee—International data gateway (LCU)					
	ti038	License annual fee—International voice gateway (LCU)					
	ti035	License annual fee—Mobile (LCU)					
	ti030	License application fee—Fixed (LCU)					
	ti039	License application fee—International data gateway (LCU)					
	ti036	License application fee—International voice gateway (LCU)					
	ti033	License application fee—Mobile (LCU)					
	ti031	License initial fee—Fixed (LCU)					
	ti040	License initial fee—International data gateway (LCU)					
	ti037	License initial fee—International voice gateway (LCU)					
	ti034	License initial fee—Mobile (LCU)					
	ti042	Price wholesale—Mobile termination rate (LCU)					

ICT template C: National-level data variables

Country:
Sector: Information and Communication Technology
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Access	**AFNAT146**	Fixed telephone lines in operation (number)					
	AFNAT185	Internet fixed broadband subscriptions (number)					
	AFNAT186	Internet international bandwidth (Mbps)					
	AFNAT191	Internet subscriptions (people)					
	AFNAT193	Internet users (Number)					
	AFNAT163	Mobile subscriptions—Prepaid (number)					
	AFNAT157	Mobile telephone subscriptions (number)					
	AFNAT170	Public payphones (number)					
Financial	**AFNAT152**	Investment—Mobile communications (LCU)					
	AFNATadd212	Investment in telecom (LCU)					
	AFNATadd216	Revenue from all telecom services (LCU)					
	AFNAT174	Revenue from mobile communications (LCU)					
	AFNAT175	Revenue from telephone service (LCU)					
Quality	**AFNAT160**	Fixed telephone line faults (per 100 main lines per year)					
	AFNAT182	Fixed telephone waiting list					
Technical	**AFNATadd213**	Staff full time in telecommunication (people)					
	AFNAT153	Staff mobile communications (people)					
	AFNAT178	Staff telephone (people)					
Usage	**AFNAT141**	International incoming telephone traffic (minutes)					
	AFNAT142	International outgoing telephone traffic (minutes)					

ICT template D: Utility-level data variables

Country:
Sector: Information and Communication Technology
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Access	**AFUT146**	Fixed telephone lines (number)					
	AFUT191	Internet subscriptions (number)					
	AFUT157	Mobile telephone subscriptions (number)					
Technical	**AFUTadd213**	Staff full time in telecommunications (persons)					
	AFUT178	Staff—Fixed telephone line (persons)					
	AFUT153	Staff—Mobile communications (persons)					

ICT template E: Operator level—main national fixed-line service provider

Country: Information and Communication Technology
Sector:
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Pricing	**AFNAT161bis**	Prepaid mobile monthly price basket (LCU)					
	AFNAadd217a1	Price of a 3-minute call to Algeria (LCU)					
	AFNAadd217a2	Price of a 3-minute call to Angola (LCU)					
	AFNAadd217a3	Price of a 3-minute call to Benin (LCU)					
	AFNAadd217a4	Price of a 3-minute call to Botswana (LCU)					
	AFNAadd217a5	Price of a 3-minute call to Burkina Faso (LCU)					
	AFNAadd217a6	Price of a 3-minute call to Burundi (LCU)					
	AFNAadd217a7	Price of a 3-minute call to Cameroon (LCU)					
	AFNAadd217a8	Price of a 3-minute call to Cape Verde (LCU)					
	AFNAadd217a9	Price of a 3-minute call to Central African Republic (LCU)					
	AFNAadd217a10	Price of a 3-minute call to Chad (LCU)					
	AFNAadd217a11	Price of a 3-minute call to Comoros (LCU)					
	AFNAadd217a12	Price of a 3-minute call to the Democratic Republic of Congo (LCU)					
	AFNAadd217a13	Price of a 3-minute call to the Republic of Congo (LCU)					
	AFNAadd217a14	Price of a 3-minute call to Côte d'Ivoire (LCU)					
	AFNAadd217a15	Price of a 3-minute call to Djibouti (LCU)					
	AFNAadd217a16	Price of a 3-minute call to Egypt (LCU)					
	AFNAadd217a17	Price of a 3-minute call to Equatorial Guinea (LCU)					
	AFNAadd217a18	Price of a 3-minute call to Eritrea (LCU)					
	AFNAadd217a19	Price of a 3-minute call to Ethiopia (LCU)					
	AFNAadd217a20	Price of a 3-minute call to Gabon (LCU)					
	AFNAadd217a22	Price of a 3-minute call to Ghana (LCU)					
	AFNAadd217a23	Price of a 3-minute call to Guinea (LCU)					
	AFNAadd217a24	Price of a 3-minute call to Guinea-Bissau (LCU)					
	AFNAadd217a25	Price of a 3-minute call to Kenya (LCU)					
	AFNAadd217a26	Price of a 3-minute call to Lesotho (LCU)					

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Pricing	**AFNAadd217a27**	Price of a 3-minute call to Liberia (LCU)					
	AFNAadd217a28	Price of a 3-minute call to Libya (LCU)					
	AFNAadd217a29	Price of a 3-minute call to Madagascar (LCU)					
	AFNAadd217a30	Price of a 3-minute call to Malawi (LCU)					
	AFNAadd217a31	Price of a 3-minute call to Mali (LCU)					
	AFNAadd217a32	Price of a 3-minute call to Mauritania (LCU)					
	AFNAadd217a33	Price of a 3-minute call to Mauritius (LCU)					
	AFNAadd217a35	Price of a 3-minute call to Morocco (LCU)					
	AFNAadd217a36	Price of a 3-minute call to Mozambique (LCU)					
	AFNAadd217a37	Price of a 3-minute call to Namibia (LCU)					
	AFNAadd217a38	Price of a 3-minute call to Niger (LCU)					
	AFNAadd217a39	Price of a 3-minute call to Nigeria (LCU)					
	AFNAadd217a40	Price of a 3-minute call to Rwanda (LCU)					
	AFNAadd217a41	Price of a 3-minute call to São Tomé and Principe (LCU)					
	AFNAadd217a42	Price of a 3-minute call to Senegal (LCU)					
	AFNAadd217a43	Price of a 3-minute call to Seychelles (LCU)					
	AFNAadd217a44	Price of a 3-minute call to Sierra Leone (LCU)					
	AFNAadd217a45	Price of a 3-minute call to Somalia (LCU)					
	AFNAadd217a46	Price of a 3-minute call to South Africa (LCU)					
	AFNAadd217a47	Price of a 3-minute call to Sudan (LCU)					
	AFNAadd217a48	Price of a 3-minute call to Swaziland (LCU)					
	AFNAadd217a49	Price of a 3-minute call to Tanzania (LCU)					
	AFNAadd217a21	Price of a 3-minute call to The Gambia (LCU)					
	AFNAadd217a50	Price of a 3-minute call to Togo (LCU)					
	AFNAadd217a51	Price of a 3-minute call to Tunisia (LCU)					
	AFNAadd217a52	Price of a 3-minute call to Uganda (LCU)					
	AFNAT165	Price of a 3-minute call to the United States (LCU)					
	AFNAadd217a53	Price of a 3-minute call to Zambia (LCU)					
	AFNAadd217a54	Price of a 3-minute call to Zimbabwe (LCU)					
	AFNAT166	Price of a 3-minute local call (off-peak rate) (LCU)					
	AFNAT167	Price of a 3-minute local call (peak rate) (LCU)					
	AFNAT136	Price of connection fee for residential telephone service (LCU)					
	AFNAT159	Price of monthly subscription for residential telephone service (LCU)					
	AFNAT197bis	Price of the 20-hour Internet basket (LCU)					
	AFNAT168bis	Price of the fixed telephone monthly price basket (LCU)					

ICT template F: Operator level—largest mobile operator

Country: Information and Communication Technology
Sector:
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Pricing	**ICTPM010**	Price of a national SMS (LCU)					
	ICTPM008	Price of a 1-minute mobile to fixed call, evening (LCU)					
	ICTPM007	Price of a 1-minute mobile to fixed call, peak (LCU)					
	ICTPM009	Price of a 1-minute mobile to fixed call, weekend (LCU)					
	ICTPM005	Price of a 1-minute off-net mobile call, evening (LCU)					
	ICTPM004	Price of a 1-minute off-net mobile call, peak (LCU)					
	ICTPM006	Price of a 1-minute off-net mobile call, weekend (LCU)					
	ICTPM002	Price of a 1-minute on-net mobile call, evening (LCU)					
	ICTPM001	Price of a 1-minute on-net mobile call, peak (LCU)					
	ICTPM003	Price of a 1-minute on-net mobile call, weekend (LCU)					

ICT template G: Operator level—largest Internet service provider

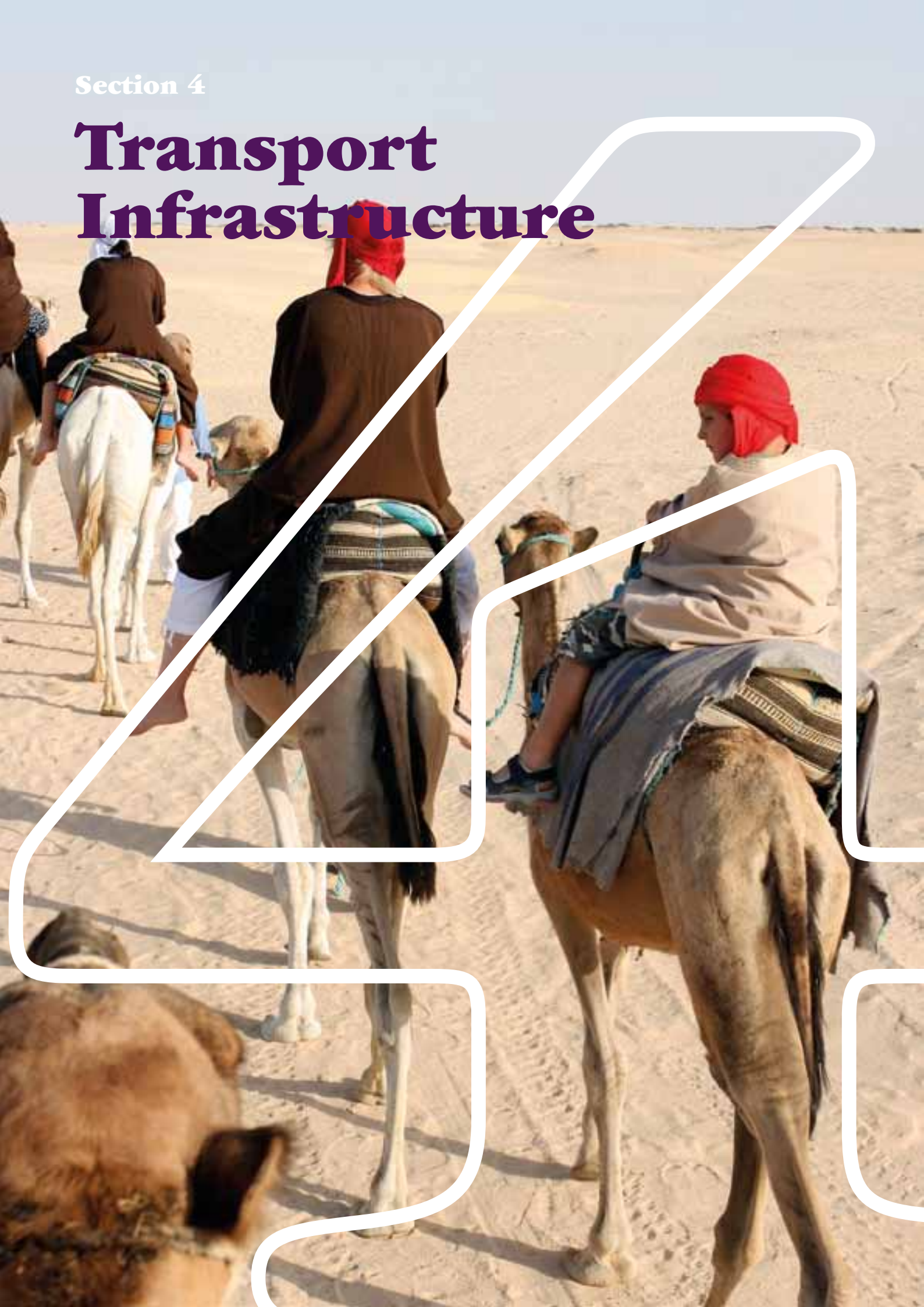
Country: Information and Communication Technology
Sector:
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy category	Temp code	Indicator name	New		History		
			2011	2010	2009	2008	2007
Pricing	**ICTPI001**	Price of connection for broadband service (LCU)					
	ICTPI002	Price of monthly subscription for broadband service (LCU)					
	ICTPI004	Price—Monthly cap for broadband service (Mb)					
	ICTPI003	Price—Speed to which broadband price data refer (Kbps)					

Section 4

Transport Infrastructure



9. Roads

9.1 Motivation

Many African countries have made progress toward developing sound institutions for the funding and building of road infrastructure. Such reforms have been numerous and significant in the years since 2000 and, in contrast to other sectors, there is a remarkable degree of consensus regarding their direction. Many countries have gone about implementing road funds, drawing upon road user charges that provide an independent source of revenue for politically challenged maintenance activities. A growing number of countries have also established technically oriented road agencies to undertake road works at arm's length from the line ministry. In spite of all these measures, however, it is striking that road maintenance still remains significantly underfunded in the majority of countries. This is partly because road user charges have been set at levels that are too low to cover the costs of road maintenance and, in some countries, have proved difficult to collect. In practice, road funds continue to be significantly topped up with transfers from the central government budget.

While much attention has focused on improving the quality of roads, the quality of transportation services ultimately matters more to the economy. Road quality is only one factor contributing to transport costs. There is increasing recognition of the importance of nonphysical barriers such as border crossings, weighing stations, and police checkpoints in delaying traffic and inflating costs. Furthermore, in many parts of Africa, the heavy cartelization of the trucking industry leads to high profit margins that prevent the cost savings from road improvements being passed on to consumers in the form of lower freight tariffs. Without a competitive trucking industry and smooth trade facilitation, road freight services will continue to be costly and inefficient, however good the quality of the roads.

One of Africa's major remaining transport challenges is to improve road accessibility in rural areas. Only one in three rural Africans have access to an all-season road—about half the share found elsewhere in the developing world. Given the large extension and low population density of Africa's rural areas, achieving universal connectivity will be a costly and protracted endeavor. It is therefore important to prioritize rural road programs in areas with agricultural development plans to obtain the maximum development impact from limited rural road funds.

Africa's rapidly growing cities also face major mobility problems that prevent them from receiving the full benefits of agglomeration. Paved road density is remarkably low in Africa's cities, perhaps reflecting low density urbanization, lack of urban planning, and very weak municipal revenues. Publicly provided urban transport services have folded in many cities, giving way to privately operated and largely unregulated minibuses.

9.2 Tracking Performance

This sector synopsis highlights some of the key policy issues facing the road transport sector. In order to continue tracking sector performance over time, various indicators are needed to shed light on a number of key policy themes:

Institutions: Most African countries have been moving toward an institutional model for the road sector that is based on the principle of road user charges. Under this approach, road users pay pseudo charges in the form of fuel levies and other surcharges that are transferred into a dedicated and ring-fenced road maintenance fund. Road works are implemented by an autonomous road agency. A series of institutional indicators are collected to capture the extent to which this modern institutional model has been applied in each country.

In addition, institutional measures in support of road safety are also tracked, in recognition of the fact that road fatalities are the third-leading cause of death in Africa after HIV/AIDS and malaria.

This kind of information can be used to benchmark countries in terms of their progress on road sector modernization. For example, some of the most advanced reformers have incorporated almost all of the best practice features, while others have yet to embark on the modernization process (Figure 9.1). Independent auditing and adoption of road user charges are the most widely applied reforms, while road user representation on the board of the road fund is comparatively rare.

- *Access*. The most basic, yet difficult data to obtain involve the length of road networks, needed to define the availability of road infrastructure. Corresponding characteristics should be obtained utilizing a link-by-link survey described in the section on technical variables, to better describe

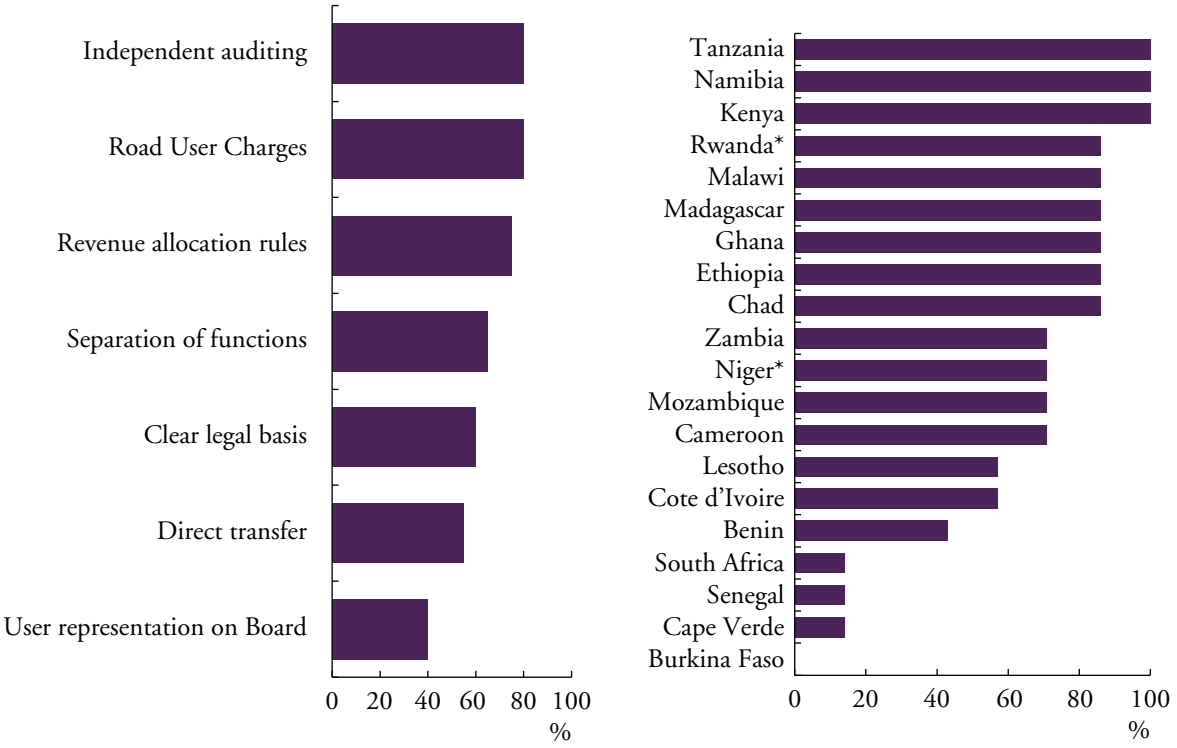
quality in terms of surface type and condition. Using the classified network as a reference, three types of density are calculated to generate access indicators. In addition, the main measure of rural access used in the road sector is the so-called rural accessibility index (RAI) that captures the percentage of the rural population that lives within 2 kilometers of an all-season road. Road network indicators physically describe the road network infrastructure including its length, network class (primary, secondary, tertiary), and surface type (paved, gravel, earth).

- *Density*. The classified road network, which represents the most reliable length data, is used as a reference to include three different types of densities for road length: per land area, per capita, and per vehicle.

There are two methods for estimating the RAI:

- The first is based on household surveys that question households as to whether they live within 2 km of an all-season road. The drawback of this approach is that household surveys are not typically designed to be representative at the level of disaggregation needed to calculate this indicator.
- The second is based on geographic information system (GIS) analysis that uses road network and population density data to estimate the population that lives within 2 km of an all-season road. The drawback of this approach is that population density data do not tend to capture small rural population clusters and may thus underestimate the true extent of access.

Figure 9.1 Prevalence of institutional good practices in Africa's road sector

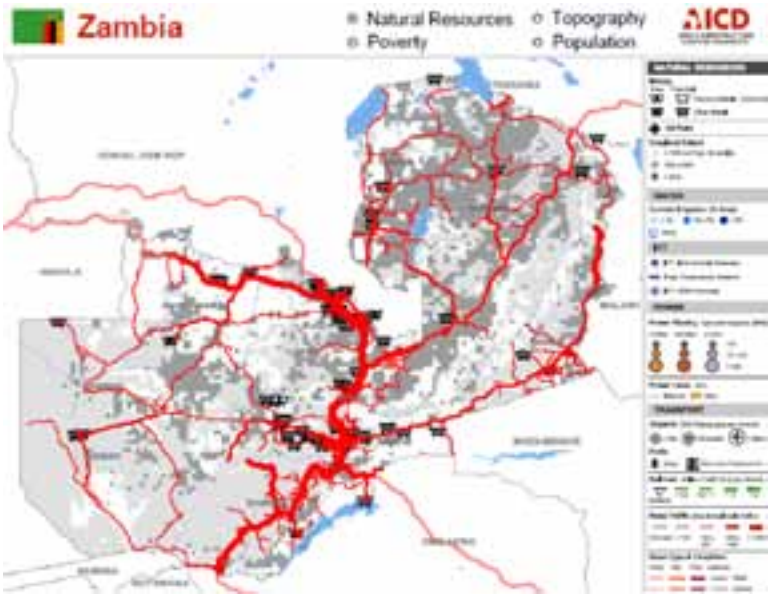


Source: Africa Infrastructure Country Diagnostic 2009.

Usage: Road network usage can be captured in a variety of ways. The preferred and most direct method is to measure traffic flows at each point on the network; however, these kinds of data are not always available. A more indirect approach is to collect more widely available macro figures on fuel consumption and motorized vehicle fleets. Using fuel consumption for different types of vehicles, it is possible to estimate the overall level of network utilization if not its spatial distribution. The usage in the road sector is best summarized by combining the traffic levels for different road classes (primary, secondary, tertiary), with the motorized vehicle fleet, and overall fuel consumption (gasoline, diesel) to obtain three key indicators: freight, passenger, and vehicle utilization in kilometers per year.

When combined with GIS spatial analysis tools, this information can be used to portray traffic flows in a country. For example, in the case of Zambia, there is a heavy concentration of traffic along the north-south copper belt and a marked decline in traffic flows on the eastern and western sides of the country (Figure 9.2).

Figure 9.2 Map of road traffic flows in Zambia



Source: Africa Infrastructure Country Diagnostic 2009.

Financial: The financial analysis of the sector covers several variables:

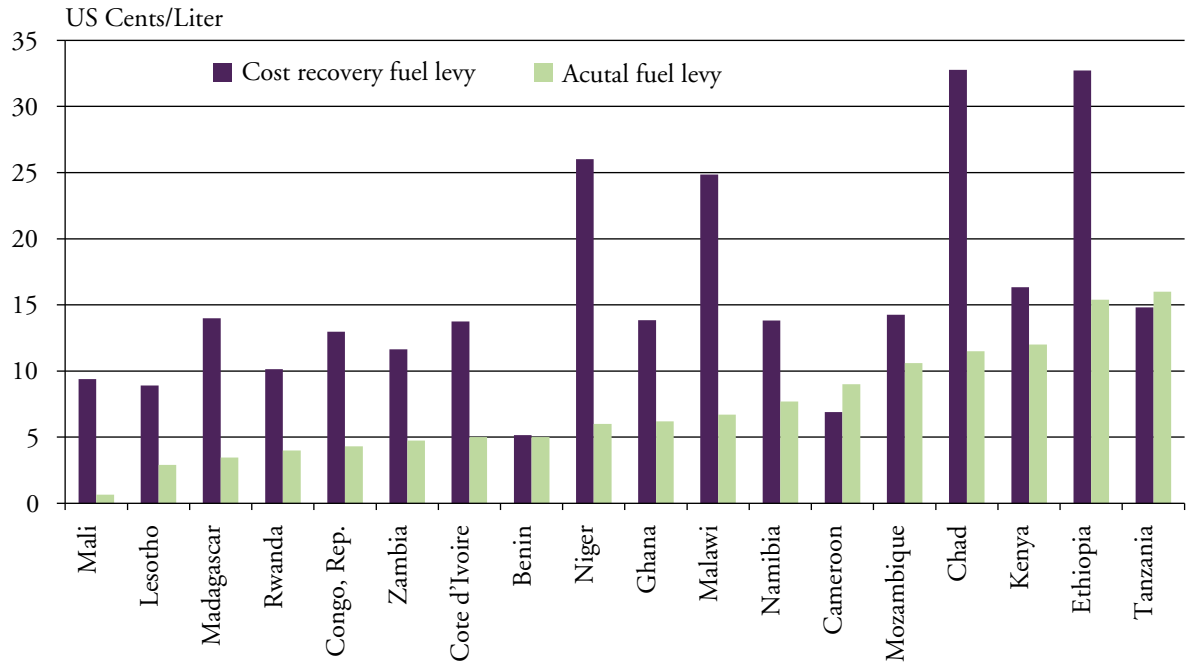
- The first set of financial variables starts with the *allocation of funds* from the road fund budget. One possible breakdown includes the shares allocated to the primary, secondary or tertiary networks. Depending on the mandate of the road fund, it is also possible to include resources for urban roads.
- A second set of variables has to do with *actual road network expenditure* on maintenance and capital works. Maintenance typically includes routine and periodic maintenance, and capital works cover new investments as well as rehabilitation.
- The third set provides *estimated network preservation requirements* that take into account the cost of maintaining and rehabilitating the network given its current condition. Preservation involves rehabilitation and periodic and routine maintenance; the definition of the estimates requires the selection of a given maintenance standard level (high, medium, low).
- Using information on the quantity and quality of the road network, it is also possible to estimate a replacement cost asset value for the entire road network, both in its current condition and (as a maximum network asset value) if it were to be restored to good condition.

Information about the *unit costs of road works*, or the actual historic costs of implementing road works of various kinds, is a critical input for estimating preservation requirements and network asset values. Information about road user costs, or the vehicle operating and time delay costs that are incurred in making use of the road network, are balanced against road preservation costs to determine the optimal level of intervention (see Annex A9.2 on technical parameters).

Pricing: Two types of prices are relevant to the road transport sector. The price of motor vehicle fuels (both gasoline and diesel) is a key determinant of vehicle operating costs that affect patterns of road usage. In addition, the fuel levy, as a road user charge that the government sometimes chooses to apply to support road maintenance funding, is an important policy variable.

This information can be used, for example, to evaluate whether fuel levies are set at levels adequate to support road maintenance funding. To do this, we compare the actual fuel levy with the optimal or custom fuel levy that comes from dividing the road maintenance or preservation-funding requirement by the total fuel consumption of motor vehicles. The results show that there are very few countries in Africa that have set fuel levies high enough to fully fund road maintenance (Figure 9.3). In most cases, a fuel levy set somewhere between $0.10 and $0.15 per liter is adequate to support full road maintenance funding. But in Africa's larger less densely populated states, the fuel levies needed to meet road maintenance funding needs are so high, at $0.25 to $0.50 per liter, that they would be difficult to apply in practice.

Figure 9.3 Comparison of fuel levy against level needed to fully finance road maintenance



Source: Africa Infrastructure Country Diagnostic 2009.

Technical: There are a number of technical aspects that are important to cover for the road sector:

- In addition to the physical indicators on network class and surface type included in the *access* category, an indicator of quality is added by specifying the surface condition (good, fair, poor) not only of the *classified* network as a whole, but also of the primary network.
- *Engineering standards*. The appropriate surface type for a road (whether paved, gravel, or earth) depends on the volume of traffic that it supports. As volumes rise beyond 30 vehicles per day, gravel surfaces become worthwhile. And as they rise further, beyond 300 vehicles per day, paved surfaces become worthwhile. In practice, however, roads may be *overengineered* (by paving at levels of traffic too low to warrant that treatment) or *underengineered* (by not paving for levels of traffic above the indicated threshold). For the primary and secondary networks, the under- and overengineering standards were applied, and for the unpaved tertiary road network the correct engineering standard was applied.
- *Road safety*. In view of the importance of road safety issues, it is also relevant to monitor the number of accidents and associated serious injuries and fatalities. Much can be done to improve road safety by appropriately engineering designs that include traffic signals, sidewalks, and pedestrian bridges.
- *Quality perceptions*. To complement technical measures of network quality and engineering standards, it is also important to collect road user perceptions of quality, as these may capture other aspects of road network management or performance, such as the nature of transport services and the presence of various kinds of obstacles to road transportation.

When combined with GIS spatial analysis tools, this information can be used to portray road condition and quality in a country. For example, in the case of Senegal, there is a marked contrast between the relatively good quality of roads along the coastal belt and the much poorer quality of roads in the hinterland. This likely reflects the concentration of economic activity along the Senegalese coast, but is disadvantageous to landlocked neighbors, such as Mali, that rely on Senegalese infrastructure for access to the sea (Figure 9.4).

Figure 9.4 Illustration of road network conditions in Senegal

Source: Africa Infrastructure Country Diagnostic 2009.

For more discussion of how road transport sector indicators can be used to inform policy analysis, the reader is referred to the following publication:

- Gwilliam and others. 2011. *Africa's Transport Infrastructure*. World Bank, Washington DC.

9.3 Indicator Overview

Annex A9.1 provides a comprehensive list of all indicators needed to track and monitor road transport sector trends, together with their corresponding technical definitions. Annex A9.2 also provides a list of commonly used technical indicators in the road sector, as well as some of the technical parameters used to compute derived indicators.

While the full list of indicators amounts to several hundred items, it is possible to group the indicators around a smaller number of some 35 primary indicators. Table 9.1 provides a synthetic overview of these primary indicators and shows how one can express each primary indicator in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators related to the primary one. It also indicates whether the indicator originates at the national level or at the level of individual road network links. Finally, the Table provides the source of the data, which in the case of road transport is a mixture of primary data collection on a link-by-link basis, processed by the RONET model, and collection of complementary indicators from a variety of secondary sources. We describe the process for obtaining data from both of these sources in detail later.

For example, the road network can be broken down into the classified and unclassified networks, while the classified network can be further broken down into the primary, secondary and tertiary network, or the paved and unpaved network. Although we typically express these variables in kilometers, it is possible also to normalize it by the area of the country to give a road density measure in terms of kilometers of road per square kilometer of area. Thus, South Africa has a classified road network density of 167 kilometers per square kilometer compared with only 21 kilometers per square kilometer in Ethiopia. Furthermore, to understand the structure of a country's road network, it is helpful to normalize each subcategory of the road network as a share of the total. Thus, in the Democratic Republic of Congo, only 7 percent of the classified roads are paved.

Table 9.1 Overview of primary indicators for road transport

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Institutional index—Roads			Base 100	National	National	Roads template A
	Road institutions, road agency legally established			Binary			
	Road institutions, road fund legally established						
	Road institutions, public works entity legally established						
	Road institutions, clear separation of functions across entities						
	Road fund, road user charges established						
	Road fund, direct transfer of funds						
	Road fund, clear allocation of funds						
	Road fund, user representation						
	Road fund, independent audits						
	Road safety lead agency identified						WHO
	National road safety strategy formulated						
Access	Length, road network		Classified/unclassified Primary/secondary/tertiary Urban Paved/unpaved	% network % classified network	Link	National	Roads template B
	Density, road network, classified		Per land area Per population Per vehicles	Km/area Km/capita Km/vehicle			
	Density per rural population			Km/capita			
	Density per urban population			Km/capita			
	GIS rural accessibility index			% rural population			
Usage	Traffic		Primary/secondary/tertiary Paved/unpaved	Vehicles per day	Link	National	Roads template B
	Utilization		Freight Passenger	Per kilometer			
	Vehicle Utilization		Classified/Unclassified Paved/Unpaved	% classified network			
	Fuel consumption		Diesel Gasoline	Per vehicle-km	National	National	IEA
	Motorized vehicle fleet			Per capita Per kilometer		National	WHO

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Financial	Road fund allocation		Primary/secondary/ tertiary Urban	% Road fund budget	National	National	Roads template A
	Spending, classified road network		Preservation	% needs $/km			Fiscal module
	Needs, classified road network		Rehabilitation Periodic maintenance Routine maintenance Custom/Optimal	% GDP $/km			Road agency processed by RONET
	Asset value		Road network/Classified network/Classified max.	% GDP % of maximum			Road agency processed by RONET
Pricing	Price		Gasoline Diesel	$/liter	National	National	GTZ
	Fuel Levy, actual assigned to road		Actual				Roads template A
	Fuel levy, to finance		Preservation Rehabilitation Maintenance Custom/Optimal				Road agency processed by RONET
Technical	Condition		Good/Fair/Poor Classified/Primary	% network	Link	National	Road agency processed by RONET
	Overengineering Underengineering		Primary and secondary paved/Unpaved	% network			
	Proper engineering		Tertiary unpaved	% tertiary unpaved			
	Road accidents		Accidents/Fatalities/ Serious injuries	Per capita Per vehicle-km	National	National	WHO
	Perception of transport as a constraint			% firms	National	National	ICA Surveys

Source: Author's elaboration

Table 9.2 Example of benchmarking road transport indicators for Zambia

Road Indicator	Unit	Resource rich	Zambia	MICs
Paved road density	km/1,000 km2 of arable land	97.6	56.3	146.8
Unpaved road density	km/1,000 km2 of arable land	128.2	95.0	257.8
GIS rural accessibility	% of rural pop. within 2 km of all-season road	19.7	16.8	22.9
Overengineering of network	% of main road network paved despite low traffic volumes	15.0	65.0	20.0
Paved road traffic	Average annual daily traffic	1,408.2	736.6	2,558.3
Unpaved road traffic	Average annual daily traffic	54.2	45.2	14.9
Paved network condition	% in good or fair condition	67.9	83.0	82.0
Unpaved network condition	% in good or fair condition	61.4	25.0	57.6
Perceived transport quality	% firms identifying roads as major business constraint	27.4	10.6	4.8

Source: Africa Infrastructure Country Diagnostic 2009.

Note: MICs = middle-income countries; GIS = geographic information system.

Where relevant, one can calculate benchmarks to facilitate cross-country comparisons. In addition to the general benchmarks introduced in the data processing chapter, there are a number of sector-specific benchmarks used for the road transport sector. In particular, it is relevant to distinguish between countries that have relatively dry and flat terrains and those that have rolling and humid terrains, since the latter face much higher costs of road construction and maintenance.

Finally, Table 9.2, which benchmarks performance indicators for the road transport sector in Zambia, provides an example of how to use indicators to inform policy analysis of the sector. The analysis shows that Zambia has relatively low road density compared to its peers, but also relatively low traffic volumes. The quality of Zambia's paved network is very high compared to the peer group; however, the quality of its unpaved network lags far behind. There is evidence that the majority of Zambia's roads are overengineered, meaning that the traffic levels on its paved roads do not really warrant the investment in paving.

9.4 Data Collection

Target institutions

This section identifies the road sector data that are to be collected in order to create the relevant road indicators. Annex A9.3 provides a comprehensive list of the road sector institutions in Africa. These are the target institutions that need to be approached for data collection in the road sector. The list includes the names of the ministries of transport and relevant sector entities, where they exist. The list is accurate as of March 2011; however, the road sector is always changing. There is constant creation of new road funds, road agencies, and public works entities, while the ministry responsible for road transport may also shift over time. For all of these reasons, the list is intended only as general guidance, and should be reviewed and updated in consultation with road specialists as a starting point for any future data collection exercise.

Many African countries have established independent road agencies responsible for the management of the national roads network, and these agencies (where they exist) should be the focal point for data collection. Otherwise, the line ministry is typically the relevant counterpart for data collection. Over time more countries are likely to establish road agencies, shifting the focus for data collection from the line ministry to the road agency.

A number of countries, most notably those with federal systems, also have subnational entities responsible for the lower tiers of the road network. Nonetheless, the data collection process is based solely on data that can be collected at the national level. The unit of analysis for the roads database is the national level.

Data templates

The data collection process for the roads sector divides into two distinct parts:

- *Institutional variables* are collected at the national level following roads template A
- *Technical variables* are collected at the level of individual links in the road network, following roads template B.

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the *comma-dot* or *dot-comma* convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

For details refer to chapter 2 of the Handbook on Infrastructure Statistics

Institutional variables

There are 11 institutional variables that are outlined in roads template A (see Annex A9.4)

The user should collect data primarily from a central government entity, since it is most likely to be able to provide a full picture of the current situation of the transport sector as a whole and of the road sector in particular. In every country, there is a transport ministry that has direct responsibility over the road sector, and any experienced official within the ministry should be able to provide answers to the template A's simple questions, thus providing a basic description of the institutional framework for the sector.

Answers may not always be a clear yes or no. Some interpretation may therefore be needed to code the data. For example, any response such as "in general," "for the most part," and "to a great extent" could legitimately be coded as "yes." But any answers that seem ambiguous should always be recorded in the comments column.

The following definitions will help to clarify the institutional variables:

- *Road agency* legally established. A positive answer should be given if a road agency has been established and is currently operational. The road agency is an autonomous entity responsible for managing the road network. Its mandate varies greatly and in some cases covers only primary or national networks, while in others may extend to state or regional or urban networks as well. Its scope of work generally includes new construction, improvements, rehabilitation, and maintenance. Depending on its degree of autonomy, it may also be involved in the long-term planning or procurement of works.
- *Road fund legally established*. A positive answer should be given if a road fund (i) has been created through proper legislation or (ii) is already established and currently operational. A road fund is a ring-fenced source of financing for road maintenance. A road fund created by legislation is typically less vulnerable to political interference and diversion from its stated objectives. If the road fund has been created by some kind of executive decree, this would count as a negative answer.
- *Public works entity (AGETIP) legally established*. A positive answer should be given if an AGETIP has been established and is currently operational. AGETIP (or, in full, Agence d'Exécution des Travaux d'Intérêt Public contre le sous-emploi) is the French acronym for a public works and employment agency, and originates in francophone Africa. It provides mostly small-scale basic infrastructure (roads, water supply, sanitation, health centers, hospitals, schools, and so on) and other services for the benefit of the poor, while creating employment and promoting the local private sector. The AGETIP model is similar to a social fund, which is a term more commonly used outside of francophone Africa.
- *Road institutions*. This refers to the clear separation of functions and responsibilities vis-à-vis other road sector institutions. A positive answer should be given if there is a clear separation of functions among institutions in the road sector. This is usually combined with a clear legal basis for the distribution of responsibilities across institutions and between government levels.
- *Road fund, road user charges established and applied*. This receives a positive answer when the road fund receives revenue from road user charges, which take the form of various surcharges, taxies, or levies on gasoline or diesel fuel, that contribute to general revenue, as well as any other transport-related taxes such as vehicle and parts input duties or vehicle registration fees.
- *Road fund, revenues are transferred directly* from road user charges into the Road Fund circumventing the national budget. A positive answer should be given if the direct transfer of funds from road user charges (such as fuel levies) to the road fund or road agency is currently in place and functioning properly.
- *Road Fund, clear rules for allocation of road funds* to different parts of the road network. A positive answer should be given if there are explicit formulas that provide for a clear allocation of road maintenance funds across road sector institutions, government jurisdictions (federal, state, municipal), and specific segments of the road network (primary, secondary, tertiary; or main, rural, urban).
- *Road fund, road user representation* on the Board of the road fund. A positive answer should be given if the board of directors of the road fund includes at least one member who is not a government official, but rather represents the interests of road users, such as a trucking association, chamber of commerce, or citizens group. This feature helps to ensure that the user perspective is taken into account in road funding decisions.
- *Road fund, independent audits* of the road fund's finances and operations. A positive answer should be given if independent financial audits are performed regularly (yearly) and the results preferably made publicly available. Alternatively, or in addition, a positive answer should be given if independent technical audits are carried out on road works.
- *Road safety lead agency identified*. There is a clearly identified and fully established agency responsible for road safety that is adequately funded in the national budget.
- *National road safety strategy formulated*. There is a national road safety strategy in place, with measurable targets, that is adequately funded.
- *Road fund, institutional index* (index base 100) is a simple average of binarized measures of institutional reform and regulation.
- *Fuel levy*. This is a particular example of a road user charge. It consists of a fixed levy on the price of gasoline and/or diesel that is intended to make road users contribute to the cost of road network maintenance. The associated revenue is typically channeled directly into a road fund.

Technical variables

A list of the technical variables for the road sector is in roads template B (see Annex A9.4). It is important to note that one can typically obtain such technical data directly from the most recent national roads survey, reported on a link-by-link basis.

Almost all countries undertake periodic road network surveys. The purpose of these surveys is to document in detail the na-

ture and condition of the road network to provide a basis for management and investment decisions. As such, they are a key component of any country's road management system. Since these surveys are large and costly, they are not undertaken either frequently or regularly, but more often on an ad hoc basis. For this reason, it is not possible to predict when a country is likely to update its road survey. But even if a full new road survey is not undertaken each year, the roads institutions update the survey information based on knowledge they acquire in the process of network management activities.

The most critical step in the data collection process is to identify the most recent national roads survey and obtain access to its data. As long as there has been a new or updated road network survey, a new data collection exercise should be initiated.

National roads surveys typically report road data on a link-by-link basis. A "link" is a stretch of road that may vary in length from a couple of kilometers to 20 or 30 km. A link constitutes a piece of the road network that is clearly segmented between two observable nodes (such as two towns or villages, or two junctions on the road network), and that is homogenous. That is to say that the entirety of the link tends to be similar in terms of type of road infrastructure, condition, and traffic flows. Links thus form the basic unit of road network management, and also the basic unit of data collection. Collecting data on a link-by-link basis has numerous advantages in terms of downstream analysis, because it allows for a very refined representation of the road network both in spatial and analytical terms.

For most countries that have already collected such data, a spreadsheet containing a list of all the links on the road network is available, and only the characteristics of the links require updating. Otherwise, the starting point is to obtain a full list of the network links and ensure that these are identified properly. The first variables in the data template provide the link's official identification number, the number of the road on which the link is located, the precise location of the start and end nodes of the link, and the region or administrative jurisdiction where the link is located. Every effort should be made to collect precise geographic coordinates for the start and end nodes of each link to be able to analyze the data spatially When geographic coordinates are not available, the description of the start and end nodes should be sufficiently precise to allow these to be georeferenced at a later stage.

With the link itself defined, the remaining variables describe the full range of physical characteristics of the link, including its length, width, number of traffic lanes, network class, surface type, surface class, and traffic characteristics. In responding to these questions, it may be helpful to refer to the following definitions.

- *Network class*. The overall country road network subdivides into five road networks based on a standard functional classification. The actual local classifications in each country should be adapted to best match the following network definitions. The different components of the network are often allocated to different administrative jurisdictions:

Primary network	Primary, main, trunk, or national roads are roads outside urban areas that belong to the top level road network, connecting the main population and economic centers of the country. These roads are characterized by a comparatively higher quality standard.
Secondary network	Secondary or regional roads are the main feeder routes into, and provide the main links between, primary, main, truck, or national roads.
Tertiary network	Tertiary, local, or rural roads are typically unpaved and carry a comparatively low level of traffic.
Classified network	The classified network is the entirety of the road network, the building and operating of which falls under the responsibility of the state. It includes the sum of the primary, secondary, and tertiary networks.
Urban network	Urban network roads are those located within the boundaries of cities or towns, but exclude streets and avenues. These networks usually fall under the responsibility of local governments and may be part of interurban networks traversing urban areas.
Unclassified network	The remaining roads in the country that do not fall under the responsibility of the state. They are typically urban roads or small rural roads, tracks, or paths maintained by local communities, or private roads maintained by mining, forestry, or agricultural enterprises access their sites.

- *Surface class*. Refers to the material with which the road link is covered. The basic distinction is between paved and unpaved roads. If possible, however, the surface type should be classified according to one of the following five categories:

Paved concrete	Includes: jointed plain concrete, jointed reinforced concrete, and continuously reinforced concrete.
Paved asphalt	Includes: asphalt concrete, hot rolled asphalt, rubberized asphalt concrete, porous asphalt, cold mix.
Paved surface treatment	Single bituminous surface dressing, and double bituminous surface dressing.
Unpaved gravel	Includes: lateritic gravel and quartzitic gravel.
Unpaved earth	Includes all earth roads.

- *Surface condition*. Each identified link falls in one of five possible road conditions:

Very good condition	Paved, gravel, and earth roads in very good condition require no capital road works.
Good condition	Paved roads in good condition are largely free of defects and require some minor maintenance work, such as preventive treatment or crack sealing. Gravel roads in good condition are roads that require only light grading and spot regravelling. Earth roads in good condition are roads that require only light grading.
Fair condition	Paved roads in fair condition are roads with defects and weakened structural resistance that require the resurfacing of the pavement (periodic maintenance) but not the demolishment of the existing pavement. Gravel roads in fair condition require regravelling (periodic maintenance). Earth roads in fair condition require heavy grading plus localized drainage repairs (periodic maintenance).
Poor condition	Paved roads in poor condition require rehabilitation (strengthening or partial reconstruction). Gravel roads in poor condition require partial reconstruction. Earth roads in poor condition require partial reconstruction.
Very poor condition	Paved roads in poor condition require rehabilitation (strengthening or partial reconstruction). Gravel roads in very poor condition require full reconstruction, almost equivalent to new construction. Earth roads in very poor condition require full reconstruction, almost equivalent to new construction.

If a five-way classification does not prove possible, a simpler three way classification (good, fair and poor (is still very useful and should be attempted (Figure 9.5).

Road conditions are defined as a function of the engineering assessment of the capital road works (periodic maintenance and rehabilitation works) required to restore a road to very good condition. Table 9.3 provides further engineering information for the determination of road condition. All roads need routine maintenance road works every year; therefore, they do not feature in the definition of the road condition classes.

Figure 9.5 Illustration of surface condition

Table 9.3 Capital works needed to restore road networks to very good condition

Capital Road Works Neede to Bring a Road to Very Good Condition			
Condition Class	Paved Roads	Gravel Roads	Earth Roads
Very Good	None	None	None
Good	Preventive Treatment	Spot Regravelling	Light Grading
Fair	Resurfacing	Regravelling	Heavy Grading
Poor	Strengthening	Partial Reconstruction	Partial Reconstruction
Very Poor	Full Reconstruction	Full Reconstruction	Full Reconstruction

Table 9.4 presents types of road condition based on engineering information on the roughness of the surface.

Table 9.4 Definition of condition in terms of roughness index by surface type

Recommended Condition Classes					
Surface Type	Condition Class	Roughness (IRI m/km)			Speeds (km/hr)
		Minimum	Maximum	Average	
Paved Roads	Very Good	1.0	2.5	2.0	
	Good	2.5	3.5	3.0	
	Fair	3.5	6.0	4.0	
	Poor	6.0	10.0	8.0	
	Very Poor	10.0	16.0	12.0	
Gravel Roads	Very Good	1.0	6.0	5.0	90-110
	Good	6.0	9.0	7.0	70-90
	Fair	9.0	13.5	11.0	40-70
	Poor	13.5	18.0	16.0	30-40
	Very Poor	20.0	25.0	20.0	20-30
Earth Roads	Very Good	1.0	8.0	7.0	90-110
	Good	8.0	11.0	9.0	70-90
	Fair	11.0	15.5	13.0	40-70
	Poor	15.5	20.0	18.0	30-40
	Very Poor	20.0	25.0	22.0	20-30

Traffic value: The roads survey, where it exists, provides information on traffic flows for each link. Ideally, this would be an actual measurement of average annual daily traffic, or the number of vehicles per day that can typically be found along the route. But since this type of information is not always available, an acceptable alternative is to classify links according to one of five traffic bands, starting with less than 10 vehicles a day and going all the way up to more than 30,000 vehicles per day. Table 9.5 provides detailed engineering parameters showing the relationship between average annual daily traffic (AADT) and the appropriate design standards for roads.

Road surveys are not comprehensive enough to provide all the relevant technical variables described here; traffic data are often

Table 9.5 Relationship between average annual daily traffic and appropriate engineering standards

Traffic Range	Average Annual Daily Traffic (AADT)			Geometry Standard	Pavement Standard
	Minimum (veh/day)	Maximum (veh/day)	Average (veh/day)		
T1	0	10	5	1-lane warranted	Formation not warranted
T2	10	30	20	1-lane warranted	Formation warranted
T3	30	100	65	2-lane warranted	Gravel warranted
T4	100	300	200	2-lane warranted	Gravel warranted
T5	300	1,000	650	2-lane warranted	Paved Surface warranted
T6	1,000	3,000	2,000	2-lane warranted	Paved Surface warranted
T7	3,000	10,000	6,500	2-lane warranted	Paved Surface warranted
T8	10,000	30,000	20,000	4-lane warranted	Paved Surface warranted
T9	30,000	100,000	65,000	Multi-lane warranted	Paved Surface warranted

Standard given for illustration purposes. Proper standards are country specific.

AADT of motorized 4-wheel or more 2-way traffic

missing and are the most difficult to capture. The variables that are not available or missing for specific links should be obtained directly from road engineers who know the network. This can be done by forming focus groups of road engineers that can review the missing data fields and provide informed professional judgments about the appropriate classification of individual links.

It is important to collect the link-by-link data for all parts of the classified road network: primary, secondary, and tertiary. In many countries, however, link-by-link data may only be available for the primary and secondary networks and sometimes for the urban networks. If link-by-link information is not available for the tertiary network, it is acceptable to aggregate links to generate and collect data for large sample roads, or representative sections, using organized focus groups of highway engineers from subnational levels of government to generate district-by-district or region-by-region data on the condition and traffic levels of the tertiary network.

Finally, data collectors should expect to make necessary adjustments to the general guidelines provided, given the differences among countries. It is important to apply the concepts evenly to all countries to ensure that the results can be later compared across countries. Local definitions should be clearly noted in the comments columns.

Data from secondary sources

In addition to the road network characteristics collected directly from the countries, the data needed to track the road transport sector include a number of complementary variables that are available from several international databases (Table 9.6).

The precise definitions of these indicators are as follows.

- *Road safety lead agency identified*. There is a clearly identified and fully established agency responsible for road safety, adequately funded in the national budget.
- *National road safety strategy formulated*. There is a national road safety strategy in place, with measurable targets, that is adequately funded.
- *Rural Accessibility Index*. The percentage of the rural population living within 2 km of an all-season road (typically a 20–25 minute walk). An "all-season road" is a road that is motorable all year round by the prevailing means of rural transport (typically a pick-up or other truck that does not have four-wheel drive). Occasional interruptions of short duration during inclement weather (for example, heavy rainfall) are accepted, particularly on lightly trafficked roads. The preferred approach for measuring this indicator is by analysis of household surveys that include appropriate questions about access to transport. The design and conduct of such surveys are costly and time consuming, and are unlikely to be repeated more than once every few years. The questions are increasingly, though not always, incorporated into information from Living Standard Measurement Surveys (LSMS) and other similar surveys such as the Income and Expenditure Household Survey (IES), Poverty Survey (PS), and Core Welfare Indicators Questionnaires (CWIQ).

Table 9.6 List of road transport sector complementary data variables and sources

Policy area	Variable	Source
Institutional	Road safety lead agency identified	World Health Organization (WHO) www.who.int/violence_injury_prevention/road_safety_status/2009/en/index.html
	National road safety strategy formulated	
Access	Rural Accessibility Index	Household Surveys www.worldbank.org/transport/transportresults/headline/ruarl-access.html
Usage	Fuel consumption—gasoline	International Energy Agency (IEA) www.worldenergyoutlook.org/2009.asp
	Fuel consumption—diesel	
	Motorized vehicle fleet	World Health Organization (WHO) www.who.int/violence_injury_prevention/road_safety_status/2009/en/index.html
Financial	Road works unit costs—capital works	World Bank Road Costs Knowledge System www.worldbank.org/wbsite/external/topics/exttransport/extroadshighways/ROCKS.html
	Road works unit costs—maintenance works	
	Road user costs—value of time	World Bank Road User Costs Knowledge System www.worldbank.org/wbsite/external/topics/exttransport/extroadshighways/RUCKS.html
	Road user costs—vehicle operating costs	
Pricing	Price gasoline	German Technical Cooperation (GTZ) www.gtz.de/en/themen/30005.htm
	Price diesel	
Technical	Road accidents	World Health Organization (WHO) www.who.int/violence_injury_prevention/road_safety_status/2009/en/index.html
	Road accidents—serious injuries	
	Road accidents—fatalities	
	Perception of transport as a constraint for business	World Bank Investment Climate Assessment Surveys www.enterprisesurveys.org

- *Fuel consumption—gasoline*. The amount of consumption of light hydrocarbon oil for use in internal combustion engines, excluding those in aircraft in millions of liters per year. Includes regular and super gasoline.
- *Fuel consumption—diesel*. The road motor vehicle fuel consumption of oil obtained from the lowest fraction of atmospheric distillation of crude oil per year. In millions of liters per year. Includes gas/diesel oil and distillate fuel oil.
- *Motorized vehicle fleet—cars, trucks, and buses*. Number of passenger cars, including vans, pick-ups, and utility vehicles; trucks, including light, medium, heavy, and articulated trucks; buses, including small, medium, and large buses.
- *Price gasoline*. The average amount paid by road motor vehicle users for one liter of gasoline. The most widely sold grade of gasoline (in terms of quantity) provides the respective basis for each country. In countries where regular-grade gasoline is still the norm, this fuel is used instead of super gasoline.
- *Price diesel*. The average amount paid by road motor vehicle users for one liter of diesel.
- *Road accidents*. Number of accidents in which at least one motor road vehicle in motion was involved on a public road or private road to which the public has right of access. Included are: collisions between road vehicles, between road vehicles and pedestrians, between road vehicles and animals or fixed obstacles and with one road vehicle alone, and between road and rail vehicles. Multivehicle collisions are counted as only one accident provided that any successive collisions happen within a short interval.
- *Road accidents—serious injuries*. Number of people seriously injured in any road accident. A serious injury is defined as one requiring hospitalization for a period of more than 24 hours.
- *Road accidents—fatalities*. Number of people killed in any road accident. The number of fatalities includes those injured people who died within 30 days of the occurrence of the accident.
- *Perception of transport as a constraint for business*. Percentage of firms responding to the World Bank's Investment Climate Assessment Survey and that identify transport as a major constraint on doing business in the country.

9.5 Data Processing

Analytical tools

The primary data collection process for the road sector assembled a very rich set of link-by-link data containing numerous georeferenced attributes of the road network. There are two ways in which the data can be usefully processed to yield policy relevant outputs:

- *Geographic information system (GIS),* which generates maps to illustrate how the characteristics of the road network (network class, surface type, surface condition, and traffic volumes) are distributed across the national space, and how they relate to other relevant economic attributes such as population density, incidence of poverty, topographical features, natural resources, agricultural potential, and so on. In some cases, the start and end nodes of each link may already be georeferenced in the original road network survey data. Otherwise, the geographic place name for the start and end node of each link can be manually georeferenced, which is more laborious but a nonetheless feasible task. Figure 9.2 and Figure 9.4 already provide examples of possible kinds of maps that can be generated. The GIS can also be used to calculate the Rural Accessibility Index. By superimposing road network data on population density data, it is possible to estimate the share of the rural population that lives within 2 km of an all-season road.
- *Road Network Evaluation Tool (RONET),* a mathematical representation of the real road network, can be used to calculate a wide range of aggregated indicators for the network, including cross-tabulations of different attributes. For example, it can show what percentage of the primary network is paved or unpaved, or what percentage of the paved network is in good, fair, or poor condition. In addition, the model can do extensive financial analysis of the road network as a whole. For example, it can estimate the costs of restoring the entire network from its current state to good condition, or the annual cost of maintaining the network once it has reached good condition.

Methodology

This section provides further methodological detail on the use of the RONET. RONET was developed for the Sub-Saharan Africa Transport Policy Program (SSATP) by the Energy, Transport and Water Department Transport Anchor (ETWTR) of the World Bank.

RONET is a tool for assessing the performance of road maintenance and rehabilitation policies and the importance of the road sector to the economy. It assesses current network condition and traffic, computes the asset value of the network, and generates road network monitoring indicators. It uses country-specific relationships between maintenance spending and road condition, and between road condition and road user costs, to assess the performance over time of the network under different road works standards. It determines, for example, the minimum cost for sustaining the network in its current condition. It also estimates the savings or the costs to the economy to be obtained from maintaining the network at different levels of road condition. It further determines the proper allocation of expenditures among recurrent maintenance, periodic maintenance, and rehabilitation road works. Finally, it determines the funding gap, defined as the difference between current maintenance spending and required maintenance spending (to maintain the network at a given level of road condition), and the effect of underspending on increased transport costs.

RONET includes a series of analytical tools designed to evaluate the road network and road sector of a country at a macrolevel by evaluating a series of representative road classes, which can be characterized, for example, as (i) functional classification, (ii) surface type, (iii) traffic level, (iv) road condition, (v) terrain, (vi) climate, and (vii) geographical region.

The model was developed using the same principles of the economic evaluation, engineering, and design model Highway Development and Management Model (HDM-4), adopting simplified road user costs relationships of the HDM-4 and simplified road deterioration equations derived from the HDM-4 research. Some of the most important RONET concepts, figures, and tables have been adapted from the RONET v2.0 Users' Guide (Draft October 2008) and are presented in the following sections. The model and associated documentation can be downloaded from the home page, as illustrated in Figure 9.6. The model is quite complex and should be used by professionals with a sound knowledge of the road sector (see www.worldbank.org/wbsite/external/topics/exttransport/extroadshighways/ROCKS.html).

The main input needed to run the RONET model is a series of 5x5 Input Matrices that provide a comprehensive series of cross-tabulations between different attributes of the road network. In the example given, the primary and secondary networks are each broken down into the two relevant surface types "surface treatment" and "gravel." For each of these portions of the network, a cross-tabulation is provided showing the number of kilometers in each traffic band that are in each condition band. Additional matrices would need to be entered for the tertiary network, or for any other surface types relevant to the primary and secondary network. The matrices can easily be created from the link-by-link database by use of pivot tables that isolate the relevant cross-tabulations. In the case of the tertiary network, where detailed link-by-link data may not exist, estimates can be inserted directly into the matrix structure (Figure 9.7).

Figure 9.6 Home page of RONET website

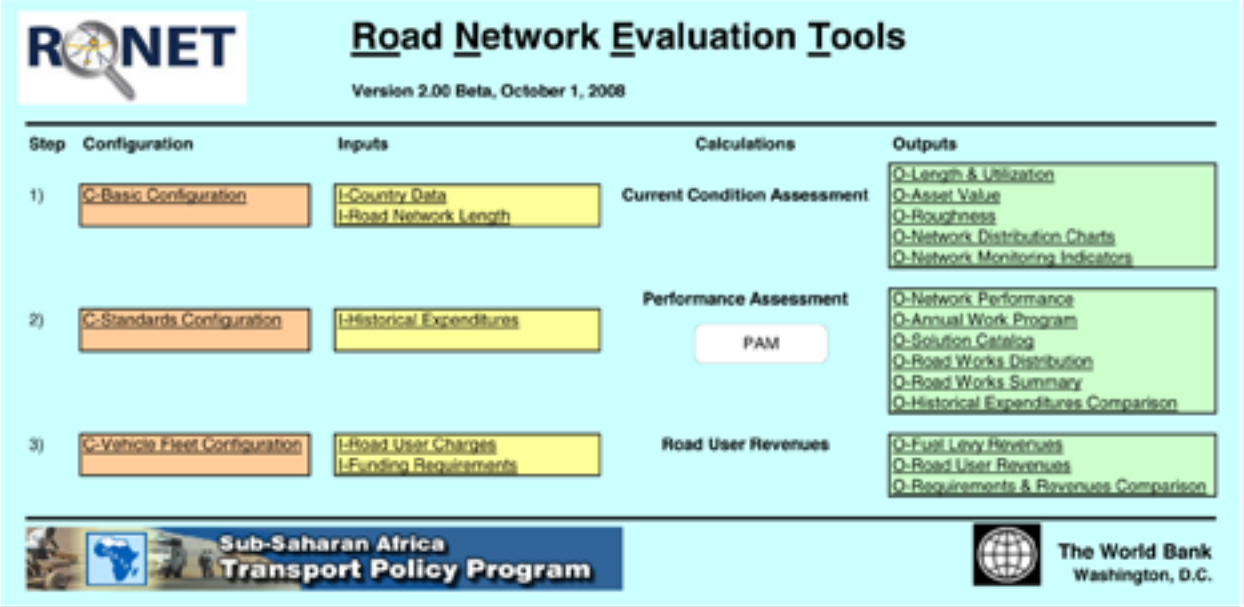


Figure 9.7 Sample road network length RONET input matrices

Road Network Two-Lane Equivalent Lenght (km)

Primary
Surface Treatment

Condition (IRI) / Traffic (AADT)	Very Good 3	Good 4	Fair 5.5	Poor 9	Very Poor 13	Total
Traffic I <300	0	0	0	0	0	0
Traffic II 100-1000	0	51	36	62	26	175
Traffic III 1000-3000	4	13	67	88	32	204
Traffic IV 3000-10000	0	0	0	0	0	0
Traffic V >10000	0	0	0	0	0	0
Total	4	64	103	150	58	379

Primary
Gravel

Condition (IRI) / Traffic (AADT)	Very Good 5	Good 7	Fair 11	Poor 16	Very Poor 20	Total
Traffic I <30	0	0	0	49	292	341
Traffic II 30-100	0	5	11	7	179	202
Traffic III 100-300	0	0	0	0	0	0
Traffic IV 300-1000	0	0	0	0	0	0
Traffic V >1000	0	0	0	0	0	0
Total	0	5	11	56	471	543

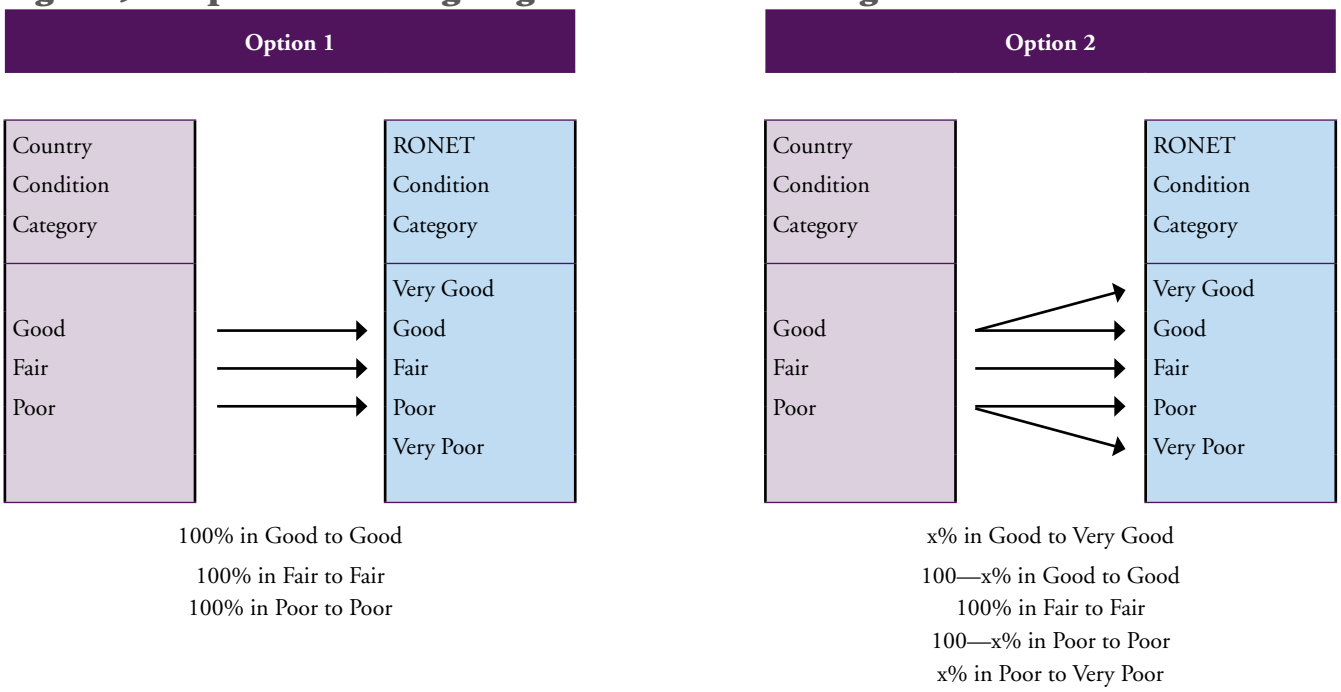
Secondary
Surface Treatment

Condition (IRI) / Traffic (AADT)	Very Good 3	Good 4	Fair 5.5	Poor 9	Very Poor 13	Total
Traffic I <300	0	0	10	0	0	10
Traffic II 100-1000	0	0	3	56	47	106
Traffic III 1000-3000	18	8	47	61	5	139
Traffic IV 3000-10000	0	0	0	0	0	0
Traffic V >10000	0	0	0	0	0	0
Total	18	8	60	117	52	255

Secondary
Gravel

Condition (IRI) / Traffic (AADT)	Very Good 5	Good 7	Fair 11	Poor 16	Very Poor 20	Total
Traffic I <30	7	56	393	631	503	1,590
Traffic II 30-100	11	15	53	507	618	1,204
Traffic III 100-300	0	0	0	37	14	51
Traffic IV 300-1000	0	0	0	0	0	0
Traffic V >1000	0	0	0	0	0	0
Total	18	71	446	1,175	1,135	2,845

Figure 9.8 Options for assigning road condition categories



RONET defines five road condition categories (very good, good, fair, poor, and very poor), but in some countries roads are classified in only three or four condition categories. The road analyst needs to judge how best to define the network on RONET, based on the available network data. For example, if there are only three categories (good, fair, and poor), you can consider the following options: (i) assign 100 percent of the road in good, fair, and poor condition to the corresponding RONET good, fair, and poor condition categories and leave the RONET very good and very poor categories blank, or (ii) assign a percentage of the roads in good condition to the RONET very good condition category, and the remaining percentage of the roads in good condition to the RONET good condition category; assign 100 percent of the roads in fair condition to the corresponding RONET fair condition category; assign a percentage of the roads in poor condition to the RONET poor condition category; and the remaining percentage of the roads in poor condition to the RONET very poor condition category (recommended option). The options are outlined in Figure 9.8.

In addition to the 5x5 input matrices summarizing the link-by-link data set, a number of the secondary source parameters are also critical inputs to RONET. These include road works unit costs, road user charges, fuel prices, and vehicle fleets.

Derived indicators

Once the data have been entered, RONET can calculate a large array of derived indicators:

- *Network length*: This is the total length of the road network. This indicator may be calculated for different segments of the network according to network type (classified/unclassified), network class (primary/secondary/tertiary), surface class (paved/unpaved), and surface condition (good/fair/poor). The indicator may also be calculated for subcategories of each segment. For example, the length of primary network roads in good/fair/poor condition, or the length of the secondary network that is paved or unpaved. Where data on urban roads are available, similar indicators can be calculated for these roads; however, they are not at present included in the calculation of the classified network, because these data are not consistently available across countries. Based on these network lengths, a series of normalized variables may be calculated that are particularly useful for cross-country comparisons.
  - *Network percentage*: It is also of interest to express what percentage of the overall road network belongs to each of the different segments according to network type (classified/unclassified), network class (primary/secondary/tertiary), and surface class (paved/unpaved). Again, percentages can also be calculated for particular segments. For example, the percentage of primary networks roads in good/fair/poor condition, or the percentage of the secondary network that is paved or unpaved.
  - *Network density*: This is the total length of the road network normalized against some measure of the scale of the country, which may be the physical area, the arable land area suitable for farming, the

population size, or the size of the vehicle fleet. This ratio is obtained by dividing the network length by one of these normalization measures.

- *Traffic*: This is the annual average daily traffic in terms of the number of vehicles per day recorded on the classified network, based on the most recent traffic surveys available. As before, the indicator may be calculated separately for different segments of the network.
- *Utilization vehicles*: This is the total usage of the classified network in terms of the numbers of vehicles per day, multiplied by the average journey length to give millions of vehicle-kilometers.
  - *Utilization vehicle average*: This indicator may be normalized against the size of the vehicle fleet to give the average number of kilometers per vehicle per year.
  - *Utilization vehicle percentage*. This indicator gives the percentages of overall vehicle utilization that relates to different segments of the network. It helps to give a sense of the distribution of the traffic across the network.

- *Utilization passengers*. This is the total usage of the classified network in terms of the numbers of passengers per day, multiplied by the average journey length to give millions of passenger-kilometers.
  - *Utilization passenger average*. This indicator may be normalized against the number of passenger vehicles to give the average number of kilometers per passenger vehicle per year.
  - *Utilization passenger percentage*. This indicator gives the percentages of overall passenger movements that relates to different segments of the network. It helps to give a sense of the distribution of passengers across the network.

- *Utilization freight*. This is the total usage of the classified network in terms of the total freight transported per day multiplied by the average freight journey length to give millions of tonne-kilometers.
  - *Utilization freight average*. This indicator may be normalized against the size of the freight vehicle fleet to give the average number of kilometers per freight vehicle per year.
  - *Utilization freight percentage*. This indicator gives the percentages of overall freight movements that relate to different segments of the network. It helps to give a sense of the distribution of freight traffic across the network.

- *Overengineering*. The surface type of a road should reflect the volume of traffic it receives. More durable surface types are costly and can only be justified once traffic reaches certain thresholds.
  - *Paved*. A paved road is considered overengineered if it has fewer than 300 vehicles per day. The indicator captures the percentage of primary/secondary roads that fall into this category.
  - *Unpaved*. An unpaved road is considered overengineered if a gravel surface has been applied when it has fewer than 30 vehicles per day. The indicator captures the percentage of secondary/tertiary roads that fall into this category.

- *Underengineering*. Following the same logic, roads can also be underengineered if the surface type is not durable enough given the volume of traffic.
  - *Paved*. A road is considered underengineered if it has more than 300 vehicles per day but has not been paved. The indicator captures the percentage of primary/secondary roads that fall into this category.
  - *Unpaved*. An unpaved road is considered underengineered if it has an earth surface even though it has more than 30 vehicles per day, which would justify a gravel surface. The indicator captures the percentage of secondary/tertiary roads that fall into this category.

- *Proper engineering*. It is defined to identify those road sections of the tertiary network that are unpaved and have less than 30 vehicles per day, which indicates that were not over- or underengineered and therefore are designed properly.
- *Asset value*. Road asset value refers to the replacement cost of the road network, which is to say what it would cost to rebuild it entirely from scratch at today's unit costs. The maximum asset value refers to the cost of replacing the existing network and putting it entirely in good condition. The current asset value refers to the cost of replacing the existing network in its current conditions; in practice, this is the maximum asset value minus any depreciation that has taken place in the condition of the network. RONET calculates both current and maximum asset values based on the physical network characteristics that are input to the model, and making use of the unit cost of capital works. The asset value indicators can usefully be normalized in the following ways:
  - *Percentage total*. This indicator gives the percentage of the current asset value that is accounted for by

different segments of the network (for example, primary/secondary/tertiary).

- *Percentage GDP*. This indicator gives the current asset value as a percentage of national GDP. It gives a sense of the importance of the road network as a national asset.
- *Percentage maximum*. This indicator gives the ratio of the current asset value to the maximum asset value; the lower this number, the worse the condition of the network and the greater the amount of capital that has been eroded as a result of poor network maintenance.

- *Preservation requirement*. Given the existing state of the network, RONET calculates the amount of money that would need to be spent both in terms of rehabilitation to restore the entire network to good condition, and in terms of ongoing annual maintenance requirements, including both routine and periodic maintenance activities. This gives rise to two measures. The first measure relates to a catch-up period of five years, during which all rehabilitation works are completed and all relevant maintenance activities are undertaken. The second measure relates to the steady state when the rehabilitation backlog has been cleared and only maintenance expenditure is required. Both are expressed as an annual preservation requirement in terms of millions of dollars per year. RONET can calculate preservation requirements for different network target standards determined by the user. For these purposes, it is recommended to use the realistic "custom standard," whereby the primary network is maintained in good condition, the secondary network in fair condition, and the tertiary network in poor condition. The following normalizations of this indicator are useful for policy analysis:
  - *Percentage GDP*. Normalizing preservation requirements in terms of GDP gives a sense of how affordable road network preservation is for the economy.
  - *Percentage road network expenditure*. Normalizing preservation requirements against actual network expenditure gives a sense of how far the country may be from spending the required amount. Catch-up requirements should be normalized against total road network spending, whereas steady state requirements should be normalized against maintenance spending only.

- *Network expenditure*. This is the total annual amount currently being spent on the road network, and is taken from the fiscal templates. It should be broken down between capital and maintenance expenditure.
- *Optimal fuel levy*. RONET can calculate the optimal fuel levy that would need to be set in order to ensure that the associated revenues were adequate to cover the (steady state) preservation requirements of the network. The optimal fuel levy can be calculated by taking the steady state preservation requirements and dividing by the fuel consumption. By comparing the optimal fuel levy to that actually practiced by the country, it is possible to gauge how close a country is to fully applying road user charging principles.

A9. Annexes to chapter 9: Transport infrastructure, roads

Annex A9.1 Comprehensive list of indicators and definitions—Roads

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Institutional	**r010**	Road Institutions, Road Agency legally established (yes=1,no=0)	A positive answer should be given if the Road Agency has been properly created, established, and is currently operational	National	Raw	
	r011	Road Institutions, Road Fund legally established (yes=1,no=0)	A positive answer should be given if a Road Fund has been properly created, established, and is currently operational	National	Raw	
	r012	Road Institutions, Public Works Entity legally established (yes=1,no=0)	A positive answer should be given if an AGETIP (public works and employment agency) has been properly created, established and is currently operational	National	Raw	
	r013	Road Institutions, clear separation of functions across agencies (yes=1, no=0)	A positive answer should be given if there is a clear separation of functions among institutions in the road sector	National	Raw	
	r014	Road Fund, road user charges established and applied (yes=1, no=0)	A positive when the road fund receives revenues from road user charges, which includes surcharges, taxies or levies on fuel and other transport-related taxes such as vehicle and parts input duties, or vehicle registration fees	National	Raw	
	r015	Road Fund, direct transfer of funds (yes=1, no=0)	A positive answer should be given if the direct transfer of funds from road user charges (such as fuel levies) to the road fund or road agency is currently in place and functioning properly	National	Raw	
	r016	Road Fund, clear allocation of funds (yes=1, no=0)	A positive answer should be given if there are explicit formulas that provide for a clear allocation of road maintenance funds among road sector institutions, across government jurisdictions, and for specific segments of the road network	National	Raw	
	r017	Road Fund, user representation (yes=1, no=0)	A positive answer should be given if the Board of Directors of the Road Fund includes at least one member who is not a government official, but rather represents the interests of road users, such as a trucking association, chamber of commerce, or citizens group	National	Raw	
	r018	Road Fund, independent audits (yes=1, no=0)	A positive answer should be given if independent financial audits are performed regularly (yearly) and the results preferably made publicly available	National	Raw	
	r019	Road safety lead agency identified (yes=1, no=0)	There is a clearly identified and fully established agency responsible for road safety and adequately funded in the national budget	National	Raw	
	r020	National road safety strategy formulated (yes=1, no=0)	There is a national road safety strategy in place with measurable targets and adequately funded	National	Raw	

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Institutional	**r021**	Institutional Index - Road Funds (index base 100)	Index that ranks the level of effort that a country has in incepting modern reforms to foster independent institutions and financial autonomy of the road sector; a score of 100 indicates the most advanced reform setting	National	Raw	
Access	**r040**	Length, Road Network (km)	Length of total road network that includes the sum of the classified, unclassified, and urban networks	National	Raw	
	r041	Length, Road Network, Classified (km)	Length of classified road network that generally falls under the responsibility of the state to build and operate. Includes the sum of the primary, secondary, and tertiary networks.	National	Raw	
	r042	Length, Road Network, Unclassified (km)	Length of unclassified roads that do not fall under the responsibility of the state. They are typically either small rural roads, tracks, or paths maintained by local communities, or private roads maintained by mining, forestry, or agricultural enterprises to access their sites	National	Raw	
	r043	Length, Road Network, Urban (km)	Length of urban roads that are those located within the boundaries of cities or towns. Primarily road networks that fall under the responsibility of local governments that provide continuity to the inter-urban networks while going across urban areas. Excludes streets and avenues.	National	Raw	
	r044	Length, Road Network, Classified (% of road network)	Length of classified network as a percentage of total network	National	Derived	(divide r041, r040)
	r045	Length, Road Network, Unclassified (% of road network)	Length of unclassified network as a percentage of total network	National	Derived	(divide r042, r040)
	r046	Length, Road Network, Urban (% of road network)	Length of urban network as a percentage of total network	National	Derived	(divide r043, r040)
	r047	Length, Road Network, Classified, Primary (km)	Length of primary, main, trunk, or national roads outside urban areas that connect the main population and economic centers of the country	National	Raw	
	r048	Length, Road Network, Classified, Secondary (km)	Length of secondary or regional roads, are the main feeder routes into, and provide the main links between primary, main, trunk, or national roads	National	Raw	
	r049	Length, Road Network, Classified, Tertiary (km)	Length of tertiary, local or rural roads are typically unpaved and carry a comparatively low levels of traffic	National	Raw	
	r050	Length, Road Network, Classified, Primary (% of classified network)	Length of primary network as a percentage of classified network	National	Derived	(divide r047, r041)
	r051	Length, Road Network, Classified, Secondary (% of classified network)	Length of secondary network as a percentage of classified network	National	Derived	(divide r048, r041)
	r052	Length, Road Network, Classified, Tertiary (% of classified network)	Length of tertiary network as a percentage of classified network	National	Derived	(divide r049, r041)

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Access	**r053**	Length, Road Network, Classified, Paved (km)	Length of classified paved network includes concrete, asphalt, and surface treatment roads	National	Raw	
	r054	Length, Road Network, Classified, Unpaved (km)	Length of classified unpaved network includes gravel and earth roads	National	Raw	
	r055	Length, Road Network, Classified, Paved (% of classified network)	Length of paved network as a percentage of classified network	National	Derived	(divide r053, r041)
	r056	Length, Road Network, Classified, Unpaved (% of classified network)	Length of unpaved network as a percentage of classified network	National	Derived	(divide r054, r041)
	r057	Length, Road Network, Classified, Primary, Paved (km)	Length of the primary network with paved surface	National	Raw	
	r058	Length, Road Network, Classified, Secondary, Paved (km)	Length of the secondary network with paved surface	National	Raw	
	r059	Length, Road Network, Classified, Tertiary, Paved (km)	Length of the tertiary network with paved surface	National	Raw	
	r060	Length, Road Network, Classified, Primary, Unpaved (km)	Length of the primary network with unpaved surface	National	Raw	
	r061	Length, Road Network, Classified, Secondary, Unpaved (km)	Length of the secondary network with unpaved surface	National	Raw	
	r062	Length, Road Network, Classified, Tertiary, Unpaved (km)	Length of the tertiary network with unpaved surface	National	Raw	
	r063	Density per land area, Road Network, Classified (km per sq km)	Density per land area of classified road network	National	Derived	(divide r041, x007)
	r064	Density per population, Road Network, Classified (km per person)	Density per population of classified road network	National	Derived	(divide r041, x001)
	r065	Density per vehicles, Road Network, Classified (km per vehicle)	Density per vehicles of classified road network	National	Derived	(divide r041, x006)
	r066	Density per rural population, Road Network, Classified, Tertiary (km per rural person)	Density per rural population of tertiary network	National	Derived	(divide r049, x005)
	r067	Density per urban population, Road Network, Urban (km per urban person)	Density per urban population of rural network	National	Derived	(divide r043, x004)
	r068	GIS Rural Accessibility Index (% of rural population)	The percentage of the rural population living within two kilometers of an all-season road (typically a 20–25 minute walk)	National	Raw	

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Usage	**r080**	Traffic, Road Network, Classified (vehicles per day)	Traffic in vehicles per day on classified road network	National	Raw	
	r081	Traffic, Road Network, Classified, Primary (vehicles per day)	Traffic in vehicles per day on primary road network	National	Raw	
	r082	Traffic, Road Network, Classified, Secondary (vehicles per day)	Traffic in vehicles per day on secondary road network	National	Raw	
	r083	Traffic, Road Network, Classified, Tertiary (vehicles per day)	Traffic in vehicles per day on tertiary road network	National	Raw	
	r084	Traffic, Road Network, Classified, Paved (vehicles per day)	Traffic in vehicles per day on classified paved road network	National	Raw	
	r085	Traffic, Road Network, Classified, Unpaved (vehicles per day)	Traffic in vehicles per day on classified unpaved road network	National	Raw	
	r086	Utilization, Freight, Road Network, Classified (million ton-km/year)	Freight transport utilization in classified road network	National	Raw	
	r087	Utilization, Passenger, Road Network, Classified (million pass-km/year)	Passenger transport utilization in classified road network	National	Raw	
	r088	Vehicle Utilization, Road Network (million vehicle-km/year)	Annual vehicle Utilization in total road network in million vehicle-km/year	National	Raw	
	r089	Vehicle Utilization, Road Network, Classified (million vehicle-km/year)	Annual vehicle utilization in classified road network in million vehicle-km/year	National	Raw	
	r090	Vehicle Utilization, Road Network, Unclassified (million vehicle-km/year)	Annual vehicle utilization in unclassified road network in million vehicle-km/year	National	Raw	
	r091	Vehicle Utilization, Road Network, Classified, Paved (% of classified road network)	Utilization of classified paved network as a percentage of classified network	National	Raw	
	r092	Vehicle Utilization, Road Network, Classified, Unpaved (% of classified road network)	Utilization of unclassified paved network as a percentage of classified network	National	Raw	
	r093	Fuel consumption, diesel (million liters per year)	The road motor vehicle fuel consumption of oil obtained from the lowest fraction from atmospheric distillation of crude oil per year	National	Raw	
	r094	Fuel consumption, gasoline (million liters per year)	The amount of consumption of light hydrocarbon oil for use in internal combustion engines, excluding those in aircraft in millions of liters per year	National	Raw	

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Usage	**r095**	Fuel consumption, average unit vehicle per vehicle-km (liters per veh-km)	Average fuel consumption per vehicle in liters per veh-km	National	Raw	
	r096	Motorized vehicle fleet (vehicles)	Number of passenger cars, vans, pick-ups, utility vehicles; light, medium, and articulated trucks; and small, medium, and large buses	National	Raw	(r096= x006)
	r097	Motorized vehicle fleet, per capita (vehicles per inhabitant)	Motorized vehicle fleet per inhabitant	National	Derived	(divide r096, x006)
	r098	Motorized vehicle fleet, per road network length (vehicles per km)	Motorized vehicle fleet per road network length	National	Derived	(divide r096, x041)
Financial	**r110**	Road Fund, allocation to primary network (% of road fund budget)	Road fund allocation to primary network as a percentage of road fund budget	National	Raw	
	r111	Road Fund, allocation to secondary network (% of road fund budget)	Road fund allocation to secondary network as a percentage of road fund budget	National	Raw	
	r112	Road Fund, allocation to tertiary network (% of road fund budget)	Road fund allocation to tertiary network as a percentage of road fund budget	National	Raw	
	r113	Road Fund, allocation to urban network (% of road fund budget)	Road fund allocation to urban network as a percentage of road fund budget	National	Raw	
	r114	Spending, Preservation, Classified Road Network (USD)	Actual expenditure on preservation of classified road network	National	Raw	
	r115	Spending, Rehabilitation, Classified Road Network (USD)	Actual expenditure on rehabilitation of classified road network	National	Raw	
	r116	Spending, Maintenance, Classified Road Network (USD)	Actual expenditure on maintenance of classified road network	National	Raw	
	r117	Spending Rehabilitation Classified Road Network (as % of preservation needs)	Actual expenditure on rehabilitation of classified road network as percentage of preservation	National	Derived	(divide r114, r120)
	r118	Spending Maintenance, Classified Road Network (as % of maintenance needs)	Actual expenditure on maintenance of classified road network as percentage of preservation	National	Derived	(divide r116, (r122 +r123))
	r119	Spending Preservation, Classified Road Network, unit cost per year (USD per km)	Average annual expenditure on preservation per km of classified network	National	Derived	(divide r114, r041)
	r120	Needs, Preservation, Classified Road Network (USD)	Estimated preservation needs for classified road network	National	Raw	

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Financial	**r121**	Needs, Rehabilitation, Classified Road Network (USD)	Estimated rehabilitation needs for classified road network	National	Raw	
	r122	Needs, Periodic Maintenance, Classified Road Network (USD)	Estimated periodic maintenance needs for classified road network	National	Raw	
	r123	Needs, Routine Maintenance, Classified Road Network (USD)	Estimated routine maintenance needs for classified road network	National	Raw	
	r124	Needs, Rehabilitation, Classified Road Network (as % of preservation needs)	Estimated rehabilitation needs for classified road network as percentage of total preservation requirements	National	Derived	(divide r121, x120)
	r125	Needs, Periodic Maintenance, Classified Road Network (as % of preservation needs)	Estimated periodic maintenance needs for classified road network as percentage of total preservation requirements	National	Derived	(divide r122, x120)
	r126	Needs, Routine Maintenance, Classified Road Network (as % of preservation needs)	Estimated routine maintenance needs for classified road network as percentage of total preservation requirements	National	Derived	(divide r123, x120)
	r127	Needs, Preservation, Classified Road Network, unit cost per year (USD per km)	Average annual preservation requirements per km of classified network	National	Derived	(divide r120, r041)
	r128	Needs, Preservation, Classified Road Network (% of GDP)	Annual preservation requirements of classified network as percentage of GDP	National	Derived	(divide r120, x002)
	r129	Asset Value, Road Network (USD)	Asset value of the total road network refers to the replacement cost of the road network; equivalent to the cost to rebuild it entirely from scratch at today's unit costs	National	Raw	
	r130	Asset Value, Road Network, Classified (USD)	Asset value of the classified road network refers to the replacement cost of the road network; equivalent to the cost to rebuild it entirely from scratch at today's unit costs	National	Raw	
	r131	Asset Value, Road Network, Classified, Maximum (USD)	Maximum asset value of the classified road network refers to asset value refers to the cost of replacing the existing network and putting it entirely in good condition	National	Raw	
	r132	Asset Value, Road Network (% of GDP)	Asset value of the total road network as a percentage of GDP	National	Derived	(divide r129, x002)
	r133	Asset Value, Road Network, Classified (% of GDP)	Asset value of the classified road network as a percentage of GDP	National	Derived	(divide r130, x002)
	r134	Asset Value, Road Network, Classified, Maximum (% of GDP)	Maximum asset value of the classified road network as a percentage of GDP	National	Derived	(divide r131, x002)
	r135	Asset Value, Road Network, Classified (% of maximum asset value)	Asset value of the classified road network as a percentage of maximum asset value	National	Derived	(divide r130, r131)

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Pricing	**r150**	Price, Gasoline (USD per liter)	The average amount paid by road motor vehicle users for one liter of gasoline	National	Raw	
	r151	Price, Diesel (USD per liter)	The average amount paid by road motor vehicle users for one liter of diesel	National	Raw	
	r152	Fuel Levy, actual assigned to road sector (USD per liter)	Value of fuel levy that is being applied to gasoline sales explicitly to fund road maintenance.	National	Raw	
	r153	Fuel Levy, to finance preservation needs, custom (USD per liter)	Fuel levy estimated to finance preservation needs under custom scenario	National	Raw	
	r154	Fuel Levy, to finance rehabilitation needs, custom (USD per liter)	Fuel levy estimated to finance rehabilitation needs under custom scenario	National	Raw	
	r155	Fuel Levy, to finance maintenance needs, custom (USD per liter)	Fuel levy estimated to finance maintenance needs under custom scenario	National	Raw	
	r156	Fuel Levy, to finance preservation needs, optimal (USD per liter)	Fuel levy estimated to finance preservation needs under optimal scenario	National	Raw	
	r157	Fuel Levy, to finance rehabilitation needs, optimal (USD per liter)	Fuel levy estimated to finance rehabilitation needs under optimal scenario	National	Raw	
Technical	**r170**	Condition Good, Road Network, Classified (% of classified network)	Classified road network in good or very good condition as percentage of classified network	National	Raw	
	r171	Condition Fair, Road Network, Classified (% of classified network)	Classified road network in fair condition as percentage of classified network	National	Raw	
	r172	Condition Poor, Road Network, Classified (% of classified network)	Classified road network in poor or very poor condition as percentage of classified network	National	Raw	
	r173	Condition Good, Road Network, Classified, Primary (% of primary classified network)	Primary road network in good or very good condition as percentage of primary network	National	Raw	
	r174	Condition Fair, Road Network, Classified, Primary (% of primary classified network)	Primary road network in fair condition as percentage of primary network	National	Raw	
	r175	Condition Poor, Road Network, Classified, Primary (% of primary classified network)	Primary road network in poor or very poor condition as percentage of primary network	National	Raw	
	r176	Over-engineering, Road Network, Classified, Primary, Paved (% of paved primary network)	Paved roads in primary network with less than 300 vehicles per day which are considered overengineered as percentage of primary paved network	National	Raw	

Policy	Indicator Name	SERIES CODE	Definition	Level	Raw/ Derived	Formula
Technical	**r177**	Under-engineering, Road Network, Classified, Primary, Unpaved (% of unpaved primary network)	Unpaved roads in primary network with more than 300 vehicles per day which are considered underengineered as percentage of primary unpaved network	National	Raw	
	r178	Over-engineering, Road Network, Classified, Secondary, Paved (% of paved secondary network)	Paved roads in secondary network with less than 300 vehicles per day which are considered overengineered as percentage of secondary paved network	National	Raw	
	r179	Under-engineering, Road Network, Classified, Secondary, Unpaved (% of unpaved secondary network)	Unpaved roads in secondary network with more than 300 vehicles per day which are considered underengineered as percentage of secondary unpaved network	National	Raw	
	r180	Proper-engineering , Road Network, Classified, Tertiary, Unpaved (% of unpaved tertiary network)	Length of road sections of the tertiary network that are unpaved and have less than 30 vehicles per day that were designed properly as percentage of tertiary unpaved network	National	Raw	
	r181	Road accidents (number per year)	Number of accidents in which at least one motor road vehicle in motion was involved on a public road or private road to which the public has right of access	National	Raw	
	r182	Road accidents, fatalities (number per year)	Number of people killed in any road accident as defined above. The number of fatalities includes those injured people that died within 30 days of the occurrence of the accident	National	Raw	
	r183	Road accidents, serious injuries (number per year)	Number of people seriously injured in any road accident. A serious injury is defined as one requiring hospitalization for a period of more than 24 hours.	National	Raw	
	r184	Road accidents, per capita (accidents per year-per inhabitant)	Road accidents per year per inhabitant	National	Derived	(divide r181, x001)
	r185	Road accidents, fatalities (fatalities per year-per inhabitant)	Road fatalities per year per inhabitant	National	Derived	(divide r182, x001)
	r186	Road accidents, per utilization (accidents per year-per vehicle-km)	Road accidents per utilization per year per veh-km	National	Derived	(divide r181, xr086)
	r187	Road accidents, fatalities, per utilization (fatalities per year-per vehicle-km)	Road fatalities per utilization per year per veh-km	National	Derived	(divide r182, xr086)
	r188	Perception of transport as a constraint (% of firms)	Percentage of firms responding to the World Bank's Investment Climate Assessment Survey that identifies transport as a major constraint on doing business in the country	National	Raw	

Annex A9.2 Technical parameters

- *Road works unit costs—capital works*. Average capital road works per kilometer calculated on a regional basis for Sub-Saharan Africa. Includes costs for two-lane roads by surface type (concrete, asphalt mix, surface treatment, gravel, and earth); by investment type (new construction or rehabilitation); and by work type (which is defined as a function of road condition). Table A9.2a gives an illustrative set of road works unit costs for capital works based on data for Africa in 2006. These data are intended primarily to illustrate the relative costs of different types of interventions. Updated information should be sought from the ROCKS website.
- *Road works unit costs—maintenance costs*. Average maintenance road works per kilometer calculated on a regional basis for Sub-Saharan Africa. It includes costs for two-lane roads by surface type (concrete, asphalt mix, surface treatment, gravel, and earth); and by maintenance type (routine and periodic maintenance); and by work type which is defined as a function of road condition). Table A9.2b gives an illustrative set of road works unit costs for maintenance works based on data for Africa in 2006. These data are intended primarily to illustrate the relative costs of different types of interventions. Updated information should be sought from the ROCKS website.
- *Road user costs—vehicle operating costs*. Regional average road user costs are calculated using representative economic unit costs for the vehicle fleet and basic characteristics. Vehicle operating costs include: fuel, lubricants, tires, maintenance parts, maintenance labor, crew time, depreciation, interest, and overhead. Table A9.2c summarizes the underlying unit costs and other relevant parameters that can be used to estimate road user costs in an African environment. Table A9.2d reports the actual vehicle operating costs that result from these assumptions broken down by different cost components.
- *Road user costs—value of time*. Regional average road user costs are calculated using representative economic unit costs for the vehicle fleet and basic characteristics. Value of time costs includes passenger time and cargo time. Table A9.2d reports the actual value of passenger and cargo time, based on the assumptions presented in Table A9.2c.

Table A9.2a Capital road works unit costs per kilometer of two-lane road

Surface Type	Current Condition	Road Work Class	Road Work Type	Primary	Secondary	Tertiary	Unclassified	Urban
Cement Concrete	Good Condition	Periodic Maintenance	Preventive Treatment	9,000	8,000	6,000	6,000	9,000
	Fair Condition	Periodic Maintenance	Resurfacing (Overlay)	74,000	67,000	52,000	52,000	74,000
	Poor Condition	Rehabilitation	Strengthening (Overlay)	158,000	142,000	111,000	111,000	158,000
	Very Poor Condition	Rehabilitation	Reconstruction	378,000	341,000	254,000	254,000	378,000
	No Road	New Construction	New Construction	504,000	454,000	339,000	339,000	504,000
Asphalt Mix	Good Condition	Periodic Maintenance	Preventive Treatment	9,000	8,000	6,000	6,000	9,000
	Fair Condition	Periodic Maintenance	Resurfacing (Overlay)	74,000	67,000	52,000	52,000	74,000
	Poor Condition	Rehabilitation	Strengthening (Overlay)	158,000	142,000	111,000	111,000	158,000
	Very Poor Condition	Rehabilitation	Reconstruction	315,000	284,000	221,000	221,000	315,000
	No Road	New Construction	New Construction	420,000	378,000	294,000	294,000	420,000
Surface Treatment	Good Condition	Periodic Maintenance	Preventive Treatment	9,000	8,000	6,000	6,000	9,000
	Fair Condition	Periodic Maintenance	Resurfacing (Reseal)	25,000	22,000	17,000	17,000	25,000
	Poor Condition	Rehabilitation	Strengthening (Overlay)	126,000	114,000	89,000	89,000	126,000
	Very Poor Condition	Rehabilitation	Reconstruction	273,000	246,000	192,000	192,000	273,000
	No Road	New Construction	New Construction	378,000	341,000	265,000	265,000	378,000
Gravel	Good Condition	Periodic Maintenance	Spot Regravelling	3,500	3,000	2,500	2,500	3,500
	Fair Condition	Periodic Maintenance	Regravelling	16,000	15,000	12,000	12,000	16,000
	Poor Condition	Rehabilitation	Partial Reconstruction	26,000	23,000	18,000	18,000	26,000
	Very Poor Condition	Rehabilitation	Full Reconstruction	51,000	46,000	36,000	36,000	51,000
	No Road	New Construction	New Construction	74,000	67,000	52,000	52,000	74,000
Earth	Good Condition	Periodic Maintenance	Spot Repairs	250	200	150	150	250
	Fair Condition	Periodic Maintenance	Heavy Grading	650	600	450	450	650
	Poor Condition	Rehabilitation	Partial Reconstruction	12,000	11,000	9,000	9,000	12,000
	Very Poor Condition	Rehabilitation	Full Reconstruction	24,000	21,000	17,000	17,000	24,000
	No Road	New Construction	New Construction	42,000	38,000	30,000	30,000	42,000

Table A9.2b Routine maintenance works unit costs per kilometer of two-lane road

Surface Type	Road Condition	Road Work Class	Road Work Type	Primary	Secondary	Tertiary	Unclassified	Urban
Cement Concrete	Very Good	Recurrent Maintenance	Recurrent Maintenance	2,100	1,900	1,050	1,050	2,100
	Good		Recurrent Maintenance	2,650	2,400	1,350	1,350	2,650
	Fair		Recurrent Maintenance	3,150	2,850	1,600	1,600	3,150
	Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
	Very Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
Asphalt Mix	Very Good	Recurrent Maintenance	Recurrent Maintenance	2,100	1,900	1,050	1,050	2,100
	Good		Recurrent Maintenance	2,650	2,400	1,350	1,350	2,650
	Fair		Recurrent Maintenance	3,150	2,850	1,600	1,600	3,150
	Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
	Very Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
Surface Treatment	Very Good	Recurrent Maintenance	Recurrent Maintenance	2,100	1,900	1,050	1,050	2,100
	Good		Recurrent Maintenance	2,650	2,400	1,350	1,350	2,650
	Fair		Recurrent Maintenance	3,150	2,900	1,600	1,600	3,150
	Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
	Very Poor		Recurrent Maintenance	1,600	1,450	800	800	1,600
Gravel	Very Good	Recurrent Maintenance	Recurrent Maintenance	1,050	950	550	550	1,050
	Good		Recurrent Maintenance	1,350	1,200	700	700	1,350
	Fair		Recurrent Maintenance	1,600	1,450	800	800	1,600
	Poor		Recurrent Maintenance	800	750	400	400	800
	Very Poor		Recurrent Maintenance	800	750	400	400	800
Earth	Very Good	Recurrent Maintenance	Recurrent Maintenance	350	300	125	125	350
	Good		Recurrent Maintenance	500	450	175	175	500
	Fair		Recurrent Maintenance	650	600	250	250	650
	Poor		Recurrent Maintenance	350	300	125	125	350
	Very Poor		Recurrent Maintenance	350	300	125	125	350

Table A9.2c Africa: Vehicle fleet economic unit costs and basic characteristics

	Motor-cycle	Small Car	Medium Car	Delivery Vehicle	Four-Wheel Drive	Light Truck	Medium Truck	Heavy Truck	Articulat-ed Truck	Small Bus	Medium Bus	Large Bus
Economic Unit Costs												
New Vehicle Cost (US$/vehicle)	1,900		20,000	19,000		19,000	70,000	119,000	133,000	21,000	40,000	65,000
New Tire Cost (US$/tire)	20		65	95		90	275	290	290	70	110	215
Fuel Cost (US$/liter)	0.39		0.39	0.39		0.38	0.38	0.38	0.38	0.38	0.38	0.38
Libricant Cost (US$/hour)	2.30		2.30	2.30		2.30	2.30	2.30	2.30	2.30	2.30	2.30
Maintenance Labor Cost (US$/hour)	1.18		3.68	4.91		4.78	4.78	5.37	5.82	5.41	5.41	5.41
Crew Cost (US$/hour)	0.40		0.52	2.76		1.07	2	3.67	3.67	3.15	1.88	1.88
Overhead (US$/year)	26		69	71		138	138	280	280	177	177	208
Interest Rate (%)	12		12	12		12	12	12	12	12	12	12
Working Passenger Time (US$/hour)	0.60		0.60	0.60		0.38	0.38	0.38	0.38	0.38	0.38	0.38
Non-working Passenger Time (US$/hour)	0.20		0.20	0.20		0.11	0.11	0.11	0.11	0.11	0.11	0.11
Cargo Delay (US$/hour)	0		0	0		0.11	0.11	0.11	0.11	0	0	0
Basic Characteristics												
Kilometers Driven per Year (km)	15000		24000	40000		59000	67000	69000	65000	78000	90000	103000
Hours Driven per Year (hr)	700		880	1300		1500	2200	2300	2400	1800	2800	2700
Service Life (years)	9		9	9		9	9	10	9	7	6	10
Percent Private Use (%)	100		100	0		0	0	0	0	0	0	0
Number of Passengers (#)	1		3	3		1	1	1	1	11	30	42
Work Related Passenger-Trips (%)	75		75	0		0	0	0	0	75	75	75
Gross Vehicle Weight (tons)	0.3		1.6	2.3		4.6	13.9	28.2	36.5	2.6	5	11.9

Table A9.2d Africa: Economic unit road user costs

Typical Economic Unit Road User Costs per Roughness Level for Flat Terrain (US$ per vehicle-km)												
Roughness (IRI)	Motor-cycle	Small Car	Medium Car	Delivery Vehicle	Four-Wheel Drive	Light Truck	Medium Truck	Heavy Truck	Articulat-ed Truck	Small Bus	Medium Bus	Large Bus
2	0.042		0.201	0.195		0.195	0.459	0.788	0.968	0.254	0.351	0.501
4	0.043		0.207	0.202		0.205	0.487	0.839	1.022	0.262	0.367	0.527
6	0.045		0.217	0.217		0.223	0.541	0.932	1.106	0.280	0.401	0.577
8	0.046		0.232	0.239		0.240	0.594	1.022	1.207	0.305	0.446	0.646
10	0.049		0.251	0.266		0.260	0.652	1.125	1.327	0.337	0.502	0.734
12	0.053		0.273	0.295		0.282	0.712	1.236	1.453	0.372	0.562	0.830
14	0.057		0.295	0.324		0.304	0.773	1.348	1.582	0.409	0.623	0.927
16	0.061		0.318	0.353		0.328	0.835	1.462	1.710	0.447	0.685	1.025
Typical Economic Unit Road User Costs Composition for Flat Terrain and Roughness 2.0 IRI (US$ per vehicle-km)												
	Motor-cycle	Small Car	Medium Car	Delivery Vehicle	Four-Wheel Drive	Light Truck	Medium Truck	Heavy Truck	Articulat-ed Truck	Small Bus	Medium Bus	Large Bus
Road User Costs	0.042		0.201	0.195		0.195	0.459	0.788	0.968	0.254	0.351	0.501
Vehicle Operating Costs	0.037		0.187	0.190		0.193	0.456	0.786	0.965	0.218	0.252	0.349
Fuel	0.018		0.043	0.047		0.059	0.093	0.181	0.248	0.053	0.073	0.109
Lubricants	0.001		0.002	0.002		0.004	0.005	0.009	0.010	0.005	0.005	0.007
Tire	0.001		0.003	0.004		0.006	0.016	0.027	0.051	0.005	0.008	0.017
Maintenance Parts	0.002		0.039	0.044		0.032	0.154	0.276	0.319	0.035	0.034	0.076
Maintenance Labor	0.002		0.009	0.014		0.042	0.048	0.069	0.077	0.047	0.041	0.048
Crew Time	0.000		0.000	0.026		0.012	0.022	0.042	0.039	0.033	0.020	0.022
Depreciation	0.012		0.078	0.044		0.030	0.096	0.143	0.186	0.033	0.062	0.052
Interest	0.002		0.013	0.008		0.008	0.021	0.036	0.035	0.007	0.009	0.017
Overhead	0.000		0.000	0.001		0.001	0.001	0.001	0.001	0.000	0.000	0.000
Value of Time Costs	0.005		0.014	0.006		0.002	0.002	0.003	0.002	0.036	0.099	0.152
Passenger Time	0.005		0.014	0.006		0.001	0.001	0.001	0.001	0.036	0.099	0.152
Cargo Time	0.000		0.000	0.000		0.001	0.001	0.001	0.001	0.000	0.000	0.000

Annex A9.3 Target institutions

Table A9.3a List of key road sector institutions in each country

Country	Line Ministry	Main Target Institution—Road Agency	Road Fund	AGETIP
Algeria	Ministry of Public Works	Directorates for Basic Infrastructure		
Angola	Ministry of Transport	Instituto de Estradas de Angola		
Benin	Ministère des Travaux Publics et des Transports	Service de Banque de Données Routieres (SBDR)	Fonds Routier	AGETUR/ AGETIP
Botswana	Ministry of Works and Transport			
Burkina Faso	Ministère des Infrastructures et du Desenclavement	Direction Generale des Routes		FASO-BAARA
Burundi	Ministère des Transports, Postes et Télécommunications	Office des Routes	Fonds Routier National	ABUTIP
Cameroon	Ministère des Travaux Publics (MINTP)	Cellule de Programmation (Ministry of Public Works)	Fonds Routier	
Cape Verde	Ministère d'Etat, des Infrastructures, des Transports et de la Mer		Fundo Autonomo	AGECABO
Central African Rep.	Ministre d'Etat à l'équipement, aux transports, à l'aviation civile	Ministere de l'Equipement et du Desenclavement, Entretient des Routes (MEDER)	Fonds Routier	AGETIPE-CAF
Chad	Ministre d'Etat aux Infrastructures Chargé des Transports		Fonds d'Entretien Routier	
Congo, Dem Rep	Ministère des Transports			
Congo Republic	Ministère des Transports et de l'Aviation Civile	Fonds d'Entretien Routier		
Cote d'Ivoire	Ministère d'Etat des Transports	Fonds d'Entretien Routier		AGEROUTE
Djibouti	Ministry of Equipment and Transport	Fonds d'Entretien Routier		ADETIP
Egypt	Ministry of Transport	General Authority for Roads, Bridges and Land Transport (GARBLT)		
Ethiopia	Ministry of Transport & Communication	Ethiopian Roads Authority (ERA)	Road Fund Office	
Eritrea	Ministry of Transport and Communications			
Gabon	Ministère des Transports et de l'Aviation Civile	Ministry of Public Works, Infrastructure and Construction (MTPIC)	Fonds d'Entretien Routier	
Gambia	Department of State for Works, Communications & Infrastructure			GAMWORKS
Ghana	Ministry of Roads & Transport	Ghana Highway Authority Department of Feeder Roads	Ghana Road Fund	
Guinea	Ministère des Transports et Travaux Publics	Direction Nationale de l'Entretien Routier	Fonds d'Entretien Routier	AGETIPE
Guinea-Bissau	Ministry of Transport			AGEOPPE
Kenya	Minister for Transport		Kenya Roads Board	
Lesotho	Ministry of Public Works & Transport		Road Fund	
Liberia	Ministry of Transport			

Country	Line Ministry	Main Target Institution—Road Agency	Road Fund	AGETIP
Libya	Ministry of Transport	National General Company for Roads		
Madagascar	Ministère des Travaux Publics et des Transports		Fonds d'Entretien Routier Autorite Routiere de Madagascar	AGETIPA
Malawi	Ministry of Transport & Public Works	National Roads Authority		
Mali	Ministère de l'Equipement et des Transports	National Directorate of Roads	Autorité Routière	
Mauritania	Ministry of Transport	Direction des Travaux Publics (DTP)		AMEXTIPE
Mauritius	Ministry of Public Infrastructure, Land Transport and Shipping	Road Development Authority		
Morocco	Ministere de l'Equipment et des Transports	Direction des Routes Societe Nationale des Autoroutes du Maroc		
Mozambique	Ministry of Transport & Communications	National Roads Administration		
Namibia	Ministry of Works, Transport & Communications	Namibia Roads Authority	Road Fund Administration	
Niger	Ministère de l'Equipement et de l'Aménagement du Territoire		C.A.F.E.R.	NIGETIP
Nigeria	Federal Ministry of Transport	Road Sector Development Team Federal Road Maintenance Agency		
Rwanda	Ministry of Infrastructure	Rwanda Transport Development Authority (RTDA)	Fonds d'Entretien Routier	
Sao Tome & Principe	Ministerio de Obras Publicas e Recursos Naturais	Instituto Nacional de Estrada (INAE)		
Senegal	Ministère des Transports Terrestres, des Transports Ferroviares et l'Amenagement du Territoire Ministere de la Cooperation Internationale des Transports Aeriens, des Infrastructures et de l'Energie	Direction des Transports Routiers Direction de la Circulation et de la Securite Routieres Conseil Executif des Transports Urbains de Dakar (CETUD) Agence de Gestion des Routes du Senegal (AGEROUTE Senegal)	Fonds d'Entretien Routier Autonome (FERA)	
Sierra Leone	Ministry of Air Transport and Aviation	Sierra Leone Roads Authority	Road Fund	
Somalia	Ministry of Public Works and Transportation			
South Africa	Ministry of Transport	South African National Roads Agency SANRAL		
Sudan	Ministry of Transport			
Swaziland	Ministry of Public Works & Transport	Roads Department		
Tanzania	Ministry of Works	Tanzania National Roads Agency	Road Fund	

Country	Line Ministry	Main Target Institution—Road Agency	Road Fund	AGETIP
Togo	Ministere des Transports	Direction Generale de Travaux Publics	Fonds Routier (FR) Compagnie Autonome de Peage et d'Entretien Routier (CAPER)	AGETUR
Tunisia	Ministry of Transport	Direction Generale des Transports Terrestres	Fond de Developpement des Autoroutes Fond de Construction des Roiutes et des Ports	
Uganda	Ministry of Works, Housing & Communications	Uganda National Road Authority (UNRA)	National Road Fund	
Zambia	Ministry of Transport & Communication		National Road Fund Agency	
Zimbabwe	Ministry of Transport & Communications	National Roads Administration		

Annex A9.4 Data collection templates

Roads template A: National-level institutions

Roads template A: National-level institutions

Country:
Sector: Roads
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee(s):

Policy Category	Temp Code	Indicator Name	New	History
			2011	2010
Financial	**r110**	Road Fund, allocation to primary network (% of road fund budget)		
	r111	Road Fund, allocation to secondary network (% of road fund budget)		
	r112	Road Fund, allocation to tertiary network (% of road fund budget)		
	r113	Road Fund, allocation to urban network (% of road fund budget)		
Institutional	**r010**	Road Institutions, Road Agency legally established (yes=1,no=0)		
	r011	Road Institutions, Road Fund legally established (yes=1,no=0)		
	r012	Road Institutions, Public Works Entity legally established (yes=1,no=0)		
	r013	Road Institutions, clear separation of functions across agencies (yes=1, no=0)		
	r014	Road Fund, road user charges established and applied (yes=1, no=0)		
	r015	Road Fund, direct transfer of funds (yes=1, no=0)		
	r016	Road Fund, clear allocation of funds (yes=1, no=0)		
	r017	Road Fund, user representation (yes=1, no=0)		
	r018	Road Fund, independent audits (yes=1, no=0)		
	r021	Institutional Index – Road Funds (index base 100)		
Pricing	**r152**	Fuel Levy, actual assigned to road sector (USD per liter)		

Roads template B. Link-by-link technical variables

Roads template B: Link-by-link technical variables

Country:
Sector:
Utility Name:

Name of Data Collector:
Period of Data:
Collection:
Source Institution:
Name of Interviewee(s):

Policy Category (code)	Series Code	Variable	Definition	Unit
Technical (TEC)	XAFRO001	Link ID	Identification of the link with a unique numeric of alphanumeric code.	Numeric or Alphanumeric
	XAFRO002	Road ID	Identification of the road. Any given road number or road ID could consist of a series of links.	Numeric or Alphanumeric
	XAFRO003	Link Start Node	Location of start point for link, may be place name, description, node, or start kilometer on road. GEOGRAPHICAL COORDINATES SHOULD BE GIVEN WHERE POSSIBLE.	Numeric or Alphanumeric
	XAFRO004	Link End Node	Location of end point for link, may be place name, description, node, or start kilometer on road. GEOGRAPHICAL COORDINATES SHOULD BE GIVEN WHERE POSSIBLE.	Numeric or Alphanumeric
	XAFRO005	Link Name	Name of the link. Generated by adding the Road ID with the start and end link nodes.	Numeric or Alphanumeric
	XAFRO006	Region Name	Name of the administrative division where the link is located (such as region, state, province, district or any other administrative unit).	Name
	XAFRO007	Link Year	Most recent year for which data are available for the link.	Number
	XAFRO008	Link Length	Length of the link from the start node to the end node	Kilometers
	XAFRO009	Link Width	Width of the main carriageway in meters. If the road has paved shoulders their total width should be added.	Meters
	XAFRO010	Link Lane Number	Number of lanes of the link. If the link width was provided, the link lane numbers can be generated following the guidelines provided in the manual.	Number
	XAFRO011	Link Network Class	Identifies the function of the road and the administrative category to which it belongs.	1=primary; 2=secondary; 3=tertiary; 4=unclassified; 5=urban
	XAFRO012	Link Surface Class	Provides a basic description of the road surface, in terms of whether it is paved or unpaved.	1=paved; 2=unpaved
	XAFRO013	Link Surface Type	Provides a more detailed description of the exact materials that are used to cover the road.	1=concrete; 2=asphalt; 3=surface treatment; 4=gravel; 5=earth

Policy Category (code)	Series Code	Variable	Definition	Unit
	XAFRO014	Link Surface Condition	Identifies the current state of the road depending on the extent to which it has been maintained.	1= very good; 2=good; 3=fair; 4=poor; 5= very poor
	XAFRO015	Link Traffic Value	Provides the exact traffic reading for the link.	Average annual daily traffic
	XAFRO016	Link Traffic Level	Provides an approximate measure of traffic on the link by placing it within a particular traffic band.	1=0-10; 2=10-30; 3=30-100 ; 4=100-300; 5=300-1,000; 6=1,000-3,000; 7=3,000-10,000; 8=10,000-30,000; 9=30,000-100,000 Average annual daily traffic

10. Railways

10.1 Motivation

The economic significance of African railroads has declined markedly during the past 30 years, following economic liberalization that allowed enterprises to choose their preferred transport mode, as well as major improvements in road infrastructure that supported the development of road freight alternatives. As a result, rail traffic declined and most African rail networks today carry no more traffic than a moderately busy branch line in other parts of the world. Railways remain competitive for the large-scale transport of bulky minerals from concentrated points with low value-to-volume ratios. Meanwhile, a number of new mining railways are likely to be developed in Africa by mining concessionaires over the coming years, given the buoyant growth in this sector. But for lighter and more time-sensitive general cargo with widely dispersed origins, the costs of concentrating cargo at rail depots and transferring across transport modes often overwhelms any intrinsic cost advantages of railway. Railways do, however, represent a more efficient mode of transportation in terms of use of fossil fuels and are therefore attracting increasing attention in the context of climate change.

Restoring Africa's aging rail networks to good operating condition would require a one-time rehabilitation effort of $3 billion. Rail concessions adopted in many countries have helped to improve operational efficiency and reverse traffic decline by improving quality of service. But concessions have not been able to mobilize the volumes of investment needed to rehabilitate the networks. The basic reason for this is that the cash flows generated by the business are simply not high enough to finance the necessary investments in the absence of public subsidy. Modest cash flows are a reflection of the relatively low traffic volumes on Africa's rail networks, combined with intense intermodal competition from trucking that prevents railways from raising tariffs to full cost-recovery levels.

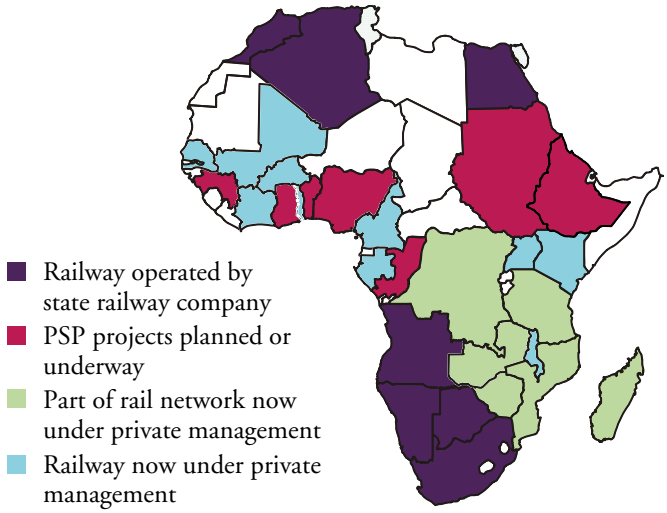
10.2 Tracking Performance

This sector synopsis serves to highlight some of the key policy issues facing the railway sector. In order to continue tracking sector performance over time, a number of indicators are needed to shed light on each of a number of key policy themes. By way of overview, Figure 10.1 maps all the railway networks in Africa and illustrates how the majority of them are isolated corridors that connect major sea ports with the landlocked hinterland. Only in southern Africa is there any extensive interconnection of rail networks across national borders.

Figure 10.1 Map of Africa's railway networks

Source: Africa Infrastructure Country Diagnostic 2009.

Figure 10.2 Rail sector institutional arrangements, by country



Source: Africa Infrastructure Country Diagnostic 2009.

Note: PSP = Private Sector Particpaiton

Institutional: The main institutional features of the railway sector can be captured by a handful of indicators. It is relevant to establish which types of freight and/or passenger services are provided, and whether the railway has been awarded as a concession to the private sector. While originally a state-owned sector in Africa, a growing number of railways had been awarded as concessions to the private sector as of January 2010 (Figure 10.2).

Usage: African railways are used mainly for freight transportation and, to a lesser extent, for passenger transport.

- The first measure of usage is the physical volume of freight and passengers transported by the system annually.
- The second measure of usage takes into account the distance traveled by the freight and passenger traffic. These are known as traffic units. In order to benchmark the intensity with which rail infrastructure is being used, traffic unit measures are typically normalized by the length of the line.

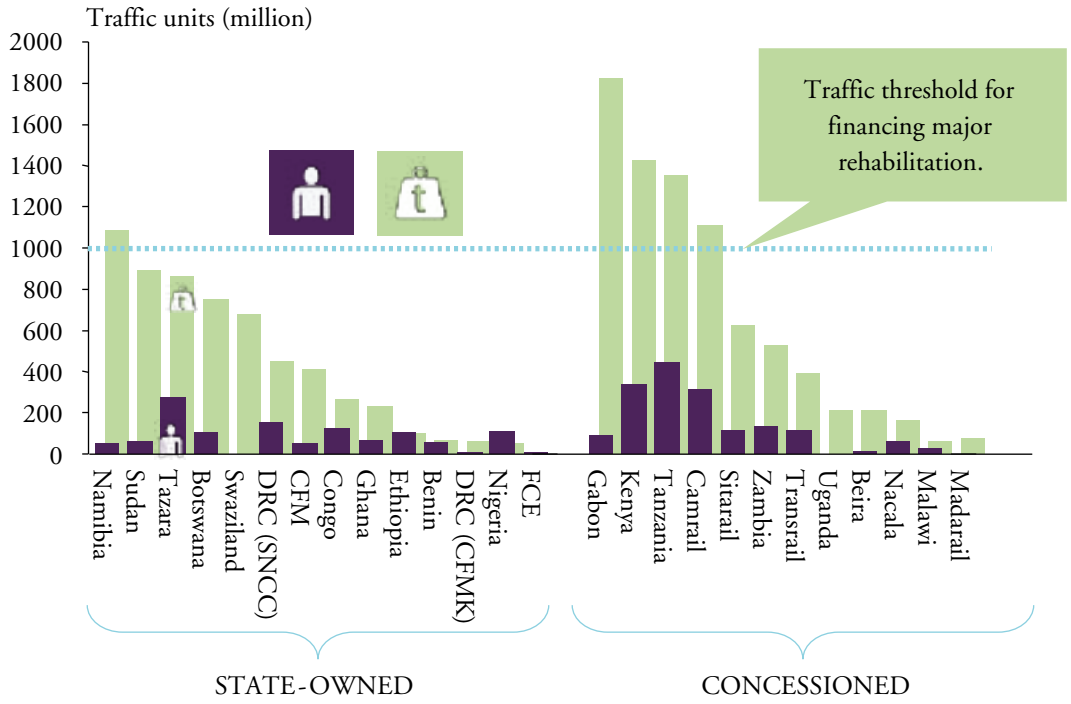
This kind of information can be used to assess the financial viability of African railways. Financial analysis suggests that railways that carry less than 1 million net tonnes of freight annually do not generate sufficient revenue to finance the capital costs of the infrastructure. Leaving aside South Africa and the North African railway networks, there are very few African countries that have the requisite volume of freight traffic. These include Cameroon, Gabon, Kenya, Namibia, and Tanzania (Figure 10.3). In general, the railways under concession present higher traffic volumes than those that remain under state control.

Technical: Technical indicators are helpful both in documenting a country's overall rail infrastructure endowment, and in highlighting the performance of rail operators in terms of the efficiency and quality of their operations.

- Given the aging of Africa's rail infrastructure, a substantial portion of assets may no longer be in functioning order. This is captured by looking at the percentage of lines, locomotives, carriages, and wagons that are actually in good operating condition and being used.
- The quality of rail service that can be provided is affected by the presence of temporary speed restrictions resulting from the poor condition of the track, as well as the axle load that sets the design limit for the volume of freight that can be carried over the line. Because of their age and the way in which they were originally designed, African railways tend to have lower axle loads than those found elsewhere in the world.
- Efficiency can be measured either in terms of labor productivity, or in terms of locomotive, carriage, or wagon productivity. In each case, the relevant traffic measure is divided by the number of employees or the number of operational pieces of rolling stock.

This kind of information can be used to look at the impact of institutional reforms, such as the award of concessions. The analysis shows a strong link between concession episodes and labor productivity (Figure 10.4). Camrail (Cameroon) and Sitarail (Côte d'Ivoire/Burkina Faso) experienced marked labor productivity growth following their respective concessions. In the case of CEAR (Malawi) and RSZ (Zimbabwe), the main improvements in labor productivity came during the years in which the company was preparing for the award of a concession. The analysis also indicates the magnitude of the disruptions

Figure 10.3: African railway traffic relative to break-even thresholds



Source: Africa Infrastructure Country Diagnostic 2009.

to railway performance that can be caused by major natural disasters (Malawi) or political crises (Côte d'Ivoire).

Financial: African railways are often found to be in a weak financial position, and so it is important to track the utilities' financial ratios. The financial accounts of the railway operators provide detailed information on the structure of costs and revenues.

- Costs are typically broken down between operating costs (including labor costs, fuel costs, maintenance costs, and so on) and capital costs. The key financial ratio on the cost side is the average operating cost, which can be used to evaluate whether average revenues are high enough to cover the recurrent costs of the business. Capital costs are not typically reliably measured in utility financial accounts, due to deficient and/or heterogeneous accounting norms.

Figure 10.4 Impact of railway concessions on labor productivity

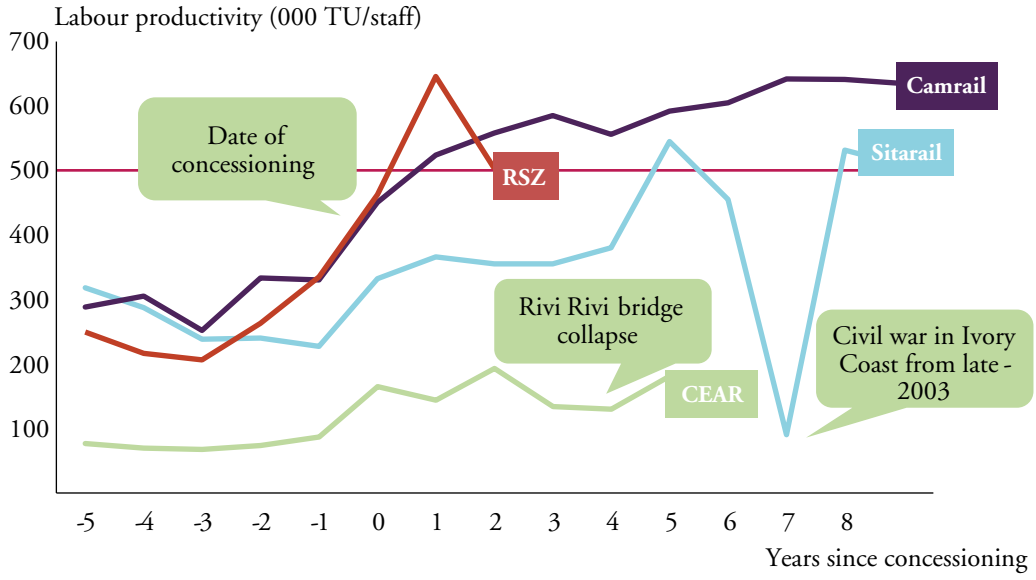


Table 10.1 Overview of primary indicators for railways

Policy category	Primary Indicator	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Railway under concession				Operator		Rail Templates A-F
	Vertical integration						
	Horizontal integration						
	Long distance passenger railway						
	Public access railway						
	Passenger service obligation						
	Suburban passenger railway						
Technical	Network density		Area Population	Km/km^2 Km/million pop.			
	Speed restrictions			% line			
	Gauge		Cape/Meter/Narrow/Standard				
	Axle load limit		<15/18/20/25 tonnes	% line			
	Employees						
	Labor productivity						
	Lines		Operational	% operational			
	Locomotives						
	Wagons						
	Carriages						
	Availability		Locomotive Carriage Wagon	% total			
	Productivity		Labor Locomotive Carriage Wagon				
Usage	Traffic		Freight/Passengers	% total			
	Traffic units (TUs)						
	Traffic density			TU/route-km			
	Trip length						
Financial	Revenues		Freight Fares Passenger service obligation Other	$ $/TU			
	Average yield		Freight Passengers				
	Working expenses						
Pricing	Yield		Freight Passenger	$/ntkm $/ntkm, 5-year average			

Note: ntkm = net tonne kilometer.

- Revenues should be broken down between those coming from passenger fares, freight charges, government subsidy payments, and other sources. Due to the complexity of customer charges, the average revenue per unit of freight or passenger traffic is used as a proxy for the average price of the service.

For more discussion of how rail sector indicators can be used to inform policy analysis, the reader is referred to the following publication:

- Gwilliam and others, 2011 *Africa's Transport Infrastructure*, World Bank, Washington DC.

10.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor rail sector trends, together with their corresponding technical definitions, is provided in Annex A10.1. While the full list of indicators amounts to several hundred items, the indicators can easily be grouped around a smaller number of some 26 primary indicators. A synthetic overview of these primary indicators is provided in Table 10.1. The Table clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators that are related to the primary one.

In the case of railways, all indicators are treated at the operator level, and the source of data is always the sector data template. Where relevant, benchmarks are calculated to facilitate cross-country comparisons. In addition to the general benchmarks introduced earlier in the data processing chapter, there are a number of sector-specific benchmarks that can be used for the rail sector. Annex A10.2 indicates which countries and railways belong to each of the benchmark groups as well as other details about the railway market and type. In particular, different benchmarks are calculated for countries that have awarded concessions to private sector operators, to account for the differences in managerial incentives between private and public sector frameworks.

Table 10.2, which benchmarks performance indicators across West Africa's various railways, provides an example of how indicators can be used to inform rail sector policy analysis. The analysis shows a marked performance discrepancy between Sitarail and Transrail, the two binational West African railways that have been awarded as concessions to the private sector, and the remaining state-owned enterprises in Benin, Ghana, and Nigeria. Labor productivity in the concessions is approximately ten times higher than in the publicly owned railways, while locomotive and wagon productivity is several times as high.

10.4 Data Collection

Target institutions

This section identifies the railway sector data that are to be collected in order to create the indicators presented here. Annex A10.3 provides a comprehensive list of the railway sector institutions in Sub-Saharan Africa. These are the target institutions that need to be approached for data collection in this sector. The list is accurate as of March 2011; however, it is important to note that the sector changes frequently. Existing railways may shut down, closed railways can come back into service (which is why they are also included in the list), completely new railways may

Table 10.2 Example of benchmarking rail indicators for West Africa

	Labor productivity	Locomotive productivity	Carriage productivity	Wagon productivity	Average passenger yield	Average freight yield
Benin, OCBN	40	3	900	74	2.0	5.8
Burkina Faso—Côte d'Ivoire, SITARAIL	481	35		1,020	3.3	5.5
Ghana, GRC	84	7	416	458	2.4	4.4
Mali—Senegal, TRANSRAIL	339	40		804	2.2	6.4
Nigeria, NRC	37	13	737	59	–	–
Sub-Saharan average for railways under concession	387	24	2,945	510	2.2	6.3

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the *comma-dot* or *dot-comma* convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between *zero*, *not available*, and *not applicable*: (i) *zero* refers to a situation where data exists but has a value of zero; (ii) *not available* refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) *not applicable* refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

For details refer to chapter 2 of the Handbook on Infrastructure Statistics

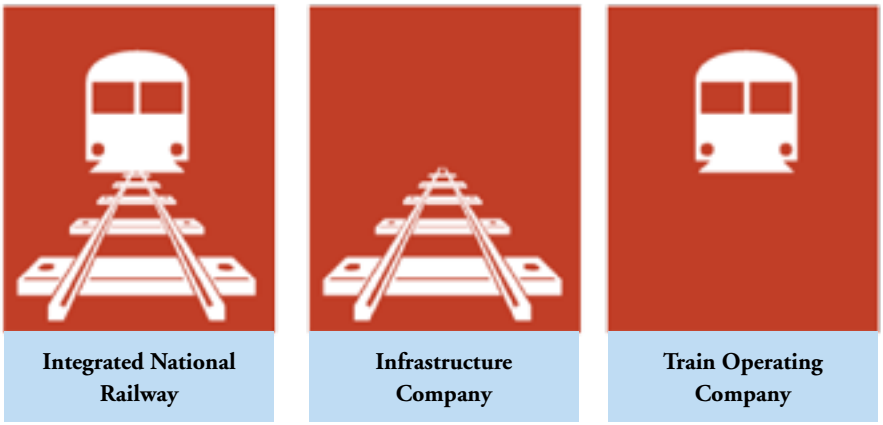
be built, while existing lines may be amalgamated or undergo a change of name to reflect new institutional arrangements such as concessions. For all of these reasons, the list provided is only intended as general guidance, and should be reviewed and updated in consultation with sector specialists, as a starting point for any future data collection exercise. The publication *Jane's World Railways* (http://jwr.janes.com/public/jwr/index.shtml) is a helpful reference for determining the number of active rail operators in Africa at any one time.

The exercise aims to cover all public railways on the African continent, as well as the largest and most significant of the private lines owned and operated by mining companies. But the target data to be collected from the private lines are somewhat more limited than those collected from the public ones.

The dos and don'ts of data collection

A summary of cross-cutting guidelines and procedures for data collection discussed in Chapter 2 is provided in the following Box.

Figure 10.5 Different institutional models for the railway sector



Data templates

The data should be collected directly from the railway operator. A total of 38 raw data variables need to be collected for each of the railway operators. These are presented in the data templates discussed here and reproduced in Annex A10.4. Five different versions of the railways template are provided. The applicable version of the template should be selected for each operator depending on whether it operates as:

(i) An integrated railway
(ii) Only a rail infrastructure company
(iii) Only a train operating company
(iv) A binational railway
(iv) A dedicated minerals railway

Railways template A is the most comprehensive of the templates, whereas the others provide selective subsets of this data. For this reason, the explanation of the content of the templates will focus solely on railways template A

The first block of the template covers seven institutional variables. A number of different types of rail operators exist in Africa. The railways may differ in terms of their institutional scope, their national coverage, the type of market that they serve, and the type of services they provide.

- *Vertical integration*: Most African rail operators are integrated railways that provide both infrastructure and train services within a single company. There are also a few companies that only operate rail infrastructure while others solely operate trains (see Figure 10.5).
- *Horizontal integration*: Even when the cross-border integration of rail *networks* exists, the operations of most African rail *companies* are confined to a single country. Nevertheless, there are a few binational companies with integrated cross-border operations. For example, the TAZARA railway covers both Tanzania and Zambia. At the same time, a single country may have more than one rail operator. For example, Tanzania has both TAZARA and TRL railways. Annex A10.3 provides the mapping between countries and operators. *The basic unit for data collection is the rail company itself*, as opposed to the national railway system.
- *Public access railway*: While most African rail operators are general cargo railways offering freight services to all interested parties, a number are dedicated mineral lines that are confined to serving a single mine.
- *Railway under concession*: Most national railway companies are organized as state-owned enterprises. However, since the year 2000, an increasing number have been awarded as concession contracts to private operators. A *concession* is a public railway whose operation and investment program have been contractually delegated to a private company for a predefined time period.
- *Passenger services*: Not all African railways provide passenger services. Some may provide long-distance passenger railway services that transport people between major cities that are some distance apart. Some may provide *suburban passenger railway* services that move commuters within the immediate vicinity of a large city (as in Dakar, Senegal). In some cases, railways are subject to a government-defined *passenger service obligation* (PSO), a contractual obligation to provide customer services even if they generate losses, and usually in return for financial compensation from the government.

The second block of the template covers 15 technical variables.

- *Gauge*: This is the distance separating the parallel rails that make up the railway. Four different gauges can be found in Africa: standard (1,435 millimeters), Cape (1,067 mm), meter (1,000 mm), and narrow (any other gauge less than 1,000 mm).

Figure 10.6 Axle loads found in Africa

- *Axle load*: This refers to the maximum weight that a particular section of railway is designed to carry on each axle of a freight wagon. Axle loads found in Africa are normally in the range of 15–25 tonnes (Figure 10.6).
- *Lines*: This is the total length of the route served by the railway line, measured in route-kilometers. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted. In some cases, there may be certain segments of the line that are not in working order; these should be deducted from the length of the lines to obtain the *operational lines*.
- *Temporary speed restrictions*: Speed restrictions may be imposed on a temporary basis because of the poor condition of the track. These are distinct from permanent speed restrictions imposed because of curves, slopes, or other dangerous situations such as approaches to level crossings. This variable captures the length of the line, in route-kilometers, that is subject to such temporary speed restrictions.
- *Employees*: The number of people directly employed by the company on a full-time basis.
- *Locomotives*: The engines used to pull trains. In some cases, a (significant) number of locomotives may be out of service due to breakdown. These are deducted to obtain the variable *operational locomotives*.
- *Carriages*: The rolling stock used to carry passengers on trains. In some cases, a (significant) number of carriages may be out of service due to breakdown. These are deducted to obtain the variable operational carriages.
- *Wagons*: The rolling stock used to carry freight on trains. In some cases, a (significant) number of wagons may be out of service due to breakdown. These are deducted to obtain the variable operational wagons.

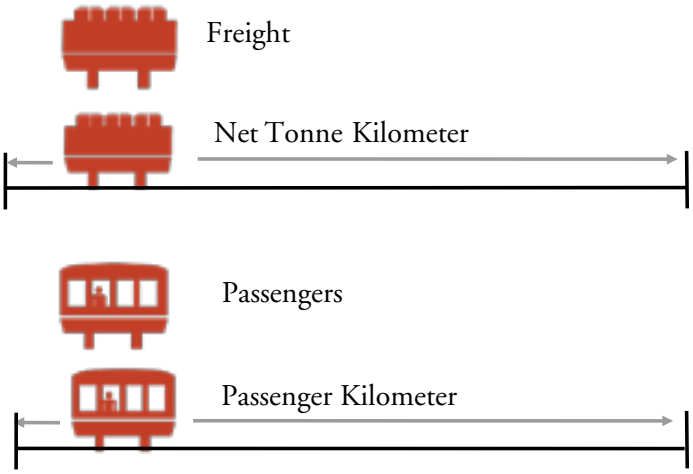
The third block of the template covers four usage variables.

- *Freight*: The total volume of physical goods (for example, coal, timber, ore) that are moved on the railway annually, in tonnes.
- *Passengers*: The total number of passengers that are moved on the railway annually.
- *Traffic Units*: The traffic units multiply each unit of freight or passengers by the distance that each travels. For example, if 10 people travel 2 km each, the passenger traffic units are 20; if 2 people travel 20 km each, the passenger traffic units are 40. Traffic units can be calculated both for freight and passenger services (Figure 10.7). In the case of passenger services, the units are millions of passenger-kilometers. In the case of freight services, the units are millions of net tonne-kilometers. Traffic units for passengers and freight are sometimes added together to give a total picture of traffic units, despite the fact that they are measured in different units.

The fourth block of the template covers six financial variables. All financial variables should be collected in local currency units (LCUs) per year.

- *Revenues*: Revenues can be broken down into a number of relevant subcategories. These include revenues obtained directly from passenger fares, freight charges, and any public service obligation payments, as well as any other sources of revenue that the rail company may have.

Figure 10.7 Meaning of traffic units



- *Working expenses*: These are the total operating costs incurred by the company, including labor, fuel, materials, debt service, and so on, but not including any depreciation charges.

Supporting documents

A starting point for data collection is to obtain the operator's annual report, if possible. Depending on its quality, a significant number of the variables should be available directly from the annual report. Any remaining variables should be sought directly from the rail operator by contacting the general manager.

A10. Annexes to Chapter 10: Transport infrastructure, railways

Annex A10.1 Comprehensive list of indicators and definitions—Railways

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Institutional	R114	Concession (1=yes; 0=no)	Whether railway operates under concession to private sector. Concession – a public railway whose operation and investment program have been contractually delegated to a private company for a predefined time period.	Utility	Raw	
	R157	Geographical type (1=national; 2=binational)	Whether railway operator is national or binational.	Utility	Raw	
	R156	Institutional type (1=integrated; 2=infrastructure only; 3=train service only)	Whether railway provides an integrated service or just infrastructure or just a train service.	Utility	Raw	
	R160	Long distance passenger railway (1=yes; 0=no)	Long distance passenger railway – a railway that provides passenger services between major cities that are some distance apart.	Utility	Raw	
	R158	Market type (1=general public; 2=private only)	Whether railway provides services to the general public or is dedicated to a private enterprise (e.g., mining).	Utility	Raw	
	R162	Passenger service obligation (1=yes; 0=no)	Whether an explicit passenger service obligation exists (a contractual obligation for a rail concessionaire to provide a loss-making customer service that receives an explicit financial compensation from the government).	Utility	Raw	
	R113	Private company (1=private, 0=nonprivate)	Whether the railway company is private or nonprivate.	Utility	Raw	
	R161	Suburban passenger railway (1=yes; 0=no)	Suburban passenger railway – a railway that provides (generally frequent) passenger services for commuters within the immediate vicinity of a large city.	Utility	Raw	
Technical	R148	Network density (km/km2)	Number of km of railway lines per km2 of land.	Utility	Derived	[R115] / country area
	R149	Network density (km/million pop.)	Number of km of railways lines per million population.	Utility	Derived	[R115] / [x001]
	R184	Network length, lines operating (% of route-km)	Percentage of railway lines operating.	Utility	Derived	[R116 X 100] / [R115]
	R185	Temporary speed restrictions (% of route-km)	Percentage of route-kilometers that have speed restrictions. Speed restrictions imposed on a temporary basis because of the condition of the track are distinct from permanent speed restrictions imposed because of alignment or other situations such as approaches to level crossings.	Utility	Derived	[R167 X 100] / [R115]

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	R167	Temporary speed restrictions (route-km)	Route-kilometers that have speed restrictions. Speed restrictions imposed on a temporary basis because of the condition of the track are distinct from permanent speed restrictions imposed because of alignment or other situations such as approaches to level crossings.	Utility	Raw	
	R111	Gauge (1-cape, 2-metre, 3-narrow, 4-standard, 5-meter/standard)	Gauge – the distance separating the parallel rails that make up the railway. Four different gauges can be found in Africa: standard (1,435 mm), Cape (1,067 mm), meter (1,000 mm), and narrow (any other gauge less than 1,000 mm).	Utility	Raw	
	R186	Axle load limit – < 15 tonnes (% of route-km)	Percentage of route-kilometers that have an axel load limit below 15 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Derived	[R163 X 100] / [R115]
	R163	Axle load limit – < 15 tonnes (route-km)	Route-kilometers that have an axel load limit below 15 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Raw	
	R181	Axle load limit – 18 tonnes (% of route-km)	Percentage of route-kilometers that have an axel load limit between 15 and 18 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Derived	[R164 X 100] / [R115]
	R164	Axle load limit – 18 tonnes (route-kilometers)	Route-kilometers that have an axel load limit between 15 and 18 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Raw	
	R182	Axle load limit – 22 tonnes (% of route-kilometers)	Percentage of route-kilometers that have an axel load limit between 18 and 22 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Derived	[R165 X 100] / [R115]
	R165	Axle load limit – 22 tonnes (route-kilometers)	Route-kilometers that have an axel load limit between 18 and 22 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Raw	

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	R183	Axle load limit – 25 tonnes (% of route-kilometers)	Percentage of route-kilometers that have an axel load limit between 22 and 25 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Derived	[R166 X 100] / [R115]
	R166	Axle load limit – 25 tonnes (route-kilometers)	Route-kilometers that have an axel load limit between 22 and 25 tonnes. Route-kilometers refer to the overall length of the railway used for transportation. Any segments of double track should be counted the same length as single track; any sidings or other minor additions to the network need not be counted.	Utility	Raw	
	R131	Employees (number)	Total number of employees at year's end.	Utility	Raw	
	R135	Labor productivity (1,000 traffic units per employee)	Thousand of traffic units per employee.	Utility	Derived	[R129 + R130] / [R131 X 1,000]
	R115	Network length, lines (km)	Total length of railway line that physically exists.	Utility	Raw	
	R117	Network length, lines not operating (km)	Total length of railway lines that does not operate.	Utility	Derived	[R115 - R116]
	R116	Network length, lines operating (km)	Total length of railway lines that operates.	Utility	Raw	
	r187	Network length, lines operating, coastal (km)	Total length of railway lines that operates.	Utility	Raw	
	r188	Network length, lines operating, landlocked (km)	Total length of railway lines that operates.	Utility	Raw	
	R132	Locomotives (number)	Engines used to pull trains in possession of operator.	Utility	Raw	
	R168	Locomotives, operating (number)	Engines used to pull trains, available for operations.	Utility	Raw	
	R133	Carriages (number)	Rolling stock used to carry passengers on trains in possession of operator.	Utility	Raw	
	R169	Carriages, operating (number)	Rolling stock used to carry passengers on trains, available for operations.	Utility	Raw	
	R134	Wagons (number)	Rolling stock used to carry freight on trains in possession of operator.	Utility	Raw	
	R170	Wagons, operating (number)	Rolling stock used to carry freight on trains, available for operations.	Utility	Raw	
	R178	Availability, Locomotive (%)	Percentage of total locomotives that are available.	Utility	Derived	[R 168 X 100] /[R 132]
	R179	Availability, Carriage (%)	Percentage of total carriages that are available.	Utility	Derived	[R 169 X 100] /[R 133]
	R180	Availability, Wagon (%)	Percentage of total wagon that are available.	Utility	Derived	[R 170 X 100] /[R 134]
	R137	Productivity, Carriage (1,000 passenger-km per carriage)	Thousand passengers by carriage.	Utility	Derived	[R129 + R130] / [R133 X 1,000]

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Technical	R136	Productivity, Locomotive (million traffic units per locomotive)	Thousand of traffic units per locomotive.	Utility	Derived	[R129 + R130] / [R132 X 1,000]
	R138	Productivity, Wagon (1,000 net tonne-km per wagon)	Thousand of net tonne-km per wagon.	Utility	Derived	[R129 + R130] / [R134 X 1,000]
Usage	R127	Freight (number of tonnes, annual)	Total volume of freight handled annually by operator.	Utility	Raw	
	R154	Freight, proportion of total task (%)	Percentage of total task that is freight.	Utility	Derived	[R129 X 100] / [R129 + R130]
	R112	Freight, traffic density (1,000 net tonne-km/ route-km)	Thousands of net tonne-km by route-km	Utility	Derived	[R129] / [R115 X 1,000]
	R140	Freight, trip length (km per tonne)	Average trip length per tonne.	Utility	Derived	[R129] / [R127 X 1,000]
	r189	Freight, coastal (number of tonnes, annual)	Total volume of freight handled annually by operator.	Utility	Raw	
	r190	Freight, landlocked (number of tonnes, annual)	Total volume of freight handled annually by operator.	Utility	Raw	
	R126	Freight, traffic density – operated by private rail company (1,000 net tonne-km/route-km)	Thousand of net tonne-km operated by private rail company by route-km.	Utility	Derived	[R121] / [R115 X 1,000]
	R125	Freight, traffic density - operated by public rail company (1,000 net tonne-km/route-km)	Thousand of net tonne-km operated by public rail company by route-km.	Utility	Derived	[R120] / [R115 X 1,000]
	R121	Freight, traffic unit – operated by private rail company (million net tonne-km)	Million net freight tonnes per kilometers operated by private rail company.	Utility	Derived	[R129 - R120]
	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)	Million net freight tonnes per kilometers operated by public rail company.	Utility	Raw	
	R129	Freight, traffic unit (million net tonne-km)	Million net freight tonnes per kilometers.	Utility	Raw	
	R128	Passenger (number, annual)	Total number of passengers handled annually by operator.	Utility	Raw	
	R153	Passenger and freight, traffic unit (million passenger-km + net tonnes-km)	Total traffic (passenger and freight) handled annually by operator.	Utility	Derived	[R129 + R130]
	R155	Passenger, proportion of total task (%)	Percentage of total operations devoted to passenger service.	Utility	Derived	[R130 X 100] / [R129 + R130]
	r191	Passenger, coastal (number, annual)	Total number of passengers handled annually by operator.	Utility	Raw	

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Usage	r192	Passenger, landlocked (number, annual)	Total number of passengers handled annually by operator.	Utility	Raw	
	R124	Passenger, traffic density (1,000 passenger-km/ route-km)	Million of passenger-km operated by route-km.	Utility	Derived	[R130] / [R115 X 1,000]
	R118	Passenger, traffic unit – long distance (million passenger-km)	Million of passenger-km in long-distance services.	Utility	Raw	
	R119	Passenger, traffic unit – suburban (million passenger-km)	Million of passenger-km in suburban services.	Utility	Raw	
	R130	Passenger, traffic unit (million passenger-km)	Total volume of passenger traffic units.	Utility	Raw	
	R139	Passenger, trip length (km per passenger)	Average trip length per passenger.	Utility	Derived	[R130] / [R128 X 1,000]
Financial	h171	Revenues, fare (LCU per year)	Total annual revenues from passenger fares.	Utility	Raw	
	R171	Revenues, fare (US$ per year)	Total annual revenues from passenger fares.	Utility	Derived	[h171] / [x003]
	h173	Revenues, freight (LCU per year)	Total annual revenues from freight charges.	Utility	Raw	
	R173	Revenues, freight (US$ per year)	Total annual revenues from freight charges.	Utility	Derived	[h173] / [x003]
	h174	Revenues, other (LCU per year)	Total annual revenues from other sources.	Utility	Raw	
	R174	Revenues, other (US$ per year)	Total annual revenues from other sources.	Utility	Derived	[h174] / [x003]
	h172	Revenues, passenger service obligation (LCU per year)	Total annual revenues from public service obligation.	Utility	Raw	
	R172	Revenues, passenger service obligation (US$ per year)	Total annual revenues from public service obligation.	Utility	Derived	[h172] / [x003]
	h175	Revenues, total (LCU per year)	Total annual revenues.	Utility	Raw	
	R175	Revenues, total (US$ per year)	Total annual revenues.	Utility	Derived	[h175] / [x003]
	h176	Working expenses (LCU per year)	Total operating costs excluding depreciation.	Utility	Raw	
	R176	Working expenses (US$ per year)	Total operating costs excluding depreciation.	Utility	Derived	[h176] / [x003]
Pricing	R142	Freight, average yield (US cent/ntkm, average 2000 - 2005)	Average yield per tonne between 2000 and 2005, expressed in US cents.	Utility	Derived	q147/X003
	q147	Freight, yield (LCU/ ntkm)	Average yield per tonne between 2000 and 2005, expressed in LCU..	Utility	Raw	

Policy	SERIES CODE	Indicator Name	Definition	Level	Raw/ Derived	Formula
Pricing	R147	Freight, yield (US cent/ ntkm)	Average yield per tonne, expressed in US cents	Utility	Derived	[q147] / [x003]
	R141	Passenger, average yield (US$cent/pkm, average 2000–05)	Average yield per passenger between 2000 and 2005, expressed in US cents.	Utility	Derived	
	q154	Passenger, yield (LCU/ ntkm)	Average yield per passenger between 2000 and 2005, expressed in LCU.	Utility	Raw	
	R177	Passenger, yield (US cent/ ntkm)	Average yield per passenger, expressed in US cents.	Utility	Derived	[q154] / [x003]

Note: LCU = local currency unit; ntkm = net tonne kilometer; pkm = passenger kilometer.

Annex A10.2 Sector-specific benchmarks

Classification based on African rail operators as of March 2011

Operator	Operator, Full Name	Country / countries	Status	Con-cession	Structure	Geographic	Market	Comments
			(Open / Closed)	(No / Yes)	(Integrated / Infrastruc-ture only / Trains only)	(National / Binational)	(Mineral / General)	
SNTF	Société Nationale des Transports Ferroviaires	Algeria	Open	No	Integrated	National	General	
Amboin	nap	Angola	Closed	No	Integrated	National	General	
CFB \	Caminho de Ferro de Benguela	Angola	Open	No	Integrated	National	General	
CFL	Caminho de Ferro de Luanda	Angola	Open	No	Integrated	National	General	
CFM-Angola	Caminho de Ferro de Moçâmedes	Angola	Open	No	Integrated	National	General	
OCBN	Organisation Commune Benin-Niger des Chemins de fer et des Transports	Benin	Open	No	Integrated	National	General	
BRC	Botswana Railways	Botswana	Open	No	Integrated	National	General	
SITARAIL	Société Internationale de Transport Africain par Rail	Burkina Faso, Cote d'Ivoire	Open	Yes	Integrated	Binational	General	Passenger service contracted to a third party (Societe de Transport Ivoire-Bukinabe)
CAMRAIL	Cameroon National Railway	Cameroon	Open	Yes	Integrated	National	General	
CFMK	Chemin de Fer Matadi Kinshasa	Congo, Dem Rep. of	Open	No	Integrated	National	General	
CFU	Chemin de Fer des Ueles		Closed	No	Integrated	National	General	
SNCC	Société Nationale des Chemins de Fer du Congo		Open	Yes	Integrated	National	General	
CFCO	Chemin de Fer du Congo Ocean	Congo, Rep. of	Open	Yes	Integrated	National	General	
CDE	Chemin de Fer Djibouti-Ethiopien	Djibouti, Ethiopia	Open	Yes	Integrated	Binational	General	
ENR	Egyptian National Rail-ways	Egypt	Open	No	Integrated	National	General	
ERA	Eritrean Railway	Eritrea	Open	No	Integrated	National	General	
SETRAG	Société d'Exploitation du Transgabonais	Gabon		Yes	Integrated	National	General	
GRC	Ghana Railway Company	Ghana	Open	Yes	Integrated	National	General	
Bauxite lines	nap	Guinea	Open	No	Integrated	National	Mineral	To Boke, Kindia, and Fria (three sepa-rate lines)

Operator	Operator, Full Name	Country / countries	Status	Con-cession	Structure	Geographic	Market	Comments
			(Open / Closed)	(No / Yes)	(Integrated / Infrastruc-ture only / Trains only)	(National / Binational)	(Mineral / General)	
ONCFG	Office National des Chemins de Fer de Guinee		Open	No	Integrated	National	General	
Magadi	Nap	Kenya	Open	No	Integrated	National	Mineral	Part of Magadi Soda Company
RVRC	Rift Valley Railways Con-sortium	Kenya, Uganda	Open	Yes	Integrated	Binational	General	Before it was named URC (Uganda)/ KRC (Kenya)
Bong	nap	Liberia	Closed	Yes	Integrated	National	Mineral	A third party runs informal trains to collect scrap from mine
LAMCO	Liberian-American-Swed-ish Minerals Company		Closed	No	Integrated	National	Mineral	
NIOC	National Iron Ore Com-pany of Liberia		Closed	No	Integrated	National	Mineral	
FCE	Fianarantsoa-Côte Est	Madagascar	Open	No	Integrated	National	General	
MADA-RAIL	Private company		Open	Yes	Integrated	National	General	
CEAR	Central East African Railways	Malawi	Open	Yes	Integrated	National	General	
RNCFM	Réseau National des Chemins de Fer Mali	Mali						
TRANS-RAIL	Nap	Mali, Senegal	Open	Yes	Integrated	Binational	General	
SNIM	Société Nationale In-dustrielle et Minière de Mauritanie	Mauritania	Open	No	Integrated	National	Mineral	
ONFCM	Office National des Chemins de Fer de Mo-rocco	Morocco	Open	No	Integrated	National	General	
CCFB	Campanhia Dos Camin-hos De Ferro Da Beira	Mozam-bique	Open	Yes	Integrated	National	General	
CDN	Corredor de Desenvolvi-mento do Norte		Open	Yes	Integrated	National	General	
CFM-Mo-zambique	Portos e Caminhos de Ferro de Moçambique		Open	No	Integrated	National	General	Previously split into narrow gauge and Ressano Garcia
Trans-Namib	nap	Namibia	Open	No	Integrated	National	General	

Operator	Operator, Full Name	Country / countries	Status	Con-cession	Structure	Geographic	Market	Comments
			(Open / Closed)	(No / Yes)	(Integrated / Infrastruc-ture only / Trains only)	(National / Binational)	(Mineral / General)	
NRC	Nigerian Railway Corpo-ration	Nigeria	Open	Yes	Integrated	National	Mineral (iron ore, steel)	Movement of passengers, goods, parcels/courier
SEFINCS	La Societe d'Exploitation Ferroviare des Industries Chimiques Senegal	Senegal	Open	No	Trains only	National	Mineral (chemicals)	Suburban trains run over TRANSRAIL lines
Petit Train-Bleu s.a	Societe Anonyme du Petit Train Bleu		Open	No	Trains only	National	General	Suburban trains run over TRANSRAIL lines
MMR	Maramba	Sierra Leone	Closed	No	Integrated	National	Mineral (ore)	
Spoornet	nap	South Africa	Open	No	Integrated	National	General	A division of Transnet, this was the original name for the railway network of South Africa. Later divided into Transnet Freight Rail and South African Rail Commuter Cor-poration (SARCC). Transnet Freight Rail later divided into Coalex and Orex. SARCC later renamed Passenger Rail Agency of South Africa (PRASA) and divided into Sho-sholoza meyl (long distance) and Metro-rail (suburban).
Orex	nap		Open	No	Integrated	National	Mineral (ore)	Mineral ore division of Transnet Freight Rail.
Coalex	nap		Open	No	Integrated	National	Mineral (Coal)	Coal ore division of Transnet Freight Rail
Shosholoza Meyl	nap		Open	No	Trains only	National	General	Long-distance divi-sion of PRASA.
Metrorail	nap		Open	No	Trains only	National	General	Suburban division of PRASA.
Gautrain	nap		Open	No	Trains only	Provincial	General	Passenger rail (rapid rail network in Gauteng)

Operator	Operator, Full Name	Country / countries	Status	Con-cession	Structure	Geographic	Market	Comments
			(Open / Closed)	(No / Yes)	(Integrated / Infrastruc-ture only / Trains only)	(National / Binational)	(Mineral / General)	
SR-Sudan	Sudan Railways Corpora-tion	Sudan	Open	No	Integrated	National	General	
SR-Swaziland	Swaziland Railway	Swaziland	Open	No	Integrated	National	General	
TAZARA	Tanzania-Zambia Railway Authority	Tanzania, Zambia	Open	No	Integrated	Binational	General	
TRL	Tanzania Railways Limited	Tanzania	Open	No	Integrated	National	General	Also known as Rites Tanzania Railways Limited
CTMB	nap	Togo	Open	No	Integrated	National	Min-eral (phos-phate)	
Togo Rail SA	nap		Open	Yes	Integrated	National	Mineral (cement)	Previously known as CFT or CNFT
SNFT	Société Nationale des Chemins de Fer Tunisiens	Tunisia	Open	No	Integrated	National	General	
RSZ	Railway Systems of Zam-bia Limited	Zambia	Open	No	Infrastruc-ture only	National	General	Counterparty to RSZ with small part of network that was not concessioned and remains under state operation
BBR	Beitbridge Bulawayo Railway	Zimbabwe	Open	Yes	Integrated	National	Mineral	
NRZ	National Railways of Zimbabwe		Open	No	Integrated	National	General	

Note: nap = Not applicable.

Annex A10.3 Target institutions

Rail operators in each country as of March 2011

Country	Railway, Short Name	Railway, Full Name
Algeria	SNTF	Société Nationale des Transports Ferroviaires
Angola	Amboin	Nap
	CFB	Caminho de Ferro de Benguela
	CFL	Caminho de Ferro de Luanda
	CFM-Angola	Caminho de Ferro de Moçâmedes
Benin	OCBN	Organisation Commune Benin-Niger des Chemins de fer et des Transports
Botswana	BRC	Botswana Railways
Burkina Faso/Côte d'Ivore	SITARAIL	Société Internationale de Transport Africain par Rail
Cameroon	CAMRAIL	Cameroon National Railway
Congo Republic	CFCO	Chemin de Fer du Congo Ocean
Djibouti/Ethiopia	CDE	Chemin de Fer Djibouti-Ethiopien
Congo, Dem. Rep. of	CFMK	Chemin de Fer Matadi Kinshasa
	CFU	Chemin de Fer des Ueles
	SNCC	Société Nationale des Chemins de Fer du Congo
Egypt	ENR	Egyptian National Railways
Eritrea	ERA	Eritrean Railway
Gabon	SETRAG	Société d'Exploitation du Transgabonais
Ghana	GRC	Ghana Railway company
Guinea	Bauxitelines	Nap
	ONCFG	Office National des Chemins de Fer de Guinee
Kenya	KRC	Kenya Railways Corporation
	Magadi	Nap
Liberia	Bong	Nap
	LAMCO	Liberian-American-Swedish Minerals Company
	NIOC	National Iron Ore Company of Liberia
Madagascar	FCE	Fianarantsoa-Côte Est
	MADARAIL	Private company
Malawi	CEAR	Central East African Railways
Mali	RNCFM	Réseau National des Chemins de Fer Mali
Mali/Senegal	TRANSRAIL	Nap
Mauritania	SNIM	Société Nationale Industrielle et Minière de Mauritanie
Morocco	ONFCM	Office National des Chemins de Fer de Morocco
Mozambique	CCFB	Campanhia Dos Caminhos De Ferro Da Beira
	CDN	Corredor de Desenvolvimento do Norte
	CFM-Mozambique	Portos e Caminhos de Ferro de Moçambique

Country	Railway, Short Name	Railway, Full Name
Namibia	TransNamib	Nap
Nigeria	Central Railways	Nap
	NRC	Nigerian Railway Corporation
Senegal	SEFINCS	Societe d'Exploitation ferovaire des Industries Chimique Senegal
	TrainBleu	Societe Anonyme du Petit Train Bleu
Sierra Leone	MMR	Maramba
South Africa	Coalex	Nap
	Metrorail	Nap
	Orex	Nap
	Spoornet	Nap
	Guatrain	Nap
Sudan	SR-Sudan	Sudan Railways Corporation
Swaziland	SR-Swaziland	Swaziland Railway
Tanzania	TRL	Tanzania Railways Limited
Tanzania/Zambia	TAZARA	Tanzania-Zambia Railway Authority
Togo	Togorail	Togorail
Tunisia	SNFT	Société Nationale des Chemins de Fer Tunisiens
Uganda	RVR Consortium	Rift Valley Railways (RVR)
Zambia	RSZ	Railway Systems of Zambia Limited
Zimbabwe	BBR	Beitbridge Bulawayo Railway
	NRZ	National Railways of Zimbabwe

Note: nap = Not applicable.

Legend: Operators shaded in grey were closed as of January 2010 but may re-open in future.

Annex A10.4 Data collection templates

Railways template A. Integrated national railway

Railways template A: Integrated national railway

Country:
Sector: Railways
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	h171	Revenues, fare (LCU per year)					
	h172	Revenues, passenger service obligation (LCU per year)					
	h173	Revenues, freight (LCU per year)					
	h174	Revenues, other (LCU per year)					
	h175	Revenues, total (LCU per year)					
	h176	Working expenses (LCU per year)					
Institutional	R113	Private company (1-private, 0-non-private)					
	R114	Concession (1=yes; 0=no)					
	R156	Institutional type (1=integrated; 2=infrastructure only; 3=train service only)					
	R157	Geographical type (1=national; 2=binational)					
	R158	Market type (1=general public; 2=private only)					
	R160	Long distance passenger railway (1=yes; 0=no)					
	R161	Suburban passenger railway (1=yes; 0=no)					
	R162	Passenger service obligation (1=yes; 0=no)					
Pricing	q147	Freight, yield (LCU/ntkm)					
	q154	Passenger, yield (LCU/ntkm)					
Technical	R111	Gauge (1-cape, 2-metre, 3-narrow, 4-standard, 5-meter/standard)					
	R131	Employees (number)					
	R132	Locomotives (number)					
	R133	Carriages (number)					
	R134	Wagons (number)					
	R163	Axle load limit – <15 tonnes (route-km)					
	R164	Axle load limit – 18 tonnes (route-km)					
	R165	Axle load limit – 22 tonnes (route-km)					
	R166	Axle load limit – 25 tonnes (route-km)					
	R167	Temporary speed restrictions (route-km)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Technical	R168	Locomotives, operating (number)					
	R169	Carriages, operating (number)					
	R170	Wagons, operating (number)					
Usage	R115	Network length, lines (km)					
	R116	Network length, lines operating (km)					
	R118	Passenger, traffic unit – long distance (million passenger-km)					
	R119	Passenger, traffic unit – suburban (million passenger-km)					
	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)					
	R127	Freight (number of tonnes, annual)					
	R128	Passenger (number, annual)					
	R129	Freight, traffic unit (million net tonne-km)					
	R130	Passenger, traffic unit (million passenger-km)					

Note: LCU = local currency unit; ntkm = net tonne kilometer.

Railways template B. Rail Infrastructure Company

Country:
Sector: Railways
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	h171	Revenues, fare (LCU per year)					
	h172	Revenues, passenger service obligation (LCU per year)					
	h173	Revenues, freight (LCU per year)					
	h174	Revenues, other (LCU per year)					
	h175	Revenues, total (LCU per year)					
	h176	Working expenses (LCU per year)					
Institutional	R113	Private company (1=private, 0=nonprivate)					
	R114	Concession (1=yes; 0=no)					
	R156	Institutional type (1=integrated; 2=infrastructure only; 3=train service only)					
	R157	Geographical type (1=national; 2=binational)					
	R158	Market type (1=general public; 2=private only)					
	R160	Long distance passenger railway (1=yes; 0=no)					
	R161	Suburban passenger railway (1=yes; 0=no)					
	R162	Passenger service obligation (1=yes; 0=no)					
Pricing	q147	Freight, yield (LCU/ntkm)					
	q154	Passenger, yield (LCU/ntkm)					
Technical	R111	Gauge (1-cape, 2-metre, 3-narrow, 4-standard, 5-meter/standard)					
	R131	Employees (number)					
	R163	Axle load limit – < 15 tonnes (route-km)					
	R164	Axle load limit – 18 tonnes (route-km)					
	R165	Axle load limit – 22 tonnes (route-km)					
	R166	Axle load limit – 25 tonnes (route-km)					
	R167	Temporary speed restrictions (route-km)					
Usage	R115	Network length, lines (km)					
	R116	Network length, lines operating (km)					
	R118	Passenger, traffic unit – long distance (million passenger-km)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Usage	R119	Passenger, traffic unit -– suburban (million passenger-km)					
	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)					
	R127	Freight (number of tonnes, annual)					
	R128	Passenger (number, annual)					
	R129	Freight, traffic unit (million net tonne-km)					
	R130	Passenger, traffic unit (million passenger-km)					

Note: LCU = local currency unit; ntkm = net tonne kilometer.

Railways template C. Train operating company

Country: Railways
Sector:
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	h171	Revenues, fare (LCU per year)					
	h172	Revenues, passenger service obligation (LCU per year)					
	h173	Revenues, freight (LCU per year)					
	h174	Revenues, other (LCU per year)					
	h175	Revenues, total (LCU per year)					
	h176	Working expenses (LCU per year)					
Pricing	q147	Freight, yield (LCU/ntkm)					
	q154	Passenger, yield (LCU/ntkm)					
Technical	R131	Employees (number)					
	R132	Locomotives (number)					
	R133	Carriages (number)					
	R134	Wagons (number)					
	R168	Locomotives, operating (number)					
	R169	Carriages, operating (number)					
	R170	Wagons, operating (number)					
Usage	R118	Passenger, traffic unit – long distance (million passenger-km)					
	R119	Passenger, traffic unit – suburban (million passenger-km)					
	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)					
	R127	Freight (number of tonnes, annual)					
	R128	Passenger (number, annual)					
	R129	Freight, traffic unit (million net tonne-km)					
	R130	Passenger, traffic unit (million passenger-km)					

Note: LCU = local currency unit; ntkm = net tonne kilometer.

Railways template D. Binational railway

Country A:
Country B:
Sector: Railways
Utility Name:

Name of Data:
Collector:
Period of Data:
Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Financial	h171	Revenues, fare (LCU per year)					
	h172	Revenues, passenger service obligation (LCU per year)					
	h173	Revenues, freight (LCU per year)					
	h174	Revenues, other (LCU per year)					
	h175	Revenues, total (LCU per year)					
	h176	Working expenses (LCU per year)					
Pricing	q147	Freight, yield (LCU/ntkm)					
	q154	Passenger, yield (LCU/ntkm)					
Technical	R111	Gauge (1-cape, 2-metre, 3-narrow, 4-standard, 5-meter/standard)					
	R131	Employees (number)					
	R132	Locomotives (number)					
	R133	Carriages (number)					
	R134	Wagons (number)					
	R163	Axle load limit – < 15 tonnes (route-km)					
	R164	Axle load limit – 18 tonnes (route-km)					
	R165	Axle load limit – 22 tonnes (route-km)					
	R166	Axle load limit – 25 tonnes (route-km)					
	R167	Temporary speed restrictions (route-kilometers)					
	R168	Locomotives, operating (number)					
	R169	Carriages, operating (number)					
	R170	Wagons, operating (number)					
Usage	R115	Network length, lines (km)					
	R116	Network length, lines operating (km)					
	R118	Passenger, traffic unit – long distance (million passenger-km)					
	R119	Passenger, traffic unit – suburban (million passenger-km)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Usage	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)					
	R127	Freight (number of tonnes, annual)					
	R128	Passenger (number, annual)					
	R129	Freight, traffic unit (million net tonne-km)					
	R130	Passenger, traffic unit (million passenger-km)					
	r187	Network length, lines operating, costal (km)					
	r188	Network length, lines operating, landlocked (km)					
	r189	Freight, coastal (number of tonnes, annual)					
	r190	Freight, landlocked (number of tonnes, annual)					
	r191	Passenger, coastal (number, annual)					
	r192	Passenger, landlocked (number, annual)					

Note: LCU = local currency unit; ntkm = net tonne kilometer.

Railways template E. Dedicated minerals railway

Country: Railways
Sector:
Utility Name:
Mining Company Name:

Name of Data:
Collector:
Period of Data:
Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Technical	R111	Gauge (1-cape, 2-metre, 3-narrow, 4-standard, 5-meter/ standard)					
	R131	Employees (number)					
	R163	Axle load limit – < 15 tonnes (route-km)					
	R164	Axle load limit – 18 tonnes (route-km)					
	R165	Axle load limit – 22 tonnes (route-km)					
	R166	Axle load limit – 25 tonnes (route-km)					
	R167	Temporary speed restrictions (route-km)					
Usage	R120	Freight, traffic unit – operated by public rail company (million net tonne-km)					
	R127	Freight (number of tonnes, annual)					
	R129	Freight, traffic unit (million net tonne-km)					

11. Ports

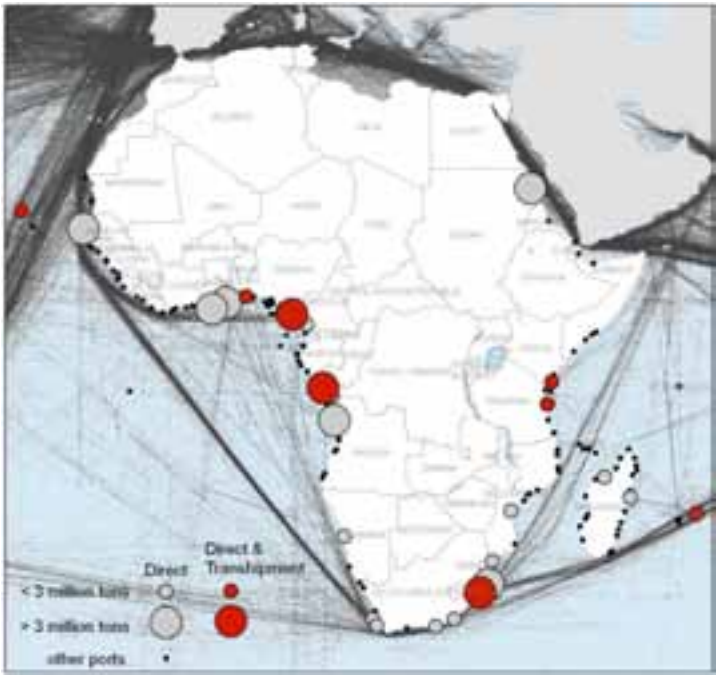
11.1 Motivation

Over the years 1995–2006, the amount of cargo passing through Africa's port system tripled. But the share of cargo being transported in containers remained low compared to other parts of the world. Now, even when containers are used, the lack of integrated inland transportation corridors means that containers are often stripped and stuffed in the vicinity of the port, and do not serve their natural purpose of facilitating the intermodal shift from maritime to land transport. Furthermore, the considerable imbalances in the structure of African trade, characterized by bulk commodity exports (petroleum, ore, and agricultural products) and containerized imports (manufactured goods), means that a high share of containers are exported empty, unnecessarily raising the overall costs of the system.

Traffic volumes at most African ports remain modest by global standards; only a handful of ports are large enough to receive calls from major shipping lines. It is therefore important to develop regional hub ports that concentrate traffic coming from a relatively large area. Such regional hubs have already emerged in some cases, the most notable one being Durban for southern Africa. Meanwhile, Mombasa and Dar es Salaam compete for a hub role in eastern Africa. The situation in Central and West Africa is much less clear. Abidjan had begun to act as a regional hub port prior to the political crisis in Côte d'Ivoire, but since then shipping lines have been serving West Africa via Malaga (Spain) or Tangiers (Morocco). Growing capacity constraints at some of Africa's most significant regional ports, such as Dar es Salam (Tanzania), Durban (South Africa), Mombasa (Kenya), and Tema (Ghana), are preventing the hub-and-spoke system from working effectively, as transhipment traffic tends to be displaced.

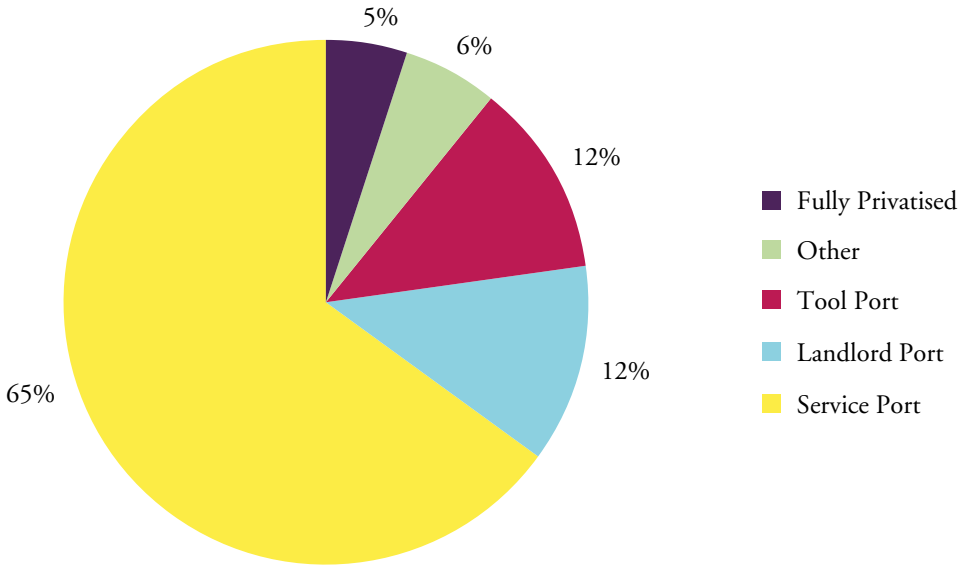
The speed and efficiency of African ports lag behind international best practice; costs are high, and delays can be considerable. With the exception of Ghana and Nigeria, few African countries have adopted the internationally preferred landlord model, under which the state takes responsibility for the basic infrastructure of the port (civil works, quays, and so on) and allows the private sector to compete for the services provided over that infrastructure (loading and unloading, storage, towing, and so on). Nevertheless, more than 20 African ports have awarded private sector concessions for the development and operation of container terminal facilities at their ports. There is some evidence that these concessions are helping to boost efficiency and operational performance.

Figure 11.1 Map of Africa's main ports and shipping routes



Source: Africa Infrastructure Country Diagnostic 2009.

Figure 11.2 Prevalence of different port sector institutional arrangements across countries



Source: Africa Infrastructure Country Diagnostic 2009.

11.2 Tracking Performance

The sector synopsis helps to highlight some of the key policy issues facing the ports sector. In order to continue to track sector performance over time, a number of indicators are needed to shed light on each of a number of key policy themes. Figure 11.1 maps all the main ports along the African coastline.

Institutional: The institutional framework for the ports sector can be measured both at the national and the port level.

- *National*. The national indicators concern the broader legal and policy framework. These include the existence of sector reforms, or the enactment of provisions relating to decentralization, private sector participation, foreign ownership, and the establishment of a regulatory body.
- *Port*. The port level indicators are the main institutional features of the port sector. The main issue of relevance is whether the port is run under the traditional landlord model, under which the state provides all services on a monopoly basis, or has moved toward a service port model, in which the state focuses on the basic infrastructure of the port, but retreats from frontline services that are competitively provided by the private sector. In addition, it is relevant to note whether there has been any kind of restructuring of the port, such as the creation of a distinct corporation, or the breaking off of the various port terminals into separate businesses.

While the majority of African countries still had service ports as of January 2010, a significant minority had adopted the landlord port model (or the hybrid tool port, which transfers only some of the frontline operations to the private sector); see Figure 11.2.

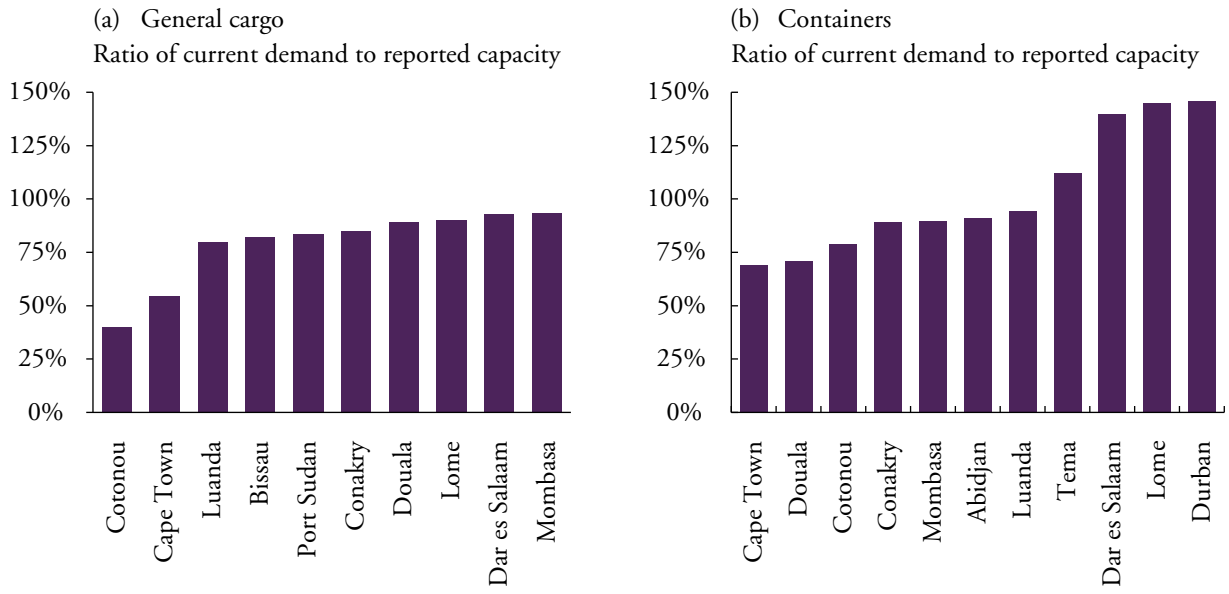
Usage: African ports service a wide range of different cargo types, ranging from containers to general cargo to dry and liquid bulk. Cargo may be imported or exported to and from the country where the port is located. In the case of containers, some cargo may be intended for subsequent transshipment to another nearby port along the coast, or re-exported over land as transit cargo for landlocked countries. An alternative measure of the usage of the port is the number of vessels that call there.

This kind of information can be used to assess the need for new investment in expanding port capacity. Once the ratio of cargo throughput to port design capacity rises above 75 percent, ports tend to become congested. This affects their operational performance. A considerable number of African ports had already passed this threshold in 2006 (Figure 11.3). In general, the problem of congestion is more serious for container traffic than for general cargo.

Technical: Technical indicators are helpful both in documenting a port's overall infrastructure endowment, and in highlighting the performance of ports in terms of the efficiency of their operations.

- Access. An important issue is the ease with which the port can be accessed, whether from inland (through road and/or rail links) or the sea. As far as vessels are concerned, key issues

Figure 11.3 African cargo traffic relative to port design capacity



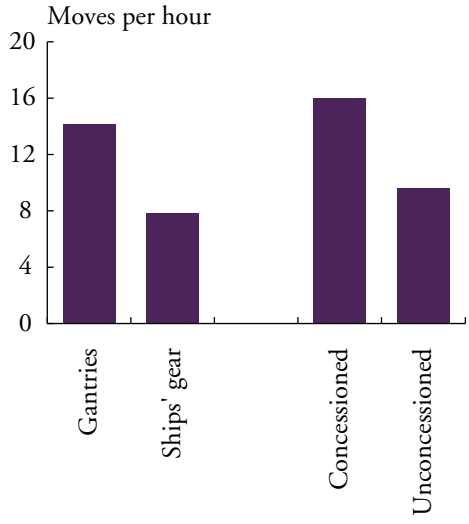
Source: Africa Infrastructure Country Diagnostic, 2009.

are restrictions in the depth of the entrance channel and the width of the turning space, which translate into the maximum vessel size that can be processed by the port.

- *Facilities*. The basic facilities of the port will determine its overall capacity to handle cargo. Among the key features are the number and overall length of berths of different types at which vessels can station during the loading and unloading of cargo.
- *Equipment*. It is important to understand how well a port is equipped to process cargo. The most important aspects of this are the number and type of cranes that are available for the loading and unloading of ships.
- *Performance*. In the ports context, performance measures focus primarily on the speed with which cargo can move through the port. This efficiency can be measured from a variety of perspectives. From the vessel perspective, the key issue is how long it has to wait before being able to enter the port, and how long it needs to stay in order to load and unload cargo once it has berthed. From the trucking perspective, the key issue is how long it takes to enter the court to drop off or pick up cargo and then exit. From the container perspective, the key issue is how long it needs to dwell inside the port until it is ready for pick-up. The main productivity measure for ports is the amount of cargo that cranes are able to load or unload from a ship during the space of an hour.

This kind of information can be used to look at the impact of institutional reforms, such as the award of container terminal concessions. The analysis shows a strong link between container terminal concessions and crane productivity (Figure 11.4). Ports with concessions manage 16 container moves per hour, compared with 10 moves per hour among ports that do not have such concessions. A similar productivity differential can be found between ports that have installed modern gantry cranes to facilitate the loading and unloading of vessels, and those that have not.

Figure 11.4 Impact of container terminal concessions on productivity



Source: Africa Infrastructure Country Diagnostic 2009.

Pricing: The two main types of charges levied at a port are the container handling charge and the handling charge for the various kinds of cargo (general, dry bulk, liquid bulk). Charges are often levied in international currencies, and discounts may sometimes apply for certain types of users.

Table 11.1 Charges at Sub-Saharan African ports compared with elsewhere in the world

	Container handling (ship-to-gate) $ per TEU	General cargo (over-the-quay) $ per tonne
East Africa	135–275	6–15
Southern Africa	110–243	11–15
West Africa	100–320	8–15
Rest of world	80–154	7–9

Source: Africa Infrastructure Country Diagnostic 2009.

Note: TEU = twenty-foot equivalent unit.

This kind of information can be used to benchmark prices of African ports against global competitors. The results show a wide range of charges between ports in Africa, varying by a factor of two (and even three) to one (Table 11.1). While the lowest charges applied by African ports are within the range observed in other parts of the world, most African ports charge significantly above the global benchmark ranges. Container charges can be twice as high as those observed elsewhere, while general cargo charges can be 70 percent higher.

For more discussion and illustration of how port sector indicators can be used to inform policy analysis, the reader is referred to the following publication:

- Gwilliam and others. 2011. *Africa's Transport Infrastructure*. World Bank, Washington DC.

11.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor port sector trends together with their corresponding technical definitions is provided in Annex A11.1. While the full list of indicators amounts to several hundred items, the indicators can easily be grouped around a smaller number of some 42 primary indicators. A synthetic overview of these primary indicators is provided in Table 11.2.

The Table clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators that are related to the primary ones. It also indicates whether the indicator originates at the national level or at the operator level; in the case of ports, all indicators will be treated at the operator level. Finally, the Table gives the source of the data, which in the case of ports is always one of the sector data templates. The process for obtaining data from this source is described later in detail.

Where relevant, benchmarks are calculated to facilitate cross-country comparisons. In the case of the port sector, there are no sector-specific benchmarks. Finally, Annex A11.2 provides a list of technical terms commonly used in the port sector.

Table 11.2 Overview of primary indicators for ports

Policy	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Sector reform		Year		National		Ports template A
	Legislation		Year				
	Corporatization of service provision						
	Decentralization						
	Foreign ownership restrictions						
	Regulatory agency		Year of establishment Level of independence				
	Concession		Port terminal Port terminal—all terminals Port terminal—some terminals				
	Handling charges		Criteria for adjustment				
	Private sector participation		Allowed Allowed with restrictions Allowed without restrictions				
	Tariff		Criteria for adjustment				
	Competition		Line handling Pilotage Stevedoring Storage and warehousing Terminal operations Towage		Port		Ports template B
	Management model		Containers Dry bulk General cargo Roll on/roll off Landlord port Service port Tool port Fully privatized port				

Policy	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Institutional	Port organization		Dockworkers unionized Retrenchment program Existence of master plan Year of updating of master plan Expansion plans in place Organizational model Ownership of basic infrastructure Ownership of major superstructure Port certified as ISPS compliant Service provision decentralized Undergone reform or restructuring		Port		Ports template B
	Private sector		Concessions in dredging Concessions in infrastructure Concessions in line handling Concessions in pilotage Concessions in stevedoring Concessions in storage and warehousing Concessions in terminal operations Concessions in towage Lease contracts in dredging Lease contracts in infrastructure Lease contracts in line handling Lease contracts in pilotage Lease contracts in stevedoring Lease contracts in storage and warehousing Lease contracts in terminal operations Lease contracts in towage Management contracts in dredging Management contracts in infrastructure Management contracts in line handling Management contracts in pilotage Management contracts in stevedoring Management contracts in storage and warehousing Management contracts in terminal operations Management contracts in towage				
Institutional	Port authority involvement		Terminal operations Cargo handling Front line operations Harbor maintenance Navigation/pilotage Towage		Port		Ports template B

Policy	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Pricing	Call		Cost per vessel	$	Port	National	Ports template B
	Excess storage charges		Bulk dry General cargo lowest level of sliding scale				
	Free storage period		Bulk Container cargo General cargo				
	Handling charge		Bulk dry Bulk liquid Cargo container General cargo				
Technical	Berth length		Bulk dry Container General cargo		Port	National	Ports template B
	Berth productivity		Bulk liquid Container General cargo Conventional berth Grain berth Ore berth				
	Berth water depth		Bulk dry Container General cargo				
	Berths		Number				
	Container handling system						
	Crane capacity		Gantry container Mobile harbor				
	Crane productivity		Bulk dry Container General cargo				
	Cranes		Gantry container Mobile harbor Specialized dry bulk				

Policy	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Technical	Draft on arrival		Bulk dry Bulk liquid Container General cargo		Port	National	Ports template B
	Draft on departure		Bulk dry Bulk liquid Container General cargo				
	Dwell time		Container				
	Employees		Public at port authority Total working in the port				
	Facilities water depth		Bulk liquid				
	Handled containers		Cargo				
	Length of vessels		Bulk dry Bulk liquid Container General Cargo				
	Loading rate		Bulk dry				
	Port capacity		Bulk dry Bulk liquid Container General cargo				
	Port characterization		Adequate road access present Cargo transshipment hub potential Entrance channel depth Entrance channel length Market extends beyond country's borders No impediments for deepening the port No impediments for port expansion Terminalization Turning basin diameter Vessel entrance restrictions Vessel entrance restrictions—maximum draft length limit Vessel entrance restrictions—maximum LOA limit Vessel maximum size allowed in port—beam Vessel maximum size allowed in port—dead-weight tonnage Vessel maximum size allowed in port—draught Vessel maximum size allowed in port—LOA Vessel traffic management system—VTS is present Working rail access is present				

Policy	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Technical	Preberth waiting time		Bulk dry Bulk liquid Container General cargo		Port	National	Ports template B
	Satellite inland Cargo depots						
	Turnaround time		Truck processing time for receipt and delivery of cargo Vessel stay—bulk dry Vessel stay—bulk liquid Vessel stay—container Vessel stay—general cargo				
	Unloading rate		Bulk dry				
Usage	Calls		Cargo vessel Cargo vessel—bulk dry Cargo vessel—bulk liquid Cargo vessel—container Cargo vessel—general cargo		Port		Ports template B
	Traffic		Exports—bulk Exports—bulk dry Exports—bulk liquid Exports—Cargo container Exports—container—cargo empty Exports—general cargo Imports— bulk dry Imports—bulk Imports—bulk liquid Imports—cargo container Imports—general cargo Transshipment volume—in-bound container Transshipment volume—outbound container				

Table 11.3, which benchmarks performance indicators across southern Africa's various ports, provides an example of how indicators can be used to inform port sector policy analysis. The analysis shows that South African and Namibian ports tend to perform significantly better than those in Angola and Mozambique, in terms of the standard efficiency parameters. But the charges for container handling at South African ports are particularly high. The lowest charges are found at Beira (Mozambique) and Walvis Bay (Namibia).

Table 11.3 Example of benchmarking port indicators for southern Africa

	Cape Town	Durban	East London	Port Elizabeth	Walvis Bay	Luanda	Beira	Maputo
	South Africa				Namibia	Angola	Mozambique	
Performance								
Container dwell time—average (days)	6	4	7	6	8	12	20	22
Truck-processing time for receipt and delivery of cargo (hours)	5	5	2	5	3	14	7	4
Container crane productivity (container per hour)	18	15	8	15		7	10	11
Prices								
Container-cargo-handling charge ($ per TEU)	258	258	258	258	110	320	125	155
General-cargo-handling charge ($ per tonne)		8	8	8	15	9	7	6

Source: Africa Infrastructure Country Diagnostic 2009.

Note: TEU = twenty-foot equivalent unit.

11.4 Data Collection

The generic cross-cutting guidelines and procedures of data collection discussed in Chapter 2 of this Handbook are summarized in the following Box, and it is essential to go over them before the actual data collection starts.

Target institutions

This section identifies and defines the ports sector data that are to be collected in order to create the indicators presented earlier. The data collection exercise aims to cover all major public access ports on the African coastline. Any port handling more than 8–10 million tonnes of total cargo per year would qualify to be a major port. There are also numerous private ports operated by petroleum and mining companies as dedicated export facilities; however, only a few of these (those of particular strategic importance) are covered in the AIKP database. Annex A11.3 provides an indicative list of Africa's major ports as of March 2011, classified according to the 25 countries where they are located. These are also the target institutions that need to be approached for data collection in this sector. Since existing ports may decline in significance or, more likely, major new ports may be developed, the list provided is only intended as general guidance, and should be reviewed and updated in consultation with sector specialists as a first step in any future data collection exercise.

The publication *Lloyd's Shipping Guide* may provide a more up-to-date list of ports at any particular time and may be of use. Data are generally collected for only the largest port in each country, plus any other ports of significant size in regional terms.

Data templates

The data collection effort for the port sector involves a few national level variables, but focuses primarily on data for individual ports. National institutional data are best collected from the local line ministry covering maritime issues, the shipping industry, and/or transport services. In a few countries, transport regulators exist and may also be a useful source. The port level data are best collected directly from the public port management bodies or authorities, or corporatized port management bodies where these exist. Chambers of Commerce can sometimes be a useful source of information about ports. The names of the relevant line ministries and port authorities for each country are also provided in Annex A11.3.

There are two data collection templates for the ports sector:

- Ports template A is a national template, which focuses on collecting a relatively small number of institutional variables.
- Ports template B is a ports template, which collects a much wider range of variables. A separate version of ports template B should be filled out for each port that is being studied in any given country.

Ports template A: This template collects variables relating to the national institutional framework for the ports sector. The

The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the *comma-dot* or *dot-comma* convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between *zero*¸ *not available*¸ and *not applicable*: (i) *zero* refers to a situation where data exists but has a value of zero; (ii) *not available* refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) *not applicable* refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

Note: For details refer to chapter 2 of the Handbook on Infrastructure Statistics

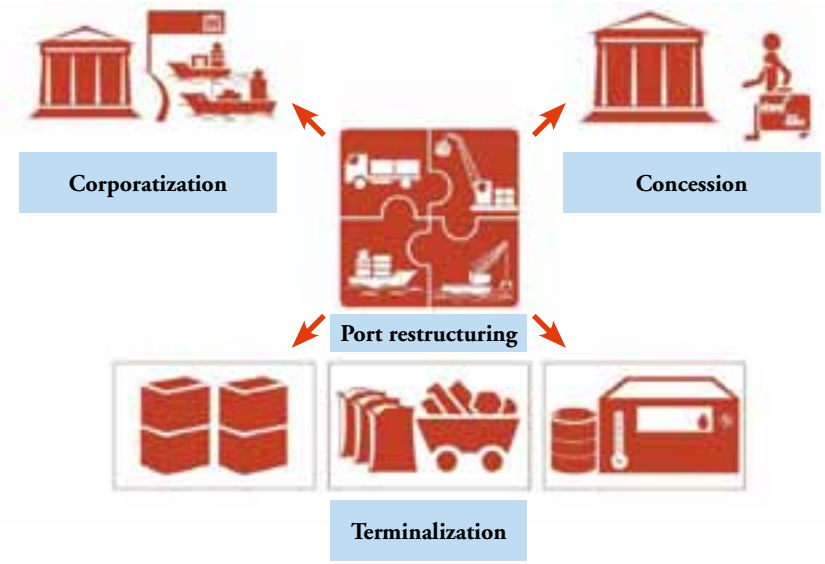
template contains a series of straightforward binary questions relating to whether any of the following measures have been adopted: adoption of a sector reform program; passing of new sectoral legislation; decentralization of responsibility for the ports sector; authorization of private sector participation in the ports sector; existence of a legal framework allowing for concessions in the ports sector; existence of restrictions on foreign ownership of the ports sector; and existence of a regulatory agency.

Ports template B: This template collects variables relating to each port.

The first block of the template comprises the following institutional variables:

- *Restructuring*: There are potentially a number of reform measures that may have taken place and affected the structure of the port (Figure 11.5). These include corpo-

Figure 11.5 Different aspects of port restructuring



ratization (establishing the port as a separate business unit from the rest of the public administration), terminalization (separating out the facilities that handle different types of cargo such as containers and dry or liquid bulk), and concession (whereby all or more often part of the port activities are contracted to a private company).

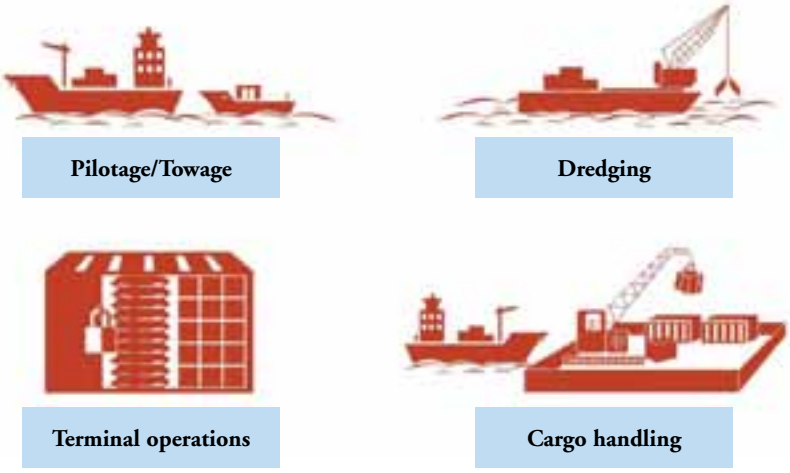
- *Organization*: There are two basic organization models for the ports sector (Figure 11.6). Under the service port, the state is responsible for all aspects of the port. Under the landlord model, the state withdraws from frontline operations, allowing them to be provided on a competitive basis by the private sector, and concentrates on providing the basic port infrastructure. In between these two models, there is the hybrid tool port, which transfers only some of the frontline operations to the private sector.

Figure 11.7 illustrates the main frontline operations of a port (pilotage, towage, dredging, cargo handling, and terminal operations) and should help to determine whether a full landlord or partial tool port model has been adopted. Much more rarely, the entire integrated port operation may be contracted to the private sector as a concession.

- *Labor issues*: Ports employ significant numbers of workers and are typically strongly unionized. In some cases, overstaffing can become a significant issue. Therefore, the template asks about unionization of the ports workers, as well as if there is any retrenchment program targeted at them.
- *Port master plan*: With the exponential growth in global trade volumes, many ports have reached or are close to reaching capacity. In order to keep pace with demand, it is important for port authorities to plan ahead and have expansion plans clearly identified. The existence of a port master plan provides some indication that this kind of foresight is being exercised.
- *ISPS compliance*: Ports are increasingly being expected to comply with international security standards, as measured

Figure 11.6 Distinction between service port and landlord port

Figure 11.7 Illustration of frontline operations at a port



by the International Ship and Port Facility Security Code (ISPS) framework. Many African ports are still some way from doing so, thus the relevance of this indicator.

- *Port type*: As well as receiving imports and exports for the local economy, some ports perform additional functions in the system of international trade. *Transit ports* handle goods for neighboring landlocked countries that do not have their own maritime access. Transhipment ports are usually larger facilities that act as staging posts for the redistribution of cargo to neighboring smaller ports along the coastline.
- *Tariff review*: Ports may compete with neighboring facilities along the same coast, yet at the same time exert considerable market power over the local economy. For that reason, port tariffs are often regulated and may be adjusted, sometimes on petition from a port user, or are subject to regular indexation or periodic regulatory review.

The second block of the template comprises the following variables relating to the usage of the port.

- *Cargo types*: There are five different types of cargo that routinely move through African ports, each of which may require specialized facilities to deal with its own peculiar characteristics (Figure 11.8).
    - o *Containers* are steel or aluminum frame boxes in which cargo can be stored, meeting ISO-specified measurements, fitted with special castings on the corners (for securing to lifting equipment or for stacking on other containers), or directly transfered to truck or train wagons. Containers come in a number of different sizes, the most relevant being of 20-foot length. Such containers are measured in volume terms, in twenty-foot equivalent units (TEUs), rather than by weight.
    - o *General cargo* comprises cargo of various kinds that is packaged but not transported in containers, typically manufactured goods or some processed food products. General cargo is measured in metric tonnes of weight.
    - o *Dry bulk* comprises loose, mostly uniform cargo, such as agricultural bulk products (for example, grain), coal, fertilizer, and ores that are transported in bulk carriers. Dry bulk cargo is measured in metric tonnes of weight.
    - o *Liquid bulk* comprises liquid cargo, such as petroleum, and is typically measured in cubic meters.
    - o *Roll on/Roll off (RoRo)* refers to cargo that takes the form of wheeled vehicles that can roll on and off vessels directly through the use of ramps, and therefore do not require to be lifted by cranes. RoRo cargo is measured in metric tonnes of weight.
- Traffic types: For each cargo type, the traffic is subdivided according to its final destination (Figure 11.9). Most cargo comprises either imports that are destined for the local market, or exports destined to be sold abroad. In the case of containers, there is also transit cargo that is bound for a neighboring landlocked country over land, and transshipment cargo that is bound for a neighboring coastal country by means of short sea shipping.
- Vessel calls: An alternative measure of traffic is the number of vessels that call at the port; these may also be broken down according to the type of cargo that they carry.

The third block of the template comprises 21 variables relating to the technical features of the port. These include port infra-

Figure 11.8 Illustration of different cargo types

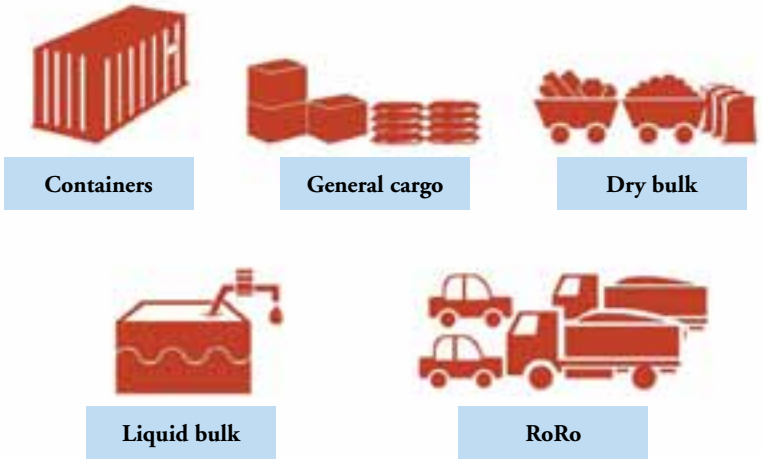
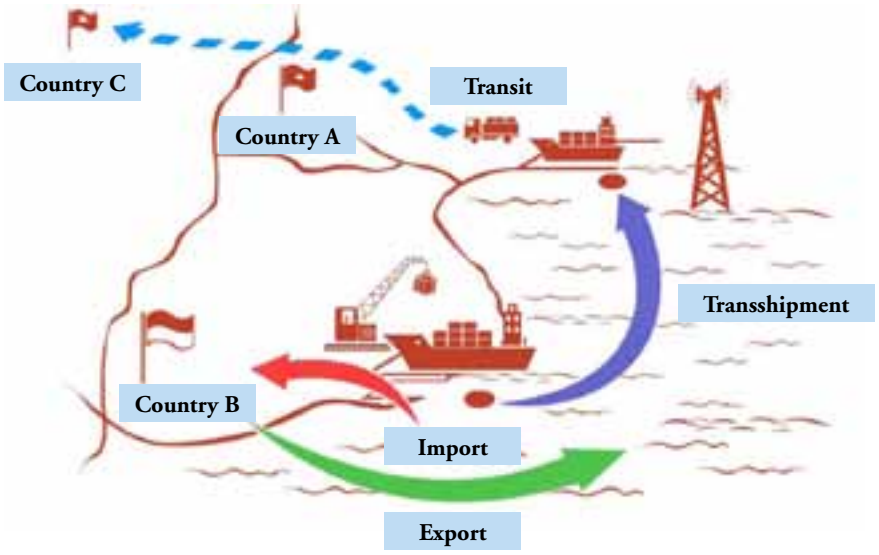


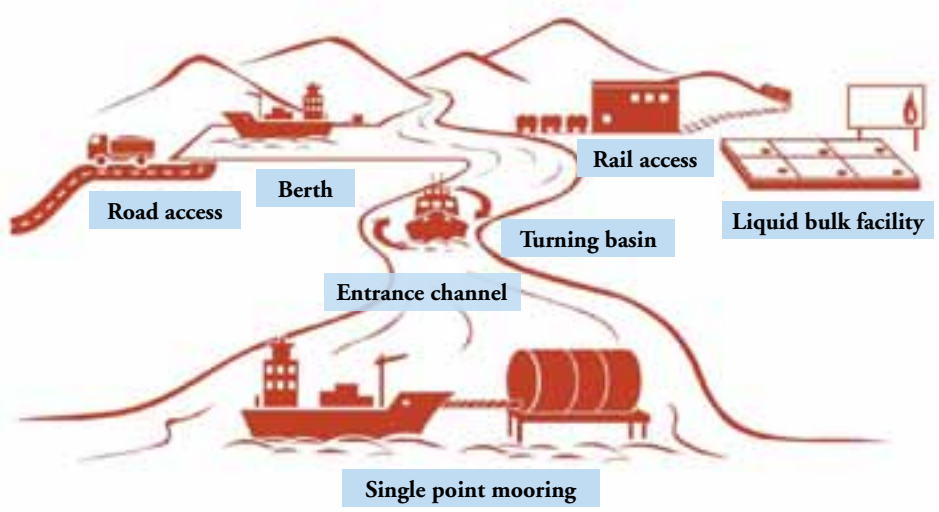
Figure 11.9 Illustration of different traffic types



structure, the civil works of the port, and port superstructure, referring to the buildings and equipment that sit on top of the port infrastructure and which are a key to the functioning of the port (Figure 11.10). In addition, port productivity measures are considered.

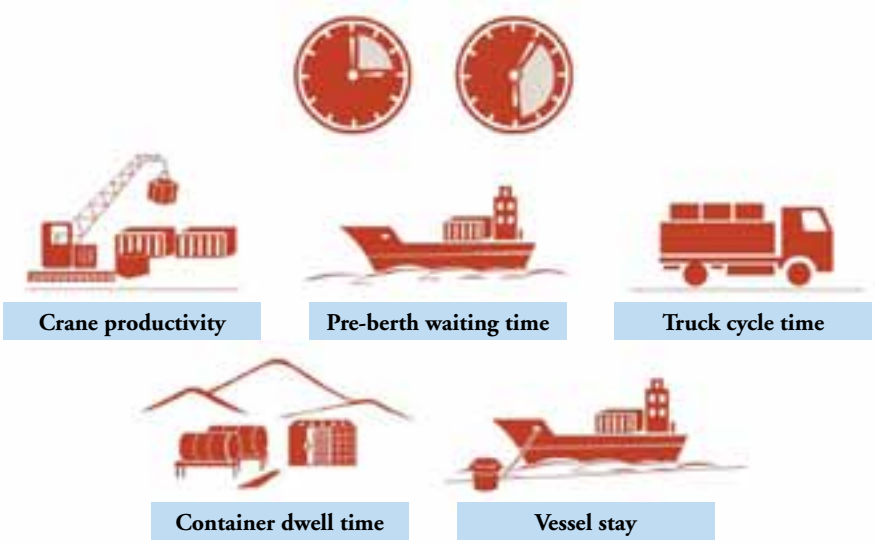
- *Port deepening*: Refers to whether any major impediments exist for deepening the port. Depth (also known as draft) is usually the binding constraint in terms of the size of ships that a port can accommodate; thus the importance of knowing whether depth could be increased to allow for larger vessels in the future.
- *Vessel entrance restrictions*: Refers to whether vessels are restricted from entering port facilities at night. Such restrictions are sometimes necessary for security or technical reasons, but significantly reduce the potential throughput of the port.
- *Road access*: Refers to the nature of the road infrastructure leading to the landside entrance of the port, outside of the port jurisdiction. If road infrastructure is inadequate, congestion will be caused around the port entrance, leading to major delays in accessing the facility.
- *Rail access*: Refers to the nature of the rail infrastructure leading to the landside entrance of the port. If rail infrastructure is inadequate, rail cargo will accumulate within the port, leading to delays in onward transportation.
- *Land area*: Refers to the total land area under port control (including land zoned for future development) and is measured in hectares.

Figure 11.10 Configuration of port infrastructure and superstructure



- *Entrance channel dimensions*: Refers to total depth and length, in meters, of the main entrance channel through which vessels access port facilities.
- *Turning basin diameter*: Refers to the diameter, in meters, of the turning basin that vessels use to maneuver within port facilities.
- *Maximum vessel size*: Refers to the maximum vessel size allowed in port due to physical constraints and is measured in dead weight tonnes (DWTs).
- *Vessel Traffic Management System*: Comprises equipment, personnel, and regulations aimed at ensuring the safe movement of vessels in and around the port. Key components of equipment include radars, tracking software, and radio communications.
- *Berths*: Comprises a length of quay equipped for a ship to dock. Of interest are the number, length, and depth of the berths. Statistics for berths may be broken down according to the type of cargo involved.
- *Terminals*: A specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations. Area is measured in square meters, and broken down according to the type of cargo that the terminal serves.
- *Cranes*: The key piece of equipment needed for the loading and unloading of ships. Ideally, ports should be adequately equipped with cranes, but where this is not the case it is sometimes possible to load and unload using ship-mounted cranes, although this is less efficient. There are two types of cranes. *Gantry cranes* are fixed on a frame or structure spanning an intervening space typically designed to traverse fixed structures, such as cargo or container storage areas or quays, and which is used to hoist cargo or containers in and out of vessels and place them on another vessel, truck, barge, or train. *Mobile cranes* are general-purpose equipment capable of moving on its own wheels from one part of the port to another, depending on where it is needed.
- *Capacity*: Refers to the maximum throughput of different types of cargo that the port was designed to accommodate within its present facilities.
- *Container handling mode*:A number of different types of systems are in use for handling the loading and unloading of containers. The main alternatives include: rubber tired gantry (RTG), a rubber-wheel mounted crane system used for yard-based container handling; rail mounted gantry (RMG), a rubber-wheel mounted crane system used for yard-based container handling; straddle carrier (SC), a mobile container handling system used mainly in container yards; and reach stacker (RS), a mobile container handling system used in container yards and elsewhere.
- *Inland cargo depots*: Also known as ICDs, refers to inland dry ports equipped for handling and temporary storage of containerized and other cargo.
- *Liquid bulk facilities*: Details which type of facilities, if any, are available for processing liquid bulk. A number of different types of infrastructure may be used for this purpose, including (i) a single point mooring (SPM), an offshore mooring usually found in deep water used for the loading/offloading of tankers, and (ii) floating production, storage, and offloading (FPSO).
- *Container dwell time*: Refers to the turnaround time of a container within the port, from the time that it enters the port facility (by sea or land) to the time that it leaves the port facility (by land or sea). Gives an indication of the

Figure 11.11 Illustration of port performance measures



typical delays associated with all aspects of port operations, including loading and unloading, as well as administrative procedures such as customs clearance (Figure 11.11). A delay of up to seven days would represent a good performance, but in practice delays can be up to four times as long.

- *Truck processing time*: Refers to the turnaround time of a truck within the port, from the time that it enters the port facility to deposit or collect cargo, to the time that it leaves the port facility. Gives an indication of the typical delays associated with receiving and dispatching cargo on the landside of the port. A delay of up to an hour would represent a good performance, but in practice delays can be up to ten times as long.
- *Preberth time*: Refers to the time that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth (Figure 11.11). If port facilities are congested or operating inefficiently, considerable preberth waiting times may result. While a delay of up to a day could be considered reasonable, delays of several days are not uncommon at some African ports.
- *Vessel stay*: Refers to the turnaround time of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel. A stay of around 17 days would be considered a Sub-Saharan African average for a container vessel, but delays of up to 4 times as much are not unknown.
- *Berth productivity*: Refers to the average volume of cargo that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity. A rate of around 24 containers per hour would be considered a reasonable average for Sub-Saharan Africa, but rates can be as low as 1.5 containers per hour.
- *Crane productivity*: Refers to the average volume of cargo that is loaded or unloaded by a crane within the space of an hour (Figure 11.11). This will depend both on the type of crane and the efficiency with which it is operated. For container cranes, a rate of 30 moves per hour would be considered a good performance, whereas many African ports only manage one-third of this level. For general cargo cranes, a rate of 9 metric tonnes per hour would be a good performance, whereas many African ports only manage 6 metric tonnes per hour.

The fourth block of the template comprises the following variables relating to the pricing of port services.

- *Handling charges*: Refers to what ports charge their customers for the processing of cargo. Different charges apply according to different types of cargo, and the units vary accordingly. For example, container charges are measured in local currency units (LCUs) per TEU, while general cargo handling charges are measured in LCU per metric tonne. In the African context, container handling charges can be anywhere between $100 and $300 per TEU, while general cargo charges are typically in the $5–$15 range.
- *Charge currency*: Port charges are often levied in international rather than local currencies, and the exact currency used is detailed here.
- *Charge discount*: Ports sometimes offer discounts to preferred customers against their list prices, and if so these are recorded here.

Supporting documents

A starting point for data collection is to obtain the port operator's annual report, if possible. The annual report is a useful document in its own right and should be archived. Depending on its quality, it might be a source of a significant number of variables. Any remaining variables should be sought directly from the port by contacting the General Manager.

A11. Annexes to Chapter 11: Transport infrastructure, ports

Annex A11.1 Comprehensive list of indicators and definitions--Ports

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P296	Sector reform (year)	Year of the partial or global reform of the sector	National	Raw	
	P297	Legislation (year)	Year of the partial or global legislation for the sector	National	Raw	
	P212	Corporatization of service provision (0=no, 1=yes)	Whether or not the responsibility for port service provision has been decentralized from national to regional level or to municipal bodies	National	Raw	
	P298	Decentralization (0=no, 1=yes)	Whether or not the responsibility for port service provision has been decentralized from national to regional or municipal level	National	Raw	
	P302	Foreign ownership restrictions (0=yes, 1=no)	Whether or not the laws establish restrictions of foreign ownership of assets (real or property) within the port sector	National	Raw	
	P306	Regulatory agency independent (0=no, 1=yes)	Whether or not there is an operational independent regulatory agency governing the port sector	National	Raw	
	P307	Regulatory agency, year of establishment	Year the regulator was established	National	Raw	
	P305	Concession, port terminal - all terminals (0=no, 1=yes)	Whether or not there is a concession to operate all the terminals in the port	National	Derived	[(If P303 ="2"), then= "1"; otherwise = "0"]
	P304	Concession, port terminal - some terminals (0=no, 1=yes)	Whether or not there is a concession to operate some terminals in the port	National	Derived	[(If P303 ="1"), then= "1"; otherwise = "0"]
	P303	Concession, port terminal (0=no; 1=some terminals; 2= all terminals)	Whether or not there is a concession to operate some or all terminals in the port	National	Raw	
	P312	Handling charges, criteria for adjustment (0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other)	Conditions for adjustment of terminal handling charges; 0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other	National	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P315	Handling charges, criteria for adjustment, at petition (0=no, 1=yes)	Whether or not terminal handling charges are adjusted at petition to the regulatory body	National	Derived	[if (P311 ="4"), then= "1"; otherwise = "0"]
	P314	Handling charges, criteria for adjustment, fixed periodic review (0=no, 1=yes)	Whether or not terminal handling charges are adjusted based on fixed periodic review within 1 year, or fixed periodic review between 1 and 3 years, or fixed periodic review of more than 3 years , or annually based on predefined indexation (i.e. inflation)	National	Derived	[if (P311 ="1", "2", "3", or "5"), then= "1"; otherwise = "0"]
	P313	Handling charges, criteria for adjustment, market conditions (0=no, 1=yes)	Whether or not terminal handling charges adjusted freely based on market conditions	National	Derived	[if (P311 ="0"), then= "1"; otherwise = "0"]
	P299	Private sector participation (0=not allowed; 1=allowed with restrictions ; 2=allowed without restrictions)	Whether or not private participation in the port sector allowed by law	National	Raw	
	P300	Private sector participation, allowed with restrictions (0=no, 1=yes)	Whether or not private sector participation is partially allowed in the port sector by law	National	Derived	[(If P299 ="1"), then= "1"; otherwise = "0"]
	P301	Private sector participation, allowed without restrictions (0=no, 1=yes)	Whether or not private sector participation is totally allowed in the port sector by law	National	Derived	[(If P299 ="2"), then= "1"; otherwise = "0"]
	P308	Tariff, criteria for adjustment (0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other)	Conditions under port tariffs are adjusted (0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other)	National	Raw	
	P311	Tariff, criteria for adjustment, at petition (0=no, 1=yes)	Whether or not port tariffs are adjusted at petition to the regulatory body	National	Derived	[if (P311 ="4"), then= "1"; otherwise = "0"]
	P310	Tariff, criteria for adjustment, fixed periodic review (0=no, 1=yes)	Whether or not port tariffs are adjusted based on fixed periodic review within 1 year, or fixed periodic review between 1 - 3 years, or fixed periodic review of more than 3 years , or annually based on predefined indexation (i.e. inflation)	National	Derived	[if (P308 ="1", "2", "3", or "5"), then= "1"; otherwise = "0"]
	P309	Tariff, criteria for adjustment, market conditions (0=no, 1=yes)	Whether or not port tariffs are adjusted freely based on market conditions	National	Derived	[if (P308 ="0"), then= "1"; otherwise = "0"]
	P243	Competition, line handling (0=no, 1=yes)	Whether or not there is competition in line handling	Operator	Raw	
	P241	Competition, pilotage (0=no, 1=yes)	Whether or not there is competition in pilotage	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P244	Competition, stevedoring (0=no, 1=yes)	Whether or not there is competition in stevedoring	Operator	Raw	
	P246	Competition, storage and warehousing (0=no, 1=yes)	Whether or not there is competition in storage and warehousing	Operator	Raw	
	P245	Competition, terminal operations (0=no, 1=yes)	Whether or not there is competition in terminal operations	Operator	Raw	
	P242	Competition, towage (0=no, 1=yes)	Whether or not there is competition in towage	Operator	Raw	
	P355	Management model, bulk liquid (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Type of management model used for bulk liquid (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Operator	Raw	
	P340	Management model, containers (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Type of management model used for containers (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Operator	Raw	
	P350	Management model, dry bulk (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Type of management model used for bulk dry (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Operator	Raw	
	P349	Management model, fully privatized - general cargo (0=no, 1=yes)	Whether the management model used for general cargo is full privatization	Operator	Derived	[if (P345 =”3”), then= “1”; otherwise = “0”]
	P344	Management model, fully privatized - containers (0=no, 1=yes)	Whether the management model used for containers is full privatization	Operator	Derived	[if (P340 =”3”), then= “1”; otherwise = “0”]
	P354	Management model, fully privatized - dry bulk (0=no, 1=yes)	Whether the management model used for dry bulk is full privatization	Operator	Derived	[if (P350 =”3”), then= “1”; otherwise = “0”]
	P359	Management model, fully privatized - general cargo (0=no, 1=yes)	Whether the management model used for general cargo is full privatization	Operator	Derived	[if (P355 =”3”), then= “1”; otherwise = “0”]
	P364	Management model, fully privatized - Ro-Ro (0=no, 1=yes)	Whether the management model used for Ro-Ro is full privatization	Operator	Derived	[if (P360 =”3”), then= “1”; otherwise = “0”]
	P345	Management model, general cargo (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Type of management model used for general cargo (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Operator	Raw	
	P348	Management model, landlord port - general cargo (0=no, 1=yes)	Whether or not landlord model is used for general cargo	Operator	Derived	[if (P345 =”2”), then= “1”; otherwise = “0”]
	P343	Management model, landlord port - containers (0=no, 1=yes)	Whether or not landlord model is used for containers	Operator	Derived	[if (P340 =”2”), then= “1”; otherwise = “0”]
	P353	Management model, landlord port - dry bulk (0=no, 1=yes)	Whether or not landlord model is used for dry bulk	Operator	Derived	[if (P350 =”2”), then= “1”; otherwise = “0”]

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P358	Management model, landlord port - general cargo (0=no, 1=yes)	Whether or not landlord model is used for general cargo	Operator	Derived	[if (P355 =”2”), then= “1”; otherwise = “0”]
	P363	Management model, landlord port - Ro-Ro (0=no, 1=yes)	Whether or not landlord model is used for Ro-Ro	Operator	Derived	[if (P360 =”2”), then= “1”; otherwise = “0”]
	P360	Management model, Ro-Ro (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Type of management model used for bulk Ro-Ro (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)	Operator	Raw	
	P356	Management model, service port - bulk liquid (0=no, 1=yes)	Whether or not service port management model is used for bulk liquid	Operator	Derived	[if (P355 =”0”), then= “1”; otherwise = “0”]
	P341	Management model, service port - containers (0=no, 1=yes)	Whether or not service port management model is used for containers	Operator	Derived	[if (P340 =”0”), then= “1”; otherwise = “0”]
	P351	Management model, service port - dry bulk (0=no, 1=yes)	Whether or not service port management model is used for dry bulk	Operator	Derived	[if (P350 =”0”), then= “1”; otherwise = “0”]
	P346	Management model, service port - general cargo (0=no, 1=yes)	Whether or not service port management model is used for general cargo	Operator	Derived	[if (P345 =”0”), then= “1”; otherwise = “0”]
	P361	Management model, service port - Ro-Ro (0=no, 1=yes)	Whether or not service port management model is used for Ro-Ro	Operator	Derived	[if (P360 =”0”), then= “1”; otherwise = “0”]
	P357	Management model, tool port - bulk liquid (0=no, 1=yes)	Whether or not tool port management model is used for bulk liquid	Operator	Derived	[if (P355 =”1”), then= “1”; otherwise = “0”]
	P342	Management model, tool port - containers (0=no, 1=yes)	Whether or not tool port management model is used for containers	Operator	Derived	[if (P340 =”1”), then= “1”; otherwise = “0”]
	P352	Management model, tool port - dry bulk (0=no, 1=yes)	Whether or not tool port management model is used for dry bulk	Operator	Derived	[if (P350 =”1”), then= “1”; otherwise = “0”]
	P347	Management model, tool port - general cargo (0=no, 1=yes)	Whether or not tool port management model is used for general cargo	Operator	Derived	[if (P345 =”1”), then= “1”; otherwise = “0”]
	P362	Management model, tool port - Ro-Ro (0=no, 1=yes)	Whether or not tool port management model is used for Ro-Ro	Operator	Derived	[if (P360 =”1”), then= “1”; otherwise = “0”]
	P219	Port organization, authority corporatized (0=no, 1=yes)	Whether or not the port authority in the sector has been commercialized and corporatized?[establishing a ring fenced autonomous enterprise]	Operator	Raw	
	P286	Port organization, dockworkers unionized (0=no, 1= yes)	Whether or not dockworkers in the port are unionized	Operator	Raw	
	P222	Port organization, existence of master plan (0=no, 1=yes)	Whether or not a port master plan exists	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P180	Port organization, expansion plans in place (0=no, 1=yes)	Expansion plans of the port exist	Operator	Raw	
	P322	Port organization, organizational model - fully privatized (0=no; 1=yes)	Fully privatization of the port	Operator	Derived	[If [P217="4"), then "1"; otherwise= "0"]
	P230	Port organization, organizational model - landlord (0=no; 1=yes)	Landlord model of port's organization used	Operator	Derived	[If [P217="1"), then "1"; otherwise= "0"]
	P320	Port organization, organizational model - service port (0=no; 1=yes)	Service port model of port's organization used	Operator	Derived	[If [P217="2"), then "1"; otherwise= "0"]
	P321	Port organization, organizational model - tool port (0=no; 1=yes)	Tool port model of port's organization used	Operator	Derived	[If [P217="3"), then "1"; otherwise= "0"]
	P217	Port organization, organizational model (1= Landlord Port ; 2=Service Port ; 3= Tool Port ; 4=Fully privatized ; 5=Other)	Model of port organization is employed at the port (1= Landlord Port; 2=Service Port; 3= Tool Port; 4=Fully privatized; 5=Other)	Operator	Raw	
	P231	Port organization, ownership of basic infrastructure (0=public sector; 1=private sector, full or partially)	Owner of the port's basic infrastructure (0=public sector; 1=private sector, full or partially)	Operator	Raw	
	P232	Port organization, ownership of major superstructure (0=public sector; 1=private sector, full or partially)	Owner of the port's major infrastructure (0=public sector; 1=private sector, full or partially)	Operator	Raw	
	P290	Port organization, port certified as ISPS compliant (0=no, 1= yes)	Whether or not the port is certified as ISPS compliant	Operator	Raw	
	P287	Port organization, retrenchment programme (0=no, 1= yes)	Whether or not a retrenchment programme for the port workforce is being implemented or actively considered	Operator	Raw	
	P220	Port organization, service provision decentralized (0=no, 1=yes)	Whether or not the responsibility for port service provision has been decentralized from national to regional level or to municipal bodies	Operator	Raw	
	P216	Port organization, undergone reform or restructuring (0=no, 1=yes)	Whether or not the port is undergoing reform or restructuring	Operator	Raw	
	P223	Port organization, year of updating of master plan (year)	Year of updating of master plan	Operator	Raw	
	P275	Private sector, Concessions in dredging (0=no, 1=yes)	Whether or not there are concession in dredging	Operator	Raw	
	P268	Private sector, Concessions in infrastructure (0=no, 1=yes)	Whether or not there are concession in infrastructure	Operator	Raw	
	P271	Private sector, Concessions in line handling (0=no, 1=yes)	Whether or not there are concession in line handling	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P269	Private sector, Concessions in pilotage (0=no, 1=yes)	Whether or not there are concession in pilotage	Operator	Raw	
	P272	Private sector, Concessions in stevedoring (0=no, 1=yes)	Whether or not there are concession in stevedoring	Operator	Raw	
	P274	Private sector, Concessions in storage and warehousing (0=no, 1=yes)	Whether or not there are concession in storage and warehousing	Operator	Raw	
	P273	Private sector, Concessions in terminal operations (0=no, 1=yes)	Whether or not there are concession in terminal operations	Operator	Raw	
	P270	Private sector, Concessions in towage (0=no, 1=yes)	Whether or not there are concession in towage	Operator	Raw	
	P284	Private sector, Lease contracts in dredging (0=no, 1=yes)	Whether or not there are lease contracts in dredging	Operator	Raw	
	P277	Private sector, Lease contracts in infrastructure (0=no; 1= yes)	Whether or not there are lease contracts in infrastructure	Operator	Raw	
	P280	Private sector, Lease contracts in line handling (0=no, 1=yes)	Whether or not there are lease contracts in line handling	Operator	Raw	
	P278	Private sector, Lease contracts in pilotage (0=no, 1=yes)	Whether or not there are lease contracts in pilotage	Operator	Raw	
	P281	Private sector, Lease contracts in stevedoring (0=no, 1=yes)	Whether or not there are lease contracts in stevedoring	Operator	Raw	
	P283	Private sector, Lease contracts in storage and warehousing (0=no, 1=yes)	Whether or not there are lease contracts in storage and warehousing	Operator	Raw	
	P282	Private sector, Lease contracts in terminal operations (0=no, 1=yes)	Whether or not there are lease contracts in terminal operations	Operator	Raw	
	P279	Private sector, Lease contracts in towage (0=no, 1=yes)	Whether or not there are lease contracts in towage	Operator	Raw	
	P266	Private sector, Management contracts in dredging (0=no, 1=yes)	Whether or not there are management contracts in dredging	Operator	Raw	
	P259	Private sector, Management contracts in infrastructure (0=no, 1=yes)	Whether or not there are management contracts in infrastructure	Operator	Raw	
	P262	Private sector, Management contracts in line handling (0=no, 1=yes)	Whether or not there are management contracts in line handling	Operator	Raw	
	P260	Private sector, Management contracts in pilotage (0=no, 1=yes)	Whether or not there are management contracts in pilotage	Operator	Raw	
	P263	Private sector, Management contracts in stevedoring (0=no, 1=yes)	Whether or not there are management contracts in stevedoring	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Institutional	P265	Private sector, Management contracts in storage and warehousing (0=no; 1= yes)	Whether or not there are management contracts in storage and warehousing	Operator	Raw	
	P264	Private sector, Management contracts in terminal operations (0=no, 1=yes)	Whether or not there are management contracts in terminal operations	Operator	Raw	
	P261	Private sector, Management contracts in towage (0=no, 1=yes)	Whether or not there are management contracts in towage	Operator	Raw	
	P329	Port authority involvement - cargo handling (0=no, 1=yes)	Whether or not the port authority is involved in cargo handling	Operator	Raw	
	P325	Port authority involvement - front line operations (0=no, 1=yes)	Whether or not the port authority is involved in front line operations	Operator	Raw	
	P328	Port authority involvement - harbour maintenance (0=no, 1=yes)	Whether or not the port authority is involved in harbour maintenance	Operator	Raw	
	P326	Port authority involvement - navigation/pilotage (0=no, 1=yes)	Whether or not the port authority is involved in navigation/pilotage	Operator	Raw	
	P330	Port authority involvement - terminal operations (0=no, 1=yes)	Whether or not the port authority is involved in terminal operations	Operator	Raw	
	P327	Port authority involvement - towage (0=no, 1=yes)	Whether or not the port authority is involved in towage	Operator	Raw	
Pricing	P181-d	Call, cost per vessel (US$)	National average of the cost of vessel call, expressed in US$	National	Derived	average[P181, across ports]
	q181	Call, cost per vessel (LCU)	Cost of vessel call, expressed in LCU	Operator	Raw	
	P181	Call, cost per vessel (US$)	Cost of vessel call, expressed in US$	Operator	Derived	[q181] / exchange
	P188-d	Excess storage charges, bulk dry (US$ per ton per day)	National average of daily charges per tonne for excess storage of bulk dry, expressed in US$	National	Derived	average[P188, across ports]
	P187-d	Excess storage charges, general cargo (US$ per ton per day)	National average of daily charges per tonne for excess storage of general cargo, expressed in US$	National	Derived	average[P187, across ports]
	P186-d	Excess storage charges, lowest level of sliding scale (US$ per TEU per day)	National average of daily charges per TEU for excess storage, expressed in US$	National	Derived	average[P186, across ports]
	q188	Excess storage charges, bulk dry (LCU per ton per day)	Daily charges per tonne for excess storage of bulk dry, expressed in LCU	Operator	Raw	
	P188	Excess storage charges, bulk dry (US$ per ton per day)	Daily charges per tonne for excess storage of bulk dry, expressed in US$	Operator	Derived	[q188] / exchange
	q187	Excess storage charges, general cargo (LCU per ton per day)	Daily charges per tonne for excess storage of general cargo, expressed in LCU	Operator	Raw	
	P187	Excess storage charges, general cargo (US$ per ton per day)	Daily charges per tonne for excess storage of general cargo, expressed in US$	Operator	Derived	[q187] / exchange

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Pricing	q186	Excess storage charges, lowest level of sliding scale (LCU per TEU per day)	Daily charges per TEU for excess storage, expressed in LCU	Operator	Raw	
	P186	Excess storage charges, lowest level of sliding scale (US$ per TEU per day)	Daily charges per TEU for excess storage, expressed in US$	Operator	Derived	[q186] / exchange
	P191	Free storage period, bulk (0=no, 1=yes)	Whether or not there is free storage period for bulk	Operator	Raw	
	P189	Free storage period, container cargo (0=no, 1=yes)	Whether or not there is free storage period for container cargo	Operator	Raw	
	P190	Free storage period, general cargo (0=no, 1=yes)	Whether or not there is free storage period for general cargo	Operator	Raw	
	P184-d	Handling charge, bulk dry (US$ per ton)	National average of dry bulk handling charge per tonne (ship to gate or rail), expressed in US$	National	Derived	average[P184, across ports]
	P185-d	Handling charge, bulk liquid (US$ per ton)	National average of bulk liquid handling charge per tonne (ship to gate or rail), expressed in US$	National	Derived	average[P185, across ports]
	P182-d	Handling charge, cargo container (US$ per TEU)	National average of cargo container handling charge per TEU (ship to gate or rail), expressed in US$	National	Derived	average[P182, across ports]
	P183-d	Handling charge, general cargo (US$ per ton)	National average of general cargo handling charge per tonne (ship to gate or rail), expressed in US$	National	Derived	average[P183, across ports]
	q184	Handling charge, bulk dry (LCU per ton)	Average dry bulk handling charge per tonne (ship to gate or rail), expressed in LCU	Operator	Raw	
	P184	Handling charge, bulk dry (US$ per ton)	Average dry bulk handling charge per tonne (ship to gate or rail), expressed in US$	Operator	Derived	[q184] / exchange
	q185	Handling charge, bulk liquid (LCU per ton)	Average bulk liquid handling charge per tonne (ship to gate or rail), expressed in LCU	Operator	Raw	
	P185	Handling charge, bulk liquid (US$ per ton)	Average bulk liquid handling charge per tonne (ship to gate or rail), expressed in US$	Operator	Derived	[q185] / exchange
	q182	Handling charge, cargo container (LCU per TEU)	Average cargo container handling charge per TEU (ship to gate or rail), expressed in LCU	Operator	Raw	
	P182	Handling charge, cargo container (US$ per TEU)	Average cargo container handling charge per TEU (ship to gate or rail), expressed in US$	Operator	Derived	[q182] / exchange
	q183	Handling charge, general cargo (LCU per ton)	Average general cargo handling charge per tonne (ship to gate or rail), expressed in LCU	Operator	Raw	
	P183	Handling charge, general cargo (US$ per ton)	Average general cargo handling charge per tonne (ship to gate or rail), expressed in US$	Operator	Derived	[q183] / exchange
Technical	P165	Berth length, bulk dry (meters)	Total length of dedicated bulk dry berths (meters)	Operator	Raw	
	P161	Berth length, container (meters)	Total length of dedicated container berths (meters)	Operator	Raw	
	P163	Berth length, general cargo (meters)	Total length of dedicated general cargo berths (meters)	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P210-d	Berth productivity, bulk liquid (tonnes per hour)	National average of the volume of bulk liquid that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P210, across ports]
	P210	Berth productivity, bulk liquid (tonnes per hour)	Average volume of bulk liquid that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity
	P195-d	Berth productivity, container (tonnes per hour)	National average of volume of containers that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P195, across ports]
	P195	Berth productivity, container (tonnes per hour)	Average volume of containers that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity
	P204-d	Berth productivity, conventional berth, bulk dry (tonnes per hour)	National average of the volume of bulk dry that is loaded or unloaded from a conventional berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P204, across ports]
	P204	Berth productivity, conventional berth, bulk dry (tonnes per hour)	Average volume of bulk dry that is loaded or unloaded from a conventional berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity
	P200-d	Berth productivity, general cargo (tonnes per hour)	National average of the volume of bulk dry that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P200, across ports]
	P200	Berth productivity, general cargo (tonnes per hour)	Average volume of bulk dry that is loaded or unloaded from a berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P205-d	Berth productivity, grain berth, bulk dry (tonnes per hour)	National average of the volume of bulk dry that is loaded or unloaded from a grain berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P205, across ports]
	P205	Berth productivity, grain berth, bulk dry (tonnes per hour)	Average volume of bulk dry that is loaded or unloaded from a grain berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity
	P206-d	Berth productivity, ore berth, bulk dry (tonnes per hour)	National average of the volume of bulk dry that is loaded or unloaded from an ore berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	National	Derived	average[P206, across ports]
	P206	Berth productivity, ore berth, bulk dry (tonnes per hour)	Average volume of bulk dry that is loaded or unloaded from an ore berth within the space of an hour. Since any berth may be equipped with more than one crane, berth productivity does not necessarily coincide with crane productivity	Operator	Derived	Productivity
	P166	Berth water depth, bulk dry (meters)	Water depth of dry bulk cargo berths (meters)	Operator	Raw	
	P162	Berth water depth, container (meters)	Water depth of dedicated container berths (meters)	Operator	Raw	
	P164	Berth water depth, general cargo - lowest (meters)	Lowest water depth of general cargo berths (meters)	Operator	Raw	
	P160	Berths (number)	The dock, quay, or pier where a cruise ship ties up to the shore; the bed or beds in the passenger cabins on the ship.	Operator	Raw	
	P293	Container handling system (1= RTGs; 2= SC; 3=RS; 4= Other)	Types of systems used for handling the loading and unloading of containers. The main alternatives include: Rubber Tired Gantry (RTG), a rubber wheel mounted crane system used for yard-based container handling; Rail Mounted Gantry (RMG), a rubber wheel mounted crane system used for yard-based container handling; Straddle Carrier (SC), a mobile container handling system used mainly in container yards; and Reach Stacker (RS), a mobile container handling system used in container yards and elsewhere.	Operator	Raw	
	P170	Crane capacity, gantry container, maximum lifting capacity (tones)	Maximum lifting capacity (tones) of gantry cranes	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P173	Crane capacity, mobile harbor, maximum lifting capacity (tons)	Maximum lifting capacity (tones) of mobile harbor cranes	Operator	Raw	
	P207-d	Crane productivity, bulk dry (tonnes per hour)	National average of number of tonnes that is loaded or unloaded by a crane within the space of an hour	National	Derived	average[P207, across ports]
	P207	Crane productivity, bulk dry (tonnes per hour)	Average number of tonnes that is loaded or unloaded by a crane within the space of an hour	Operator	Derived	Productivity
	P196-d	Crane productivity, container (containers per hour)	National average of number of containers that is loaded or unloaded by a crane within the space of an hour	National	Derived	average[P196, across ports]
	P196	Crane productivity, container (containers per hour)	Average number of containers that is loaded or unloaded by a crane within the space of an hour	Operator	Derived	Productivity
	P201-d	Crane productivity, general cargo (tonnes per hour)	National average of number of tonnes of general cargo that is loaded or unloaded by a crane within the space of an hour	National	Derived	average[P201, across ports]
	P201	Crane productivity, general cargo (tonnes per hour)	Average number of tonnes of general cargo that is loaded or unloaded by a crane within the space of an hour	Operator	Derived	Productivity
	P169	Cranes, gantry container (number)	Key piece of equipment needed for the loading and unloading of ships. Ideally, ports should be adequately equipped with cranes, but where this is not the case it is sometimes possible to load and unload using ship-mounted cranes; although this is less efficient. There are two types of cranes. Gantry cranes are fixed on a frame or structure spanning an intervening space typically designed to traverse fixed structures such as cargo or container storage areas or quays, and which is used to hoist cargo or containers in and out of vessels and place them on another vessel, truck, barge or train. Mobile cranes are general-purpose equipment capable of moving on their own wheels from one part of the port to another depending on where they are needed.	Operator	Raw	
	P174	Cranes, loader/unloader systems - bulk dry (number)	Key piece of equipment needed for the loading and unloading of ships. Ideally, ports should be adequately equipped with cranes, but where this is not the case it is sometimes possible to load and unload using ship-mounted cranes; although this is less efficient. There are two types of cranes. Gantry cranes are fixed on a frame or structure spanning an intervening space typically designed to traverse fixed structures such as cargo or container storage areas or quays, and which is used to hoist cargo or containers in and out of vessels and place them on another vessel, truck, barge or train. Mobile cranes are general purpose equipment capable of moving on its own wheels from one part of the port to another depending on where it is needed.	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P172	Cranes, mobile harbor (number)	Key piece of equipment needed for the loading and unloading of ships. Ideally, ports should be adequately equipped with cranes, but where this is not the case it is sometimes possible to load and unload using ship-mounted cranes; although this is less efficient. There are two types of cranes. Gantry cranes are fixed on a frame or structure spanning an intervening space typically designed to traverse fixed structures such as cargo or container storage areas or quays, and which is used to hoist cargo or containers in and out of vessels and place them on another vessel, truck, barge or train. Mobile cranes are general purpose equipment capable of moving on its own wheels from one part of the port to another depending on where it is needed.	Operator	Raw	
	P294	Cranes, specialized dry bulk (number)	Number of specialized dry bulk cranes (loaders/unloaders)	Operator	Raw	
	P135	Draft on arrival, cargo vessel - bulk dry (meters)	Number of meters on arrival from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with bulk dry	Operator	Raw	
	P139	Draft on arrival, cargo vessel - bulk liquid (meters)	Number of meters on arrival from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with bulk liquid	Operator	Raw	
	P127	Draft on arrival, cargo vessel - container (meters)	Number of meters on arrival from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with containers	Operator	Raw	
	P131	Draft on arrival, cargo vessel - general cargo (meters)	Number of meters on arrival from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with general cargo	Operator	Raw	
	P136	Draft on departure, cargo vessel - bulk dry (meters)	Number of meters on departure from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with bulk dry	Operator	Raw	
	P140	Draft on departure, cargo vessel - bulk liquid (meters)	Number of meters on departure from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with bulk liquid	Operator	Raw	
	P128	Draft on departure, cargo vessel - container (meters)	Number of meters on departure from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with containers	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P132	Draft on departure, cargo vessel - general cargo (meters)	Number of meters on departure from the waterline to the lowest point of sheep's keel (the depth of water a ship draws) for a cargo vessels with general cargo	Operator	Raw	
	P192	Dwell time, container (days)	Average number of days a container remains on the terminal before being picked up by consignee or loaded to a vessel including time taken for necessary clearances	Operator	Raw	
	P192-d	Dwell time, container (days)	Number of average of number of days a container remains on the terminal before being picked up by consignee or loaded to a vessel including time taken for necessary clearances	National	Derived	average[P192, across ports]
	P295	Employees, public at port authority (% of total employees)	Percentage of employees working with the port authority that are public	Operator	Derived	[P288 x 100] / [P289]
	P288	Employees, public at port authority (number)	Number of public employees working with the port authority	Operator	Raw	
	P289	Employees, total working in the port (public and private, number)	Number of employees working in the port authority	Operator	Raw	
	P167	Facilities water depth, bulk liquid (meters)	Water depth of liquid bulk facilities (meters)	Operator	Raw	
	P114	Handled containers, cargo (TEU per year)	Annual number of TEU handled in cargo containers	Operator	Raw	
	P134	Length of vessels, cargo vessel - bulk dry (meters)	Average length of vessels (meters), bulk dry	Operator	Raw	
	P138	Length of vessels, cargo vessel - bulk liquid (meters)	Average length of vessels (meters), bulk liquid	Operator	Raw	
	P126	Length of vessels, cargo vessel container (meters)	Average length of vessels (meters), container	Operator	Raw	
	P130	Length of vessels, general cargo (meters)	Average length of vessels (meters), general cargo	Operator	Raw	
	P175	Loading rate, bulk dry (tonnes per hour)	Number of tonnes of bulk dry loaded per hour	Operator	Raw	
	P175-d	Loading rate, bulk dry (tonnes per hour)	Number of tonnes of bulk liquid loaded per hour	National	Derived	average[P175, across ports]
	P213	Port capacity, bulk dry (tones per year)	Maximum throughput of bulk dry that the port was designed to accommodate within its present facility	Operator	Raw	
	P295-d	Port capacity, bulk dry (tones per year)	National average of the maximum throughput of bulk dry that the port was designed to accommodate within its present facilities	National	Derived	summation[P179, across ports]
	P179	Port capacity, bulk liquid (tones per year)	Maximum throughput of bulk liquid that the port was designed to accommodate within its present facility	Operator	Raw	
	P179-d	Port capacity, bulk liquid (tones per year)	National average of the maximum throughput of bulk liquid that the port was designed to accommodate within its present facility	National	Derived	summation[P179, across ports]

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P177	Port capacity, container (TEU per year)	Maximum TEU port capacity for containers	Operator	Raw	
	P177-d	Port capacity, container (TEU per year)	National average of the maximum TEU port capacity for containers	National	Derived	summation[P177, across ports]
	P178	Port capacity, general cargo (tones per year)	Maximum tonne port capacity for general cargo	Operator	Raw	
	P178-d	Port capacity, general cargo (tones per year)	National average of the maximum tonne port capacity for general cargo	National	Derived	summation[P177, across ports]
	P159	Port characterization, adequate road access present (0=no, 1=yes)	Whether or not there is adequate road access to the port (i.e nature of the road infrastructure leading to the landside entrance of the port, outside of the ports jurisdiction. If road infrastructure is inadequate congestion will be caused around the port entrance, leading to major delays in accessing the facility)	Operator	Raw	
	P142	Port characterization, cargo transshipment hub potential (0=no, 1=yes)	Whether or not the port has significant potential to exploit as a cargo transshipment hub	Operator	Raw	
	P146	Port characterization, entrance channel depth (meters)	Total depth in meters of main entrance channel through which vessels access port facilities	Operator	Raw	
	P147	Port characterization, entrance channel length (meters)	Total length in meters of main entrance channel through which vessels access port facilities	Operator	Raw	
	P141	Port characterization, market extends beyond country's borders (0=no, 1=yes)	Whether or not, in geographical terms, the port's market reach extend beyond its country's borders	Operator	Raw	
	P153	Port characterization, no impediments for deepening the port (0=impediments; 1=no impediments)	Whether or not there are major impediments exist for deepening the port. Depth (also known as draft) is usually the binding constraint in terms of the size of ships that a port can accommodate, hence the importance of knowing whether depth could be increased to allow for larger vessels in the future.	Operator	Raw	
	P145	Port characterization, no impediments for port expansion (0=impediments; 1=no impediments)	Whether or not there are major impediments exist for port expansion	Operator	Raw	
	P225	Port characterization, terminalization - bulk liquid (0=no, 1=yes)	Whether or not there is terminalization of bulk liquid. Terminal is a specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations	Operator	Raw	
	P226	Port characterization, terminalization - container (0=no, 1=yes)	Whether or not there is terminalization of containers. Terminal is a specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P224	Port characterization, terminalization - dry bulk (0=no, 1=yes)	Whether or not there is terminalization of dry bulk. Terminal is a specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations	Operator	Raw	
	P233	Port characterization, terminalization (0=no, 1=yes)	Whether or not there is terminalization. Terminal is a specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations	Operator	Raw	
	P227	Port characterization, terminalization -general cargo (0=no, 1=yes)	Whether or not there is terminalization of general cargo. Terminal is a specific operating area encompassing waterside quays for the loading and discharge of vessels with an adjacent yard area for cargo storage and ancillary operations	Operator	Raw	
	P148	Port characterization, turning basin diameter (meters)	Diameter in meters of the turning basin which vessels use to maneuver within port facilities	Operator	Raw	
	P155	Port characterization, vessel entrance restrictions - maximum draft length limit (meters)	Maximum draft length limit for vessel to enter port facilities. Such restrictions are sometimes necessary for security or technical reasons, but significantly reduce the potential throughput of the port.	Operator	Raw	
	P156	Port characterization, vessel entrance restrictions - maximum LOA limit (meters)	Maximum LOA limit for vessel to enter port facilities. Such restrictions are sometimes necessary for security or technical reasons, but significantly reduce the potential throughput of the port.	Operator	Raw	
	P154	Port characterization, vessel entrance restrictions (0=restrictions; 1=no restrictions)	Whether or not there are restrictions for vessel to enter port facilities. Such restrictions are sometimes necessary for security or technical reasons, but significantly reduce the potential throughput of the port.	Operator	Raw	
	P151	Port characterization, vessel maximum size allowed in port - beam (meters)	Vessel maximum size allowed in port expressed as beam (meters)	Operator	Raw	
	P152	Port characterization, vessel maximum size allowed in port - deadweight tonnage (tons)	Vessel maximum size allowed in port expressed as deadweight tonnage	Operator	Raw	
	P150	Port characterization, vessel maximum size allowed in port - draught (meters)	Vessel maximum size allowed in port expressed as draught (meters)	Operator	Raw	
	P149	Port characterization, vessel maximum size allowed in port - LOA (meters)	Vessel maximum size allowed in port expressed as LAO (meters)	Operator	Raw	
	P157	Port characterization, vessel traffic management system - VTS is present (0=no, 1=yes)	Comprises equipment, personnel, and regulations aimed at ensuring the safe movement of vessels in and around the port. Key components of equipment include radars, tracking software, and radio communications.	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P158	Port characterization, working rail access is present (0=no, 1=yes)	Whether or not there is working access rail to port (i.e refers to the nature of the rail infrastructure leading to the landside entrance of the port. If rail infrastructure is inadequate rail cargo will accumulate within the port leading to delays in onward transportation)	Operator	Raw	
	P199-d	Pre-berth waiting time, general cargo (hours)	National average of time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result.	National	Derived	average[P199, across ports]
	P199	Pre-berth waiting time, general cargo (hours)	Time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result	Operator	Raw	
	P203-d	Pre-berth waiting time, bulk dry (hours)	National average of time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result.	National	Derived	average[P203, across ports]
	P203	Pre-berth waiting time, bulk dry (hours)	Time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result	Operator	Raw	
	P209-d	Pre-berth waiting time, bulk liquid (hours)	National average of time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result.	National	Derived	average[P209, across ports]
	P209	Pre-berth waiting time, bulk liquid (hours)	Time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result	Operator	Raw	
	P194-d	Pre-berth waiting time, container (hours)	National average of time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result.	National	Derived	average[P184, across ports]

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P194	Pre-berth waiting time, container (hours)	Time in hours that vessels may need to spend queuing outside the port before they are able to enter the facility and dock at the berth. If port facilities are congested or operating inefficiently considerable pre-berth waiting times may result	Operator	Raw	
	P168	Satellite inland cargo depots (0=absent, 1=present)	Whether or not port infrastructure include satellite Inland Cargo Depots under port management	Operator	Raw	
	P193-d	Turnaround time, truck processing time for receipt and delivery of cargo (hours)	Turnaround time of a truck within the port, from the time that it enters the port facility to deposit or collect cargo, to the time that it leaves the port facility. Gives an indication of the typical delays associated with receiving and dispatching cargo on the landside of the port. A delay of up to an hour would represent a good performance, but in practice delays can be up to ten times as long.	National	Derived	average[P193, across ports]
	P193	Turnaround time, truck processing time for receipt and delivery of cargo (hours)	Turnaround time of a truck within the port, from the time that it enters the port facility to deposit or collect cargo, to the time that it leaves the port facility. Gives an indication of the typical delays associated with receiving and dispatching cargo on the landside of the port. A delay of up to an hour would represent a good performance, but in practice delays can be up to ten times as long.	Operator	Raw	
	P202-d	Turnaround time, vessel stay - bulk dry (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	National	Derived	average[P202, across ports]
	P202	Turnaround time, vessel stay - bulk dry (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	Operator	Raw	
	P208-d	Turnaround time, vessel stay - bulk liquid (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	National	Derived	average[P208, across ports]
	P208	Turnaround time, vessel stay - bulk liquid (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Technical	P197-d	Turnaround time, vessel stay - container (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	National	Derived	average[P197, across ports]
	P197	Turnaround time, vessel stay - container (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	Operator	Raw	
	P198-d	Turnaround time, vessel stay - general cargo (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	National	Derived	average[P198, across ports]
	P198	Turnaround time, vessel stay - general cargo (hours)	Turnaround time in hours of a vessel within the port, from the time that it docks at the berth to the time that it is able to leave the berth. Gives an indication of the typical delays associated with unloading and loading the vessel.	Operator	Raw	
	P176-d	Unloading rate, bulk dry (tonnes per hour)	National average of number of bulk dry tonnes unloaded tonnes per hour	National	Derived	average[P176, across ports]
	P176	Unloading rate, bulk dry (tonnes per hour)	Number of bulk dry tonnes unloaded tonnes per hour	Operator	Raw	
Usage	P133-d	Calls, cargo vessel - bulk dry (number per year)	National average of the number of cargo vessel calls for bulk dry	National	Derived	summation[P133, across ports]
	P133	Calls, cargo vessel - bulk dry (number per year)	Number of cargo vessel calls for bulk dry	Operator	Raw	
	P137-d	Calls, cargo vessel - bulk liquid (number per year)	National average of the number of cargo vessel calls for bulk liquid	National	Derived	summation[P137, across ports]
	P137	Calls, cargo vessel - bulk liquid (number per year)	Number of cargo vessel calls for bulk liquid	Operator	Raw	
	P125-d	Calls, cargo vessel - container (number per year)	National average of the number of cargo vessel calls for containers	National	Derived	summation[P125, across ports]
	P125	Calls, cargo vessel - container (number per year)	Number of cargo vessel calls for containers	Operator	Raw	
	P129-d	Calls, cargo vessel - general cargo (number per year)	National average of the number of cargo vessel calls for general cargo	National	Derived	summation[P129, across ports]
	P129	Calls, cargo vessel - general cargo (number per year)	Number of cargo vessel calls for general cargo	Operator	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Usage	P123-d	Calls, cargo vessel (number per year)	National average of the number of cargo vessel calls	National	Derived	summation[P123, across ports]
	P123	Calls, cargo vessel (number per year)	Number of cargo vessel calls	Opera-tor	Raw	
	P119-d	Traffic, exports - bulk (tones per year)	Summation of annual number of bulk tonnes exported using country's ports	National	Derived	summation[P119, across ports]
	P119	Traffic, exports - bulk (tones per year)	Annual number of bulk tonnes exported	Opera-tor	Raw	
	P120-d	Traffic, exports - bulk dry (tones per year)	Summation of annual number of bulk dry tonnes exported using country's ports	National	Derived	summation[P120, across ports]
	P120	Traffic, exports - bulk dry (tones per year)	Annual number of bulk dry tonnes exported	Opera-tor	Raw	
	P122-d	Traffic, exports - bulk liquid (tones per year)	Summation of annual number of bulk liquid tonnes exported using country's ports	National	Derived	summation[P122, across ports]
	P122	Traffic, exports - bulk liquid (tones per year)	Annual number of bulk liquid tonnes exported	Opera-tor	Raw	
	P112-d	Traffic, exports - cargo container (TEU per year)	Summation of annual number of TEU con-tainers exported using country's ports	National	Derived	summation[P112, across ports]
	P112	Traffic, exports - cargo container (TEU per year)	Annual number of TEU containers exported	Opera-tor	Raw	
	P113-d	Traffic, exports - container - cargo empty (TEU per year)	Summation of annual number of TEU con-tainers exported using country's ports, cargo empty	National	Derived	summation[P113, across ports]
	P113	Traffic, exports - container - cargo empty (TEU per year)	Annual number of TEU containers exported, cargo empty	Opera-tor	Raw	
	P116-d	Traffic, exports - general cargo (tones per year)	Summation of annual number of general cargo tonnes exported (non-containerized tones) us-ing country's ports	National	Derived	summation[P116, across ports]
	P116	Traffic, exports - general cargo (tones per year)	Annual number of general cargo tonnes ex-ported (non-containerized tones)	Opera-tor	Raw	
	P117-d	Traffic, imports - bulk (tones per year)	Summation of annual number of bulk tonnes imported using country's ports	National	Derived	summation[P117, across ports]
	P117	Traffic, imports - bulk (tones per year)	Annual number of bulk tonnes imported	Opera-tor	Raw	
	P118-d	Traffic, imports - bulk dry (tones per year)	Summation of annual number of bulk dry tonnes imported using country's ports	National	Derived	summation[P118, across ports]
	P118	Traffic, imports - bulk dry (tones per year)	Annual number of bulk dry tonnes imported	Opera-tor	Raw	

Policy Category	SERIES CODE	Indicator_Name	Definition	Level	Raw/ Derived	Formula
Usage	P121-d	Traffic, imports - bulk liquid (tones per year)	Summation of annual number of bulk liquid tonnes imported using country's ports	National	Derived	summation[P121, across ports]
	P121	Traffic, imports - bulk liquid (tones per year)	Annual number of bulk liquid tonnes imported	Operator	Raw	
	P111-d	Traffic, imports - cargo container (TEU per year)	Summation of annual number of TEU containers imported using country's ports	National	Derived	summation[P111, across ports]
	P111	Traffic, imports - cargo container (TEU per year)	Annual number of TEU containers imported	Operator	Raw	
	P115-d	Traffic, imports - general cargo (tones per year)	Summation of annual number of general cargo tonnes imported (non-containerized tones) using country's ports	National	Derived	summation[P115, across ports]
	P115	Traffic, imports - general cargo (tones per year)	Annual number of general cargo tonnes imported (non-containerized tones)	Operator	Raw	
	P291	Traffic, transshipment volume - inbound container (TEU)	TEU Transshipment Inbound: container discharged from one vessel to eventually connect with another vessel	Operator	Raw	
	P292	Traffic, transshipment volume - outbound container (TEU)	TEU Transshipment Outbound: container loaded to vessel for on carriage to destination after being discharged from a previous vessel	Operator	Raw	

Annex A11.2 Technical terms

Technical Term		Abbreviation	Explanation
Traffic Terms	Twenty Foot Equivalent Unit (20ft)	TEU	By applying the TEU measure to different size containers it is possible to calculate container volume on an overall basis
	TEU Transit Import		Container bound for neighboring landlocked country
	TEU Transit Export		Container originating from neighboring and locked country
	TEU Transshipment Inbound		Container discharged from one vessel to another for onward transportation
	TEU Transshipment Outbound		Container loaded to vessel for carriage to destination after being discharged from a previous vessel
	Forty Foot Equivalent Unit	FEU	By applying the FEU measure to different size containers it is possible to calculate container volume on an overall basis
	Full Container Load	FCL	A fully laden container
	Less than Container Load	LCL	A partially laden container
	Breakbulk		Assorted, noncontainerized cargo
	Cabotage		Water transportation of cargo between ports of one nation that is only allowed to be carried by vessels flying the flag of that nation. Typically, this involves coastal trade
	Dry Bulk		Cargoes such as coal, iron ore, fertilizer, grain and cement—dry cargoes moved in bulk
	Liquid Bulk		Liquid cargoes moved in bulk such as crude oil and liquid gases
	Roll-on Roll-off	Ro-Ro	Typically Ro-Ro cargo wheeled onto and off vessels
	Lighter Aboard Ship	LASH	Lighter Aboard Ship—a cargo handling system whereby lighters are employed as cargo carrying units and floated into and from the mother vessel when in port
Hazardous Cargo	International Maritime Dangerous Goods Code	IMDG	The Code designates specific categories of dangerous goods
Cargo Documentation	Cargo Manifest		A manifest that lists all cargo carried on a specific voyage
	Equipment Interchange Report	EIR	A document transferring a container from one carrier to another, or to/from a terminal
	EDIFACT		International data interchange standards sponsored by the United Nations
	Electronic Data Interchange	EDI	The electronic transfer of data
Pricing Port Charge Terms	Port Dues		Charges by a Port Authority to a vessel for each harbor entry, usually on a per gross tonnage basis, to cover the costs of basic port infrastructure and marine facilities such as buoys, beacons and vessel traffic management systems
	Berth Fees		Charges for the use of a berth. Typically assessed based on the duration of a vessel's stay and length overall (LOA)
	Demurrage		A penalty charge against shippers or consignees for delaying the carrier's equipment beyond the allowed free time
	Terminal Handling Charges	THCs	Terminal Handling Charges are the charges applied by terminal operators for cargo handling services

Technical Term		Abbreviation	Explanation
Navigational Terms	Pilotage		The provision of safe navigation services and systems
	Towage		The provision of tug services for safe navigation/berthing
	Line Handling		Services provided in conjunction with the safe mooring of vessels
	Draught		The depth of available water
	LOA		The length overall of a vessel
	Beam		The width of a vessel
	Gross Tonnage	GT	Gross Tonnage (GT) refers to the volume of all ship's enclosed spaces (from keel to funnel)
	Deadweight Tonnes	DWT	Deadweight (often abbreviated as DWT for deadweight tonnes) is the displacement at any loaded condition minus the lightship weight.
Cargo Handling Terms/ Facilities	Stevedoring		The loading and unloading of cargo by dockers at either a hired or dedicated quay
	Terminal Operation		A site dedicated to a specific type or types of operation—for e.g. container handling—and nominated as a specific area where this takes place
	Container Yard	CY	The area of a container terminal employed for container storage and other purposes
	Container Freight Station	CFS	A facility purpose-built to undertake container loading, unloading and other operations
	Container Stripping		The stripping of goods from a container
	Container Stuffing		The stuffing of a container with goods for onward carriage
	Inland Container Depot	ICD	An inland terminal used as a strategic point at which to generate and distribute cargo
	Free Trade Zone	FTZ	An area which operates with either total or partial exemption from Customs duties
	Bonded Warehouse		Authorized by Customs for the storage of goods
Equipment Terms	Ship-to-Shore Gantry	STS	A specific crane type that is employed to load and discharge vessels—typically container vessels
	Rubber Tired Gantries	RTGs	A crane type utilizing rubber wheels and employed in landside container handling operations
	Rail Mounted Gantries	RMGs	A crane type that operates on rails in landside container handling operations
	Fork Lift Truck	FLT	A cargo handling machine employed as an all round workhorse and in some cases for specific roles (e.g. empty container handling).
	Chassis		A specialized trailer device used for the carriage of containers
	Fixed Spreader Frame		A crane-based lifting frame built to a specific dimension—e.g. 20ft or 40ft—designed to handle a specific size of container
	Telescopic Spreader		A crane-based lifting frame with the ability to telescope between a given range and therefore handle different sizes of container
	Container Seal		A specialist device for the locking of containers

Annex A11.3 Target institutions

Major ports and institutions as of March 2011

Country	Line Ministry	Port	Port Authority
Algeria	Ministry of Transport	Algiers	EPAL/DP World
		Arzew	EPAL
		Oran	Entreprise Portuaire d'Oran
		Skikda	Port of Skikda Corporation
Angola	Ministry of Transport and Communications	Luanda	Empresa Portuaria de Luanda
		Lobito	
		Namibe	
Benin	Ministry of Works, Transport and Communications	Cotonou	Autonomous Port of Cotonou
Cameroon	Ministry of Transport	Douala	National Port Authority of Douala
		Kribi	National Port Authority of Douala
		Limbe	National Port Authority
Cape Verde	Ministry of Transport	Mindelo	ENAPOR
		Praia	ENAPOR
Congo, Dem Rep	Ministry of Transport	Boma	Office National des Transports (ONATRA)
		Matadi	Office National des Transports (ONATRA)
Congo Republic	Ministry of Infrastructure, Equipment and Surface Transport	Pointe Noire	Port Authority of Pointe Noire
Cote d'Ivoire	Ministry of Transport	Abidjan	Port Authority of Abidjan
Djibouti	Ministry of Environment, Natural Resources and Transport	Djibouti	None
Egypt	Ministry of Transportation	Alexandria	Alexandria Port Authority
		Damietta	Damietta Port Authority
		East Port Said	East Port Said Port Authority
		Safaga Port	Safaga Port Authority
		Sokhna Port	Sokhna Port Authority
		Port Said	Port Said Authority
		El-Dekheila	Alexandria Port Authority
		Suez	Red Sea Ports Authority
		Adabiya	Red Sea Ports Authority
		Nuweibah	Red Sea Ports Authority
		Hurghada	Red Sea Ports Authority
		Sharm El-Sheikh	Red Sea Ports Authority
		El Arish	Port Said Authority
Ghana		Takoradi	Ghana Ports & Harbor Authority
		Tema	Ghana Ports & Harbor Authority
Kenya		Mombasa	Kenya Ports Authority
		Lamu Port	Kenya Ports Authority

Country	Line Ministry	Port	Port Authority
Libya	Secretariat of Transportation	Benghazi	Port Authority
		Tripoli	Port Authority
Madagascar	Ministere des Transports	Ehoala Port	Port d'Ehoala SA
		Toamasina	Service du Port a Gestion de Toamasina (SPAT)
		Tolagnaro	Tolagnaro Port Authority
		Mahajanga	Mahajanga Port Authority
Mauritius	Ministry of Transport	Port Louis	Mauritius Ports Authority (MPA)
Morocco	Ministry of Transportation	Casablanca	SODEP
		Tangier Med	SODEP
Mozambique	Ministry of Communications and Transport	Beria	Cornelder Mozambique
		Maputo	Maputo Port Development Company
		Nacala	Nacala Port Authority
Namibia	Ministry of Works, Transport and Communications	Luderitz	Namibian Ports Authority (NAMPORT)
		Walvis Bay	Namibian Ports Authority (NAMPORT)
Nigeria	Ministry of Transport	Apapa-Lagos	Nigeria Ports Authority
		Tin Can Island	Nigeria Ports Authority
		Leki Port	Nigeria Ports Authority
		Onne	Nigeria Ports Authority
		Port Harcourt	Nigeria Ports Authority
Sao Tome & Principe	Ministerio do Plano e Desenvolvimento	Sao Tome	Empresa Nacional de Porto (ENAPORT)
Senegal	Ministere de l'Economie Maritime	Dakar	Societe Nationale du Port Autonomie de Dakar
Seychelles	Ministry of Environment, Natural Resources and Transport	Port Victoria	Seychelles Port Authority
Sierra Leone	Ministry of Transport and Aviation	Freetown	Sierra Leone Port Authority
South Africa		Cape Town	National Ports Authority
		Durban	National Ports Authority
		Coega	National Ports Authority
		East London	National Ports Authority
		Port Elizabeth	National Ports Authority
		Richards Bay	National Ports Authority
		Saldanha Bay	National Ports Authority
Sudan	Ministry of Transport	Port Sudan	Sea Ports Corporation of Sudan
		Suakin	Sea Ports Corporation of Sudan
Tanzania	Ministry of Transport	Dar es Salaam	Tanzania Ports Authority
		Matwara	Tanzania Ports Authority
Togo	Ministere des Transports	Lome	Port Autonomie de Lome
Tunisia	Ministry of Transport	La Goulette	OMMP
		Rades	OMMP

Annex A11.4 Data collection templates

Ports template A. Institutional variables—national level

Country:
Sector: Ports
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New	History
			2011	2010
Institutional	P212	Corporatization of service provision (0=no, 1=yes)		
	P296	Sector reform (year)		
	P297	Legislation (year)		
	P298	Decentralization (0=no, 1=yes)		
	P299	Private sector participation (0=not allowed; 1= allowed with restrictions ; 2=allowed without restrictions)		
	P302	Foreign ownership restrictions (0=yes, 1=no)		
	P303	Concession, port terminal (0=no; 1=some terminals; 2= all terminals)		
	P306	Regulatory agency independent (0=no, 1=yes)		
	P307	Regulatory agency, year of establishment		
	P308	Tariff, criteria for adjustment (0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other)		
	P312	Handling charges, criteria for adjustement (0=Freely based on market conditions,1=Fixed periodic review within 1 year, 2= Fixed periodic review between 1 - 3 years, 3= Fixed periodic review of more than 3 years , 4=At petition to the RB, 5=Annually based on predefined indexation (i.e. inflation), 6=Other)		

Ports template B. Data variables—ports level

Country:
Sector: Ports
Utility Name:

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Institutional	P180	Port organization, expansion plans in place (0=no, 1=yes)					
	P216	Port organization, undergone reform or restructuring (0=no, 1=yes)					
	P217	Port organization, organizational model (1= Landlord Port ; 2=Service Port ; 3= Tool Port ; 4=Fully privatized ; 5=Other)					
	P219	Port organization, authority corporatized (0=no, 1=yes)					
	P220	Port organization, service provision descentralized (0=no, 1=yes)					
	P222	Port organization, existence of master plan (0=no, 1=yes)					
	P223	Port organization, year of updating of master plan (year)					
	P231	Port organization, ownership of basic infrastructure (0=public sector; 1=private sector, full or partially)					
	P232	Port organization, ownership of major superstructure (0=public sector; 1=private sector, full or partially)					
	P241	Competition, pilotage (0=no, 1=yes)					
	P242	Competition, towage (0=no, 1=yes)					
	P243	Competition, line handling (0=no, 1=yes)					
	P244	Competition, stevedoring (0=no, 1=yes)					
	P245	Competition, terminal operations (0=no, 1=yes)					
	P246	Competition, storage and warehousing (0=no, 1=yes)					
	P259	Private sector, Management contracts in infrastructure (0=no, 1=yes)					
	P260	Private sector, Management contracts in pilotage (0=no, 1=yes)					
	P261	Private sector, Management contracts in towage (0=no, 1=yes)					
	P262	Private sector, Management contracts in line handling (0=no, 1=yes)					
	P263	Private sector, Management contracts in stevedoring (0=no, 1=yes)					
	P264	Private sector, Management contracts in terminal operations (0=no, 1=yes)					
	P265	Private sector, Management contracts in storage and warehousing (0=no; 1= yes)					
	P266	Private sector, Management contracts in dredging (0=no, 1=yes)					
	P268	Private sector, Concessions in infrastructure (0=no, 1=yes)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Institutional	P269	Private sector, Concessions in pilotage (0=no, 1=yes)					
	P270	Private sector, Concessions in towage (0=no, 1=yes)					
	P271	Private sector, Concessions in line handling (0=no, 1=yes)					
	P272	Private sector, Concessions in stevedoring (0=no, 1=yes)					
	P273	Private sector, Concessions in terminal operations (0=no, 1=yes)					
	P274	Private sector, Concessions in storage and warehousing (0=no, 1=yes)					
	P275	Private sector, Concessions in dredging (0=no, 1=yes)					
	P277	Private sector, Lease contracts in infrastructure (0=no; 1= yes)					
	P278	Private sector, Lease contracts in pilotage (0=no, 1=yes)					
	P279	Private sector, Lease contracts in towage (0=no, 1=yes)					
	P280	Private sector, Lease contracts in line handling (0=no, 1=yes)					
	P281	Private sector, Lease contracts in stevedoring (0=no, 1=yes)					
	P282	Private sector, Lease contracts in terminal operations (0=no, 1=yes)					
	P283	Private sector, Lease contracts in storage and warehousing (0=no, 1=yes)					
	P284	Private sector, Lease contracts in dredging (0=no, 1=yes)					
	P286	Port organization, dockworkers unionized (0=no, 1= yes)					
	P287	Port organization, retrenchment programme (0=no, 1= yes)					
	P290	Port organization, port certified as ISPS compliant (0=no, 1= yes)					
	P325	Port authority involvement - front line operations (0=no, 1=yes)					
	P326	Port authority involvement - navigation/pilotage (0=no, 1=yes)					
	P327	Port authority involvement - towage (0=no, 1=yes)					
	P328	Port authority involvement - harbour maintenance (0=no, 1=yes)					
	P329	Port authority involvement - cargo handling (0=no, 1=yes)					
	P330	Port authority involvement - terminal operations (0=no, 1=yes)					
	P340	Management model, containers (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)					
	P341	Management model, service port - containers (0=no, 1=yes)					
	P342	Management model, tool port - containers (0=no, 1=yes)					
	P343	Management model, landlord port - containers (0=no, 1=yes)					
	P344	Management model, fully privatized - containers (0=no, 1=yes)					
	P345	Management model, general cargo (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)					
	P346	Management model, service port - general cargo (0=no, 1=yes)					
	P347	Management model, tool port - general cargo (0=no, 1=yes)					
	P348	Management model, landlord port - general cargo (0=no, 1=yes)					
	P349	Management model, fully privatized - general cargo (0=no, 1=yes)					
	P350	Management model, dry bulk (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Institutional	P351	Management model, service port - dry bulk (0=no, 1=yes)					
	P352	Management model, tool port - dry bulk (0=no, 1=yes)					
	P353	Management model, landlord port - dry bulk (0=no, 1=yes)					
	P354	Management model, fully privatized - dry bulk (0=no, 1=yes)					
	P355	Management model, bulk liquid (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)					
	P356	Management model, service port - bulk liquid (0=no, 1=yes)					
	P357	Management model, tool port - bulk liquid (0=no, 1=yes)					
	P358	Management model, landlord port - general cargo (0=no, 1=yes)					
	P359	Management model, fully privatized - general cargo (0=no, 1=yes)					
	P360	Management model, Ro-Ro (0=service port, 1=tool port, 2= landlord port, 3=fully privatized port)					
	P361	Management model, service port - Ro-Ro (0=no, 1=yes)					
	P362	Management model, tool port - Ro-Ro (0=no, 1=yes)					
	P363	Management model, landlord port - Ro-Ro (0=no, 1=yes)					
	P364	Management model, fully privatized - Ro-Ro (0=no, 1=yes)					
Pricing	P189	Free storage period, container cargo (0=no, 1=yes)					
	P190	Free storage period, general cargo (0=no, 1=yes)					
	P191	Free storage period, bulk (0=no, 1=yes)					
	q181	Call, cost per vessel (LCU)					
	q182	Handling charge, cargo container (LCU per TEU)					
	q183	Handling charge, general cargo (LCU per ton)					
	q184	Handling charge, bulk dry (LCU per ton)					
	q185	Handling charge, bulk liquid (LCU per ton)					
	q186	Excess storage charges, lowest level of sliding scale (LCU per TEU per day)					
	q187	Excess storage charges, general cargo (LCU per ton per day)					
	q188	Excess storage charges, bulk dry (LCU per ton per day)					
Technical	P114	Handled containers, cargo (TEU per year)					
	P126	Length of vessels, cargo vessel container (meters)					
	P127	Draft on arrival, cargo vessel - container (meters)					
	P128	Draft on departure, cargo vessel - container (meters)					
	P130	Length of vessels, general cargo (meters)					
	P131	Draft on arrival, cargo vessel - general cargo (meters)					
	P132	Draft on departure, cargo vessel - general cargo (meters)					
	P134	Length of vessels, cargo vessel - bulk dry (meters)					
	P135	Draft on arrival, cargo vessel - bulk dry (meters)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Technical	P136	Draft on departure, cargo vessel - bulk dry (meters)					
	P138	Length of vessels, cargo vessel - bulk liquid (meters)					
	P139	Draft on arrival, cargo vessel - bulk liquid (meters)					
	P140	Draft on departure, cargo vessel - bulk liquid (meters)					
	P141	Port characterization, market extends beyond country's borders (0=no, 1=yes)					
	P142	Port characterization, cargo transshipment hub potential (0=no, 1=yes)					
	P145	Port characterization, no impediments for port expansion (0=impediments; 1=no impediments)					
	P146	Port characterization, entrance channel depth (meters)					
	P147	Port characterization, entrance channel length (meters)					
	P148	Port characterization, turning basin diameter (meters)					
	P149	Port characterization, vessel maximum size allowed in port - LOA (meters)					
	P150	Port characterization, vessel maximum size allowed in port - draught (meters)					
	P151	Port characterization, vessel maximum size allowed in port - beam (meters)					
	P152	Port characterization, vessel maximum size allowed in port - deadweight tonnage (tons)					
	P153	Port characterization, no impediments for deepening the port (0=impediments; 1=no impediments)					
	P154	Port characterization, vessel entrance restrictions (0=restrictions; 1=no restrictions)					
	P155	Port characterization, vessel entrance restrictions - maximum draft length limit (meters)					
	P156	Port characterization, vessel entrance restrictions - maximum LOA limit (meters)					
	P157	Port characterization, vessel traffic management system - VTS is present (0=no, 1=yes)					
	P158	Port characterization, working rail access is present (0=no, 1=yes)					
	P159	Port characterization, adequate road access present (0=no, 1=yes)					
	P160	Berths (number)					
	P161	Berth length, container (meters)					
	P162	Berth water depth, container (meters)					
	P163	Berth length, general cargo (meters)					
	P164	Berth water depth, general cargo - lowest (meters)					
	P165	Berth length, bulk dry (meters)					
	P166	Berth water depth, bulk dry (meters)					
	P167	Facilities water depth, bulk liquid (meters)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Technical	P168	Satellite inland cargo depots (0=absent, 1=present)					
	P169	Cranes, gantry container (number)					
	P170	Crane capacity, gantry container, maximum lifting capacity (tones)					
	P172	Cranes, mobile harbor (number)					
	P173	Crane capacity, mobile harbor, maximum lifting capacity (tons)					
	P174	Cranes, loader/unloader systems - bulk dry (number)					
	P175	Loading rate, bulk dry (tonnes per hour)					
	P176	Unloading rate, bulk dry (tonnes per hour)					
	P177	Port capacity, container (TEU per year)					
	P178	Port capacity, general cargo (tones per year)					
	P179	Port capacity, bulk liquid (tones per year)					
	P192	Dwell time, container (days)					
	P193	Turnaround time, truck processing time for receipt and delivery of cargo (hours)					
	P194	Pre-berth waiting time, container (hours)					
	P197	Turnaround time, vessel stay - container (hours)					
	P198	Turnaround time, vessel stay - general cargo (hours)					
	P199	Pre-berth waiting time, general cargo (hours)					
	P202	Turnaround time, vessel stay - bulk dry (hours)					
	P203	Pre-berth waiting time, bulk dry (hours)					
	P208	Turnaround time, vessel stay - bulk liquid (hours)					
	P209	Pre-berth waiting time, bulk liquid (hours)					
	P213	Port capacity, bulk dry (tones per year)					
	P224	Port characterization, terminalization - dry bulk (0=no, 1=yes)					
	P225	Port characterization, terminalization - bulk liquid (0=no, 1=yes)					
	P226	Port characterization, terminalization - container (0=no, 1=yes)					
	P227	Port characterization, terminalization -general cargo (0=no, 1=yes)					
	P233	Port characterization, terminalization (0=no, 1=yes)					
	P288	Employees, public at port authority (number)					
	P289	Employees, total working in the port (public and private, number)					
	P293	Container handling system (1= RTGs; 2= SC; 3=RS; 4= Other)					
	P294	Cranes, specialized dry bulk (number)					
Usage	P111	Traffic, imports - cargo container (TEU per year)					
	P112	Traffic, exports - cargo container (TEU per year)					
	P113	Traffic, exports - container - cargo empty (TEU per year)					
	P115	Traffic, imports - general cargo (tones per year)					

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Usage	P116	Traffic, exports - general cargo (tones per year)					
	P117	Traffic, imports - bulk (tones per year)					
	P118	Traffic, imports - bulk dry (tones per year)					
	P119	Traffic, exports - bulk (tones per year)					
	P120	Traffic, exports - bulk dry (tones per year)					
	P121	Traffic, imports - bulk liquid (tones per year)					
	P122	Traffic, exports - bulk liquid (tones per year)					
	P123	Calls, cargo vessel (number per year)					
	P125	Calls, cargo vessel - container (number per year)					
	P129	Calls, cargo vessel - general cargo (number per year)					
	P133	Calls, cargo vessel - bulk dry (number per year)					
	P137	Calls, cargo vessel - bulk liquid (number per year)					
	P291	Traffic, transshipment volume - inbound container (TEU)					
	P292	Traffic, transshipment volume - outbound container (TEU)					

12. Air Transport

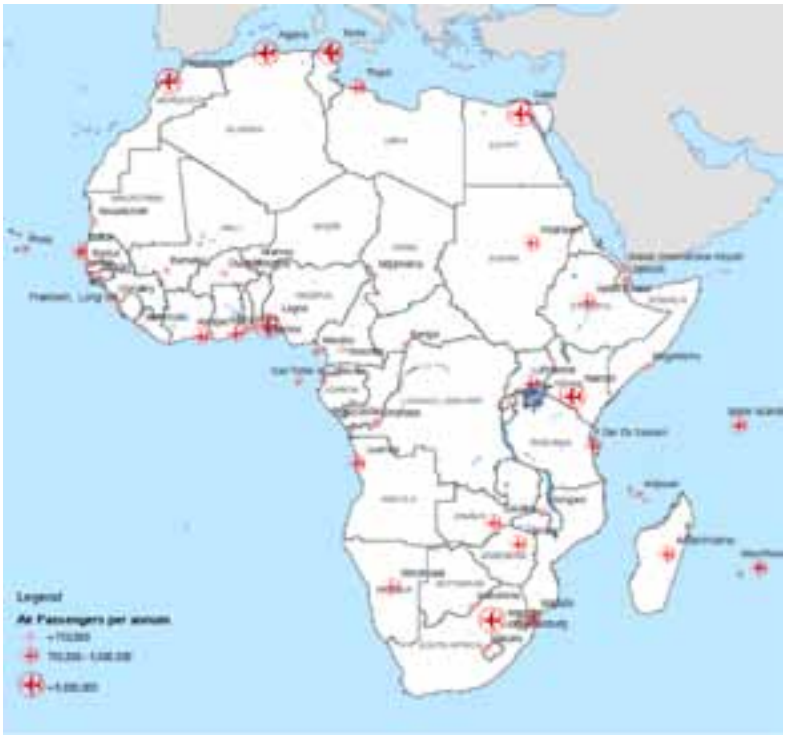
12.1 Motivation

While Africa's air traffic dipped in 2001, it proceeded to grow at a good rate in the period up to 2007. Patterns across the region, however, differed markedly. A relatively efficient hub-and-spoke system has evolved in eastern and southern Africa, anchored in Addis Ababa, Johannesburg, and Nairobi and the strong national carriers that Ethiopia, Kenya, and South Africa have developed. By contrast, air connectivity in West and Central Africa is cumbersome and even declining in some areas. The collapse of some of the major regional carriers in the early 2000s left a gap in the market, which is increasingly being filled by eastern and southern African airlines operating under the fifth freedom provisions of the Yamoussoukro Decision.

Africa has little need for new runways and terminals; its current infrastructure is perfectly adequate to serve connectivity needs. Traffic volumes are still relatively low compared to the capacity of runways. Most of the bottlenecks in air sector infrastructure for the foreseeable future can be resolved by improving flight scheduling to avoid the clustering of flights and in some cases building parallel taxiways so that runways can be more rapidly vacated. The only exception may be in one or two of the larger hub airports (such as Nairobi), where terminal congestion is becoming an issue. The real investment need for African airports is to modernize air traffic control and surveillance facilities, which are often entirely absent.

A poor safety record is the largest challenge facing the air transport industry in Africa today. In Sub-Saharan Africa 4.3 aircraft are lost per 1 million departures, compared with 0.7 elsewhere. The high accident rate has typically been attributed to an aging aircraft fleet. That said, there has been considerable fleet renewal in recent years, and this is no longer as much of an issue. Human error seems to be at fault in many recent accidents, so that the solution seems to lie in the better training of pilots and the tighter supervision of airlines by the civil aviation authorities. To account for the scarcity of human resources, there are now efforts to take a more regional approach to regulating aviation.

Figure 12.1 Map of Africa's top 50 international airports



Source: Africa Infrastructure Country Diagnostic 2009.

12.2 Tracking Performance

The above sector synopsis serves to highlight some of the key policy issues facing the air transport sector. In order to continue to track sector performance over time, various indicators are needed to shed light on each of a number of key policy themes. By way of overview, Figure 12.1 maps all the main airports across the African continent.

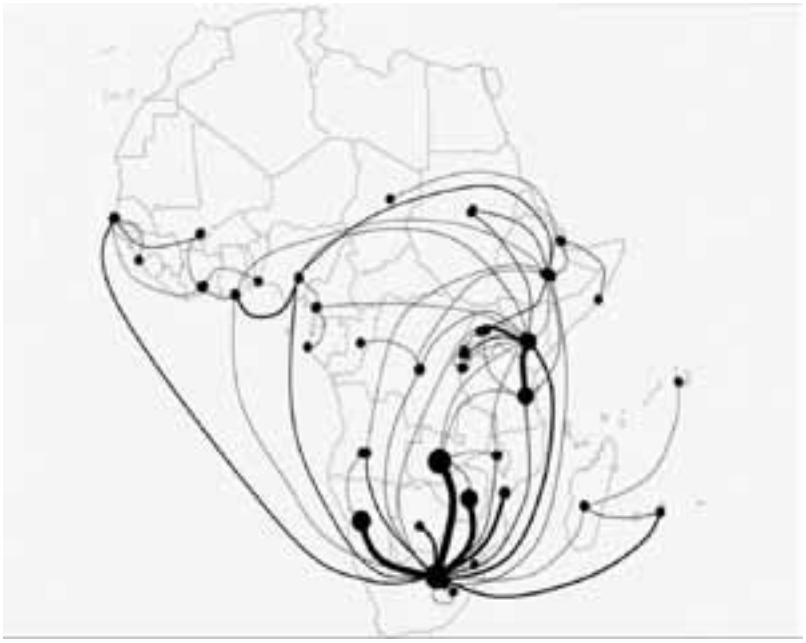
Access: Access to air transport services can be measured from a variety of angles, including the number of airlines serving the market, the number of connections to surrounding cities and countries, and the availability of terminal space.

- *Airlines*. The extent of service availability will reflect the number of airlines serving the market, and more importantly the extent of competition between them. Two relevant measures for gauging the competitiveness of the market are the market shares of each of the active airlines, and the Herfindahl Index—a measure of market concentration based on the sums of the squares of the market shares of all the market players.
- *Connectivity*. Even where many airlines are competing, it is relevant to ask how wide a range of routes is being served. Connectivity is measured in terms of the number of cities that can be reached from a given airport without changing carrier.
- *Terminals*. Landside infrastructure is an important determinant of access, in particular the number of terminals and their passenger handling capacity in relation to current usage levels.

Usage: Unfortunately, it is very difficult to obtain exact traffic figures for aviation services in Africa. There is, however, good information on the airline seats that are available along each route. Seats (or airline capacity) are therefore used as a proxy for traffic. After collecting information on the seats available on every scheduled service in Africa, it is possible to aggregate these data to estimate the market size by subregion, by country, by airport, by route, by type of service (domestic or international), by type or age of aircraft, by type of flight (1st–4th freedom versus 5th–7th freedom).

Using this kind of data, it is possible to get a good estimate of traffic patterns in Africa. For example, Figure 12.2 highlights the 60 most heavily served routes in Sub-Saharan Africa. It clearly illustrates the uneven development of the aviation sector across the eastern and southern part of the continent as compared with the central and western part of the continent.

Figure 12.2 Map of Africa's top 60 air transport routes by traffic



Source: Africa Infrastructure Country Diagnostic 2009.

Table 12.1 Connectivity matrix for ECCAS countries

		Destination						
		Angola	Cameroon	Central African Republic	Congo DRC	Equatorial Guinea	Gabon	São Tomé and Príncipe
Origin	Angola				1	4		1
	Cameroon			1	1	3	19	
	Central African Republic		1					
	Congo, Dem. Rep. of		1			3		
	Equatorial Guinea	2	3		2		2	
	Gabon		18			4		2
	São Tomé and Príncipe	1					2	

It is possible to look at connectivity patterns, that is, the number of flights per week connecting two countries within a particular regional grouping. For example, the connectivity matrix shown in Table 12.1 for the Economic Community of Central African States (ECCAS) countries illustrates how few air transport connections there are between countries in that region, as well as the absence of any clear regional air transport hub. The only route in the region that has a significant amount of movement is that connecting Cameroon to Gabon, with close to 20 flights per week.

Technical: These cover the nature of the available infrastructure and equipment, as well as the quality of the service provided.

- *Aircraft*. Based on the flight data, it is possible to identify the percentage of seats that are flown in aircraft of different sizes or vintages. The size composition provides an important clue as to the market dynamics and the patterns of route consolidation. The age composition indicates the extent to which aging equipment may represent a safety hazard.
- *Runways*. Another important technical issue is the runway situation. The number of runways can usually be found in a number of international publications. Data on runway quality are not generally available but can be qualitatively assessed using tools such as Google Earth.
- *Quality*. The most relevant aspects of quality for the air transport sector are flight safety and airport security. These can be gauged through a number of easily accessible indices published by various international organizations. Indicators include airlines' air traffic accident rates, outcome of the International Air Transport Association (IATA) Operational Safety Audit (IOSA), placement on the European Union (EU) blacklist, rating from the U.S. Federal Aviation Authority (FAA), and overall safety grade from the International Civil Aviation Organization (ICAO).

Pricing: Airports levy a number of different charges, including for passengers' terminal use and for the landing and parking of aircraft, intended to cover the cost of runway and gate facilities. There are also charges for overflying a country's airspace, which in theory pay for air traffic control services.

This kind of information can be used to benchmark prices of African airports against one another, as in the example in Table 12.2. The results show a wide range of charges levied by airports in Africa. Passenger charges and parking charges vary by a factor of more than three to one. The variation in landing charges is somewhat smaller, ranging from $300 to $500.

Financial: It is important to understand the revenue base of the major airports and the extent to which it is sufficient to fund any necessary investments in the sector. Airport revenues are often regarded as a good source of foreign currency by the fiscal authorities and may not necessarily revert to the air transport sector. In contrast to airports in Organisation for Economic Co-operation and Development (OECD) countries, which depend on secondary retail services for their income, African airports have very little revenue from retail and rely for the most part on user charges.

Table 12.2 Comparison of African airport charges

	Passenger charge	Landing charge (65 tons)	Parking charge (65 tons, 5 hours)	
			Fee	Grace Period
Burundi	30	364	33	2
Cape Verde	10	487	29	
Cameroon	25	465		
Gambia	23	390	56	6
Lesotho			52	<24
Rwanda	20	300	60	
Uganda	40	390	60	
Mozambique	30	375	65	

Source: Africa Infrastructure Country Diagnostic 2009.

For more discussion and illustration of how air transport sector indicators can be used to inform policy analysis, the reader is referred to the following publication:

- Gwilliam and others. 2011. *Africa's Transport Infrastructure*. World Bank, Washington DC.

12.3 Indicator Overview

A comprehensive list of all indicators needed to track and monitor air transport sector trends, together with their corresponding technical definitions, is provided in Annex A12.1. While the full list of indicators amounts to several hundreds of items, the indicators can easily be grouped around a smaller number of some fifty primary indicators. A synthetic overview of these is provided in Table 12.3.

Table 12.3 clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators related to the primary ones. It also indicates whether the indicator originates at the national level or at the operator level; in the case of air transport usage, statistics are national but facilities and pricing statistics will be reported at the airport level. Finally, the Table gives the source of the data, which in the case of air transport are mostly derived from secondary sources, except for some information on airport facilities and charges from the sector data template. The process for obtaining data from both of these sources will be described in detail later.

Where relevant, benchmarks are calculated to facilitate cross-country comparisons; the generic benchmark categories were presented in the data processing chapter (Chapter 3).

Table 12.4, which benchmarks air transport performance indicators across the different regional economic communities of Sub-Saharan Africa, provides an example of how indicators can be used to inform air transport sector policy analysis. The analysis shows that the Southern African Development Community (SADC) has by far the largest domestic air transport market of any of the subregions, while the East African Community (EAC) has the largest international air transport market. In terms of connectivity, or the number of domestic and international city pairs that are served, the EAC and the SADC are also well ahead of the Economic and Monetary Community of Central Africa (CEMAC) and the Economic Community of West African States (ECOWAS).

Table 12.3 . . . . . Overview of primary indicators for air transport

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Access	No. of airlines with scheduled service		Country/REC		Flights	National	Seabury SRS
	Airlines market share		Domestic				
	Connectivity—city pairs		International within Africa				
	Herfindahl Index		Intracontinental				
	No. of airports providing scheduled service		Country/REC				
	No. of terminals		Domestic		Airport		Air transport template A
	Terminal capacity		International				
	Terminal traffic		Mixed use				
Usage	Load factor		Domestic	Per capita	Airport	National	Air transport template A
	Market growth—passengers		International within Africa	%			
	Market size—passengers		Intracontinental				
	Terminal usage		Main airport				
	Market growth—seats		Domestic		Flights	National Airport	Seabury SRS
	Market size—seats		International within Africa Intracontinental				
Financial	Revenues		Landing charges Parking charges Passenger charges Overflight charges		Airport		Air transport template A
Pricing	Airport charges		Landing charges Parking charges Passenger charges Overflight charges Domestic/international passenger		Airport		Air transport template A
	Grace period						
	Aviation fuel price (Jet A)						
Technical	Aircraft capacity		Large/medium/small Recent/older vintage	%	Flights	National	Seabury SRS
	Airlines passing IOSA audit				National	Continental	IATA
	Airlines on EU blacklist						EU
	FAA rating of safety oversight						FAA
Institutional	Planned investment		Main airportTerminals	$	National		Air transport template A
	Government anticipation of PPP				National		

Note: NA = North Africa; SSA = Sub-Saharan Africa; PPP = purchasing power parity; REC = regional economic community; Int. Air Transport Association = IATA; IATA Operational Safety Audit = IOSA; European Union = EU; U.S. Federal Aviation Authority = FAA.

Table 12.4 Benchmarking air transport indicators across regional economic communities, 2007

	ECOWAS	CEMAC	EAC	SADC
Annual seats, domestic ('000s)	2,034	235	1,345	3,076
Annual seats, international within SSA ('000s)	362	187	1,196	964
Domestic city pairs served (number)	8	4	13	17
International city pairs (number)	20	15	29	26
Seat-km in old aircraft (% of total)	43	30	33	29
Seat-km in recent aircraft (% of total)	57	70	67	71
Market Herfindahl Index, domestic	0.84	0.83	0.64	0.73
Market Herfindahl Index, international	0.19	0.24	0.25	0.34
Market Herfindahl Index, overall	0.21	0.30	0.27	0.42

Source: Africa Infrastructure Country Diagnostic 2009.

Note: Southern African Development Community = SADC; East African Community = EAC; Economic and Monetary Community of Central Africa = CEMAC; Economic Community of West African States = ECOWAS.

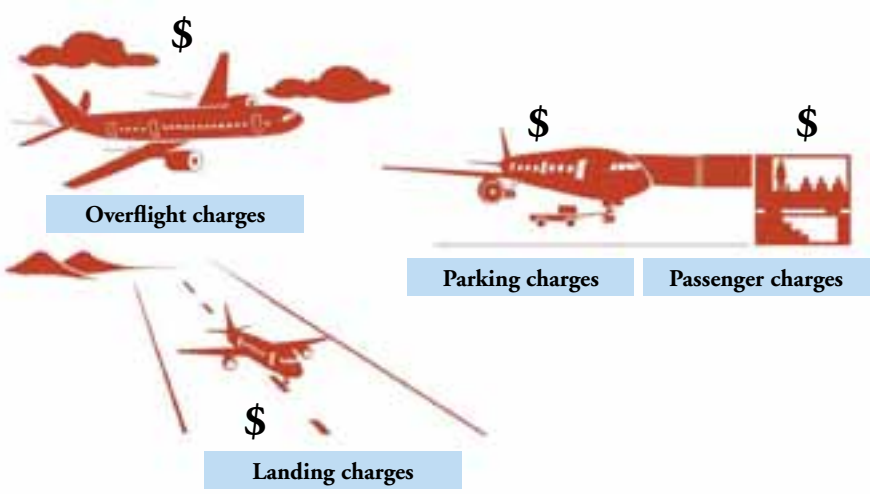
12.4 Data Collection

The following Box summarizes the generic cross-cutting guidelines and procedures of data collection adequately discussed in chapter 2 of this Handbook, and it is necessary to spend some time to understand how they can influence the quality of data before embarking on the actual data collection exercise.

Target institutions

This section identifies the airports sector data that are to be collected in order to create the indicators discussed earlier. Annex A12.2 provides a comprehensive list of the air transport sector institutions in Africa. These are the target institutions that need to be approached for data collection in this sector, and include the names of the civil aviation authorities of each country as well as the main airports. The list is accurate as of March 2011, but it should be kept in mind that the sector is in a constant state of change. Some airports cease to receive scheduled service as new airports open up. Thus, the list provided is intended only as general guidance, and should be reviewed and updated in consultation with sector specialists as the first step in any future data collection exercise. Data are generally collected for only the largest airport in each country, plus any other airports of significant size in regional terms that provide scheduled service.

Figure 12.3 Overview of air transport charges



The *dos* and *don'ts* of data collection

1. Begin by validating and updating the list of target institutions. This is to account for (i) operators that have ceased to operate, (ii) operators that have changed name due to reform, (iii) new operators that have come into being since the last survey took place.
2. Report data for each relevant operator. No attempt should be made to aggregate data to the national level or disaggregate to the subsector and/or sub-national level. Aggregation and/or disaggregation might be particularly problematic and require cross-country standard assumptions when (i) some operators serve multiple sectors, (ii) some operators span more than one country, and (iii) many operators are to be found in one country.
3. Where source documents are readily available from websites and other sources, it may be helpful to review these and to extract any relevant information prior to conducting interviews.
4. Wherever source documents are provided, these should be carefully retained and archived.
5. During any given collection year, data should be collected for each of the two preceding years, and the data collector should also revise those data reported as interim or preliminary.
6. The templates should be completed electronically. The prevalent electronic version will be provided in due time by the African Development Bank, Statistical Department (AfDB-SD)
7. Before starting to complete a template, organize the template's metadata:
   a. Indicate whether the *comma-dot* or *dot-comma* convention will be followed.
   b. Indicate the country, the sector, the utility name (if applicable), the name of data collector, the period of data collection, the source institution, and the name of the interviewee(s) or contact person.
8. For each indicator the policy category, series codes, variable, and definition will be prefilled and should not be altered under any circumstance.
9. Identify which unit is being used to report the data using the drop-down menu provided.
10. Use the comments column to alert the AfDB-SD to any deviations from the prescribed practice that may affect the subsequent interpretation and analysis of the variable.
11. Provide the source of the data and the precise technical definition of the variable if these vary from those provided in the Handbook.
12. Ensure that what have been collected are raw data variables. The conversion of raw data variables into indicators should ideally be undertaken centrally by AfDB-SD; but in the case that the National Statistical Offices (NSOs) undertake this conversion, it will be in coordination with and verified by the AfDB-SD.
13. If there is an imperative need to overwrite a derived value, do so through the country's focal point in close consultation with sector experts and the AfDB-SD.
14. Ensure all financial data is in nominal local currency units. The name of the local currency unit should be clearly specified in the comments column. No currency conversion or inflationary adjustment calculations should ever be performed in the field.
15. It is absolutely critical to distinguish accurately between zero¸ not available¸ and not applicable: (i) zero refers to a situation where data exists but has a value of zero; (ii) not available refers to a situation where data should exist, but for whatever reason cannot be provided by the source institution; and (iii) not applicable refers to a situation where data should not exist because it is not relevant to the local situation.
16. Do not under any circumstances attempt to convert from one unit of measurement to another. Furthermore (i) great care should be taken in selecting whether the variable is reported in units, thousands of units, millions of units, or some other factor and (ii) where data variables are in percentage units, the data collector should set the percentage number to base 100 (that is, 79 percent should be entered as 79).
17. The actual date that applies to the data should be reported in the comments column. If data only relate to a sub-period of the year or to a fiscal year as opposed to a calendar year, this should also be clearly reported.

For details refer to chapter 2 of the Handbook on Infrastructure Statistics

Data templates

There is just one data collection template for the airports sector, to be administered to the largest airport in each country. In larger countries with multiple large airports of regional significance, the exercise may be repeated for additional variables. The data collection template focuses on landside facilities and pricing practices.

The first block of the template comprises a few technical variables.

- *Number of terminals*: Details the number of terminals at the airport, distinguishing the type of terminal according to whether it handles primarily *international* or *domestic* passengers.
- *Terminal capacity*: Refers to the maximum number of passengers per year that could use the terminal facilities when these are operating at full design capacity, broken down by type of terminal.

- *Terminal traffic*: Refers to the actual number of passengers per year that are using the terminal facilities, broken down by type of terminal.

The second block of the template comprises the following variables, relating to the pricing of airport services (see Figure 12.3).

- *Passenger charge*: Refers to the airport charge applied to each international or domestic passenger's ticket to cover the use of landside terminal facilities. These charges are sometimes included in the price of the ticket, or sometimes levied during the check-in process. They are also known as departure taxes. Size varies according to the size of the aircraft: *large, midsize, or small.*
- *Landing charge*: Refers to the charge applied to each landing of a visiting aircraft, and is intended to cover the cost of runway and airside facilities. Varies according to the size of the aircraft: *large, midsize, or small.*
- *Parking charge*: Refers to the charge applied to each hour of parking over and above any grace period, and is intended to cover costs associated with operating boarding gates.

Table 12.5 Aircraft models, by size class

Large	Airbus A300, A310, A330, A340, A380 Antonov AN-26 Boeing 747, 767, 777 Douglas DC-10 Lockheed L-1011 McDonnell Douglas MD-11
Midsize	Airbus 318, 319, 320, 321 Boeing 707, 717, 727, 737, 757 BAC 1-11 Douglas DC-8, DC-9 McDonnell Douglas MD80, MD81, MD82, MD83, MD87, MD88, MD90
Small	Aerospatiale Avro Beechcraft British Aerospace 146, Jetstream 31, 32, 41 Canadair Regional Jet CASA/IPTN Cessna Convair De Havilland Canada DHC-2, DHC-3, DHC-5, DHC-6, DHC-7, DHC-8 Embraer 170, 190, 110, 120, RJ135/145, 170/190, 170/175 Fairchild Fokker 50, 70, 100, F27, F28 Gulfstream Aerospace Hawker Sidley 748, 780 LET NAMC Pilatus Britten-Norman Piper Saab Shorts Vickers Viscount

Source: Author's own elaboration.

Varies according to the size of the aircraft: *large, midsize or small.*

- *Grace period*: Refers to the number of hours of free parking allowed before parking charges apply. Varies according to the size of the aircraft: *large, midsize, or small.*
- *Revenues*: Total revenues received from the various airport charges detailed here, plus charges from aircraft that overfly the country, measured in the local currency unit (LCU), per year. (Countries are entitled to apply overflight charges to any aircraft flying through their sovereign airspace, even if the aircraft does not land or take off from that country. The charges are notionally intended to cover the cost of providing air traffic control and navigation services to overflying aircraft.)
- *Price of aviation fuel*: Price charged to visiting aircraft for JetA aviation fuel at the main international airport, measured in LCU per liter.

There are three classifications of aircraft, according to size: large, midsize, and small, and differentiated charges usually apply to each group. Table 12.5 indicates which commonly used models of aircraft fall into each of these three size categories.

Supporting documents

A starting point for data collection is to obtain the airport operator's annual report, if possible. The annual report is a useful document in its own right and should be archived. Depending on its quality, it may be the source for a significant number of the variables. Any remaining variables should be sought directly from the airport by contacting the General Manager.

Data from secondary sources

The data needed to track the air transport sector rely heavily on international sources, as opposed to national data collection via templates, more so than for any of the other sectors. Table 12.6 identifies variables and their sources.

Table 12.6 List of air transport sector complementary data variables and sources

Policy code	Variable	Source
Access	Airlines with scheduled service	Diio's SRS www.airlineplanning.com Similar information can be obtained from Official Airline Guide (OAG)
	Airlines market share	
	Herfindahl index	
	Connectivity—city pairs	
	Connectivity—country pairs	
	Airports with scheduled service	
Usage	Market size	Diio's SRS www.airlineplanning.com Similar information can be obtained from Official Airline Guide (OAG)
	Market growth	
	Market liberalization (5th–7th freedoms)	
Pricing	Aviation tariffs	Various travel websites can be used such as www.opodo.com www.expedia.com
Technical	Aircraft capacity	Diio's SRS www.airlineplanning.com Similar information can be obtained from Official Airline Guide (OAG)
	Runways	Jeppensen's, Google Earth, Wikipedia, www.azworldairports.com www.worldaerodata.com
	Air traffic accident rate	International Air Transport Association (IATA) http://www.iata.org/pressroom/facts_figures/fact_sheets/safety.htm
	Airlines passing IOSA audit	International Air Transport Association (IATA) www.iata.org/ps/certification/iosa/Registry?Query=all
	Airlines on EU blacklist	European Union
	Overall safety grading	International Civil Aviation Organization (ICAO) www.icaosec/icao.int Obtain name and password by contacting ICAO
	FAA rating of safety oversight	US Federal Aviation Authority

The secondary sources listed in Table 12.6 divide into two groups. Technical data variables from IATA, ICAO, EU, FAA, Jeppensen's, and the various industry websites cited can be extracted directly in the form required and do not need any further discussion. The precise definitions of these indicators are as follows.

- *Air traffic accident rate*. Western-built aircraft hull loss rate per million flights of airlines that are IATA members.
- *FAA rating of safety oversight*. Results of a safety oversight evaluation performed by the FAA. The result can be either (a) not rated, (b) category 2 (fail), or (c) category 1 (pass).
- *Airlines on EU blacklist*. Number of countries airlines that have been placed on the EU blacklist preventing direct flight into European airports due to safety concerns.
- *Airlines passing IOSA audit*. Airlines that are listed in the IOSA registry after having passed a safety audit.
- *Overall safety grading*. Overall compliance with the ICAO's standards and recommended practices as found by the latest Universal Safety Oversight Audit Programme (USOAP) findings for the country.

Data on aviation tariffs and from the Seabury SRS flights database require significant effort in order to be extracted in the form required. In each case, further guidance will be provided.

In addition to the sources cited in Table 12.6, a few others (see Table 12.7) may be helpful for the analysis of the air transport sector in Africa.

Extracting data from Seabury SRS

In principle, data on Africa's air traffic patterns should be available directly from the ICAO's statistical website. In practice, many developing countries (including many African countries) have not yet developed the data collection and submission systems to provide this information, and so their records remain blank. Though the data may be known by the authorities, they rarely are reported to the ICAO as required by the ICAO charter. This makes the collection of actual passenger figures on a continental level much more difficult.

For this reason, a different approach is recommended to estimate air traffic patterns based on comprehensive data available from the private sector. Two companies, Official Airlines Guides (OAG) and Seabury Aviation Data Group, collect submissions from airlines on their schedules. These submissions then feed into reservation systems and other end applications, such as the flight scheduling screens found at airports. Though these data do not contain passenger numbers, they contain, among other rich elements, the actual seat capacity of flights. Since not many airlines would fly empty aircraft or at load factors that are not sustainable for a very long time, the seat capacity can be used as an approximation of actual passenger travel, particularly when examining route trends (Box 12.1).

The air transport database to date has been based on data acquired from Seabury Aviation Data Group's SRS, an IATA-certified data provider. These data, similar to those sold by the Official Airline Guide (OAG), cover about 99 percent of all airlines. But it must be kept in mind that airlines (1–2 percent of airlines) that are not covered are often also the ones providing domestic services in the developing world.

Importing SRS data: Since the data found in the SRS analyzer is voluminous and needed to be kept to a manageable size, and also due to cost constraints, targeted "full extracts" were made for the years 2001, 2004, and 2007 using the SRS web interface, filtering for all traffic involving Africa. In order to capture seasonality, the data should be extracted for one week in the month of February of each year, and the same for May, August, and November, with a separate Excel file for each extract. The resulting data set is a table of 107,100 records with 17 fields (columns), resulting in a total of over 1.8 million data points for the three years.

Table 12.7 List of additional useful sources of information

Source	Website	Relevance
Boeing	www.boeing.com/commercial/cmo/highlights.html	Recurring analysis and forecast for the commercial aircraft market, which also looks at passenger flows. Coverage of Africa is incomplete, but this can be used as a cross-check on more extensive data from other sources.
ACW	www.aircraft-charter-world.com	Useful information that helps to create an updated list of African airports.
AZ	www.azworldairports.com	Provides some (incomplete) figures on terminal capacity in Africa that can be used as a cross-check on data obtained from the national data collection templates.

Box 12.1 Nomenclature used for the SRS data

The database uses the phrase estimated advertised scheduled seats for most capacity analysis. This estimation was constructed in order to highlight some of the shortcomings of the data, in particular what they do not represent:

- Estimated: Seats are estimated for two reasons: (i) the data are extrapolated from only four weeks of data per year— seasonality is captured by the location of those weeks, since each is in the second month of each quarter; and (2) the data have been adjusted for multileg flights, where possible, using rough assumptions.
- Advertised: There are a number of airlines in domestic markets that do not advertise their flights through normal channels, such as online booking agencies, or are part of any reservation system. In addition, though these airlines may call themselves nonscheduled, they may be acting as a scheduled carrier to fill a market niche. The data only reflect airlines that partake in the most formal systems, and that appear in airport announcement panels.
- Scheduled: Charter operations are generally not included. Only formally declared scheduled services are included.
- Seats: The data do not represent actual passenger flows but capacity, as measured in seats.

When possible, the data were compared to actual passenger flows, though this could be done in only a few instances. The comparison showed that the actual passenger figures were roughly 65 to 69 percent of the capacity figure—a realistic load figure that approximates the industry. But these figures could only be verified for international flights. Due to the informal nature of many domestic service providers, it is very likely that the SRS data are underestimating passenger flows in some areas of Africa.

In addition, the rise of fuel prices has led to higher load factors overall, which means that the actual growth rates of passenger flows may have been even higher than the growth rate in capacity.

The structure of columns of the retrieved raw data tabulations in Excel are as shown in Figure 12.4. The month and year of each row were added, in two columns ("year" and "month"), to each of the Excel sheets, since the extracts themselves do not have such columns. The extracts were then imported into a Microsoft Access or other structured query language (SQL) database, and processed and queried using the MS Access SQL interface.

Figure 12.5 shows a general data diagram for the final structure of the database, followed by a description of the process for obtaining the structure.

Figure 12.4 A record (data line) in the Seabury SRS Data Analyzer extract used for the air transport infrastructure portion of the AICD study

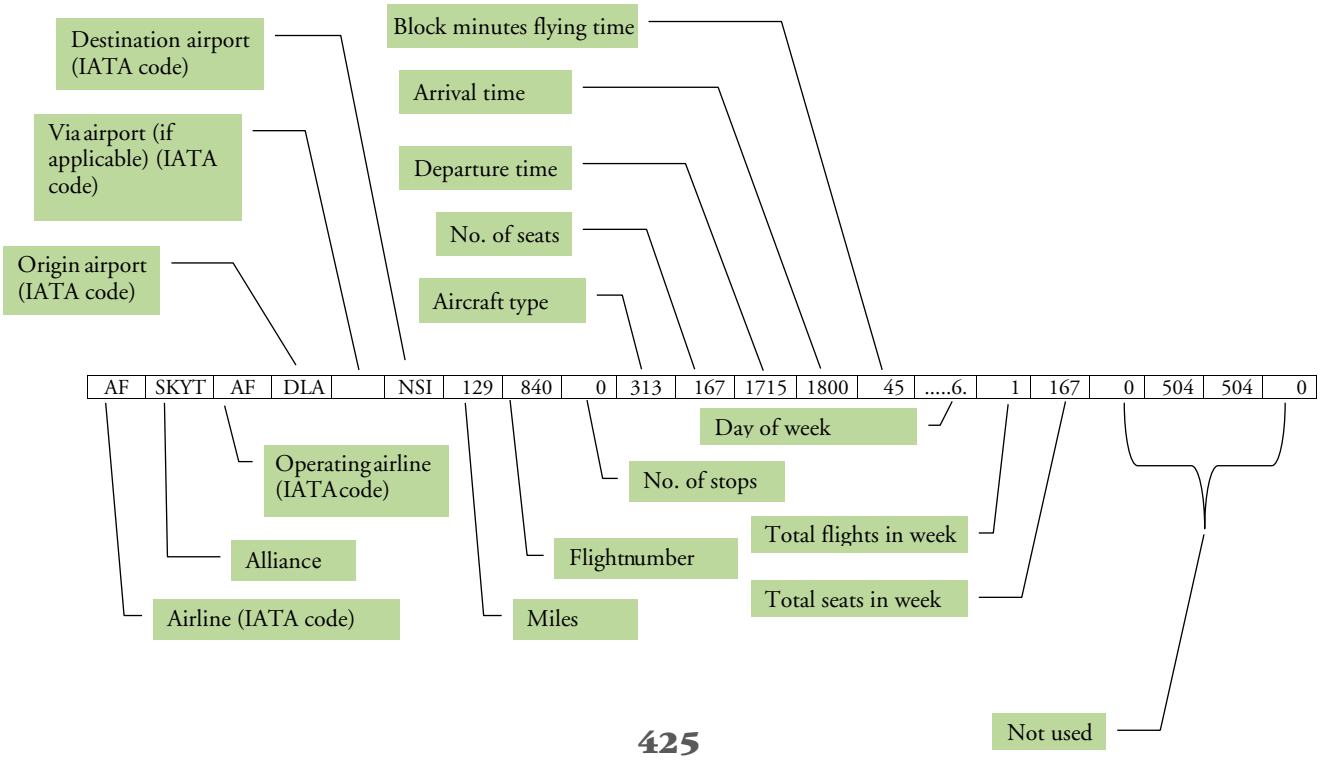
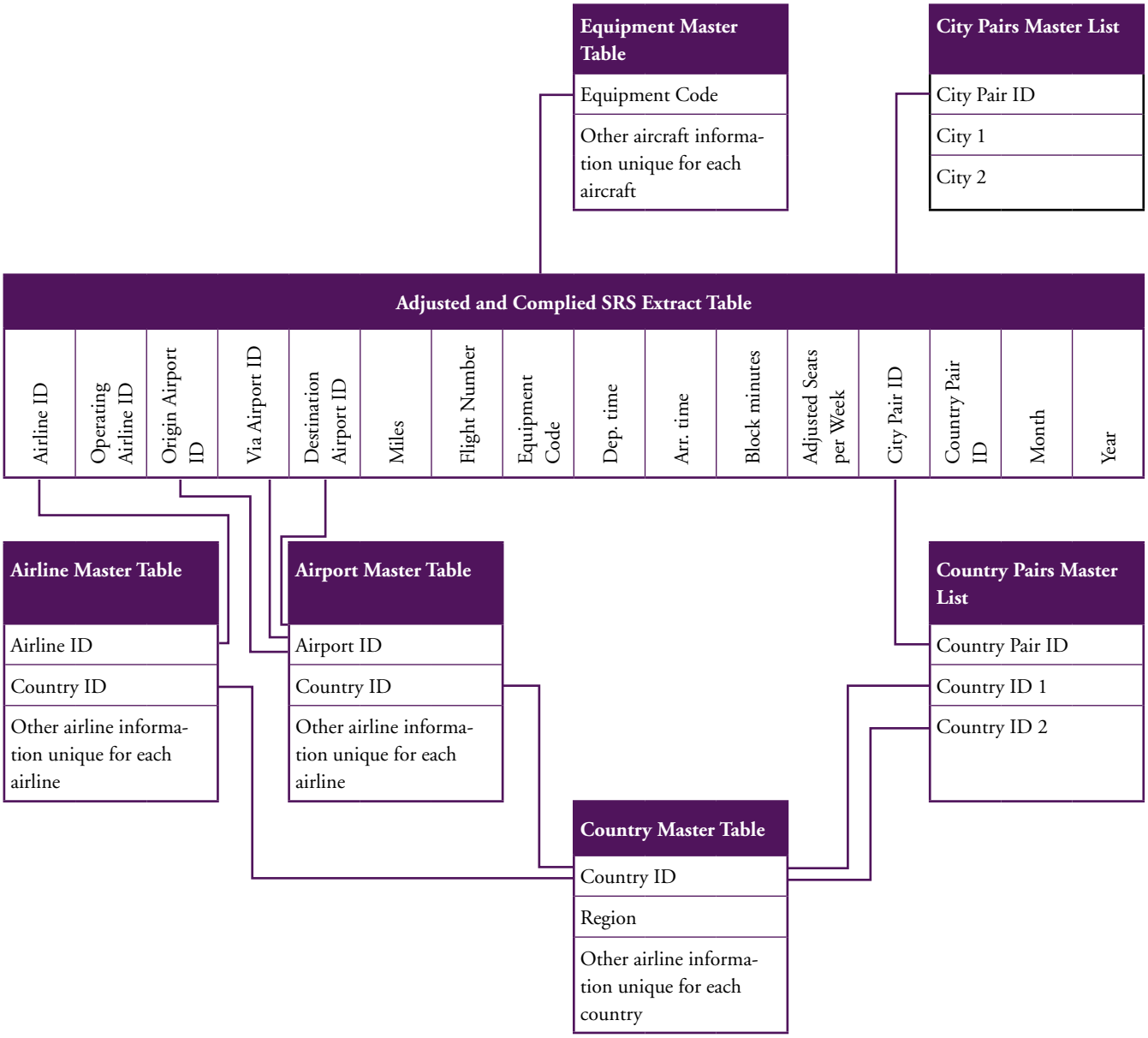


Figure 12.5 Diagram of the database constructed from the SRS data, after modifications



Note: Some fields that are not being used have been omitted.

Adjustments to SRS data: Once imported, several steps need to be taken to make necessary adjustments and complete the data set.

Additional flags: Two fields where added and filled to simplify processing, namely a yes/no flag for international flights, and a yes/no nonstop flag for one-legged flights.

Multileg flights: Seven percent of seat capacity in 2007 (and over 10 percent in 2001) was found to be for flights that had multiple stopovers. For example, a hypothetical Addis–Nairobi–Kilimanjaro–Dar es Salaam flight *would have multiple records*: (i) Addis Ababa via Nairobi to Kilimanjaro, (ii) Nairobi to Kilimanjaro, (iii) Nairobi to Dar es Salaam via Kilimanjaro, and (iv) Kilimanjaro to Dar es Salaam. Since the SRS data set is limited to only one intermittent stop, there would be no record stating Addis to Nairobi to Kilimanjaro to Dar es Salaam (two stopovers).

If one simply tried to add the numbers for each flight and tried to assign them to the route that the origin and destination indicated, one would ignore the fact that, for example, a large part of the passengers boarding in Addis Ababa could be bound for Dar es Salaam. Though not a perfect solutions by any means, the data were adjusted by dividing the original capacity of the aircraft by the number of destinations. This methodology presents an undercount, since it ignores that passengers are boarding at the intermediate stops, and assumes an even distribution. In addition, a flight with multiple legs was defined as being the same flight number, with the same operating carrier, the same equipment,

and the same capacity, operating on the same day. This implied that flights operating past midnight, a small percentage of flights overall, were not included.

In order to repeat the exercise, two new fields would be added to the data table: "adjusted seats" (for the total adjusted seats per week), and "legs" for the total number of legs (or destinations) per record. These fields would then need to be populated, using a series of SQL queries identifying the multileg flights. The result of dividing the total seats per week by the number of legs would be entered into the "estimated seats" field.

Airline master list: Airlines in general are identified by their IATA indicator, a two letter (alphanumeric) code that has two disadvantages: (i) The code can be used for two entirely different airlines in different regions, and (ii) the code can be reassigned to a new airline when an old airline becomes defunct.

In technical terms, the IATA code does not represent a solid "key field" on which a relational table can be built. This means that an airline master list had to be built, using various sources, for which each airline, beyond the IATA code, also had a unique numeric identifier. When "linking" this table (with the IATA code) to the main data table, duplications of the main data record would occur wherever the IATA code could identify more than one airline. These were captured, and subsequently correct numeric airline identifiers were added to every flight record, making the numeric airline identifier the key field for linking flight records to airline analysis. Considerable manual scrubbing of the airline data had to be performed, especially because of the inconsistency of the IATA code and of the fact that the ICAO airline identifier (three alphanumeric letters) was being used when the airline had no IATA code. The maintaining and scrubbing of the airline master list will need to be redone when the exercise is repeated, though it can be assumed that this process will be much less daunting than it was for the original study, since most of the historical data have already been cleaned up.

Airport master list: Airports enjoy a three-letter IATA identifier that is unique. But many airports have very little traffic, so in constructing an airports master list, many identifiers had to be researched in order to get the actual location and related city name. Several lists using the IATA identifier were merged to create a master airports list, containing all pertinent information, including the geographic coordinates. This allowed for more data gathering beyond the data provided by the SRS Analyzer System. Because of the consistency of the IATA airport identifier, no additional unique keys had to be created for airports. In the future, new airports not found in the airports master list created for this report would need to be identified and added.

City pairs: One complication in determining route data was the exponential nature of city pairs. The data extracts do not show city pairs in a consistent manner, since a particular pair can show up with airport A as either the origin or the destination, and airport B showing up as either the destination or the origin. In order to capture city pair information, two numeric tables were created. The first table contains three columns: one with a unique city pair ID number, and the two others with the actual city ID numbers (a city table, with a city ID number, was created from the airports master list. The airports master list itself could not be used, because some cities have more than one airport, and cities needed to be uniquely identified). This city pair ID table had one important feature: if cities A and B where a pair, they would appear only once, that is, there might be an entry for B and A, but then no entry for A and B.

Since in the data set cities (as identified through airports) could show up as either origins or destinations, a second table had to be created in which each city pair ID appeared twice, with the original order and the reverse order of the cities under the same city pair ID number. This then allowed for the assignment of a unique city pair ID to each of the records, permitting the analysis of city pair numbers and their capacities.

Since the composition of pairs is mathematically an exponential problem, and the analysis had to follow a rigorous process, the city pair table created included all potential city pairs from the data set, and not just those actually found. This meant that a total of 6,217,696 unique city pairs were identified for Africa. The report used city pairs to analyze traffic patterns within Africa; however, for intercontinental travel summarizing by country pairs, rather than by city pairs, seemed more appropriate.

Country pairs: A similar process was used for creating country pairs: Two numeric tables were created, though with fewer records (24,754). In a similar fashion as described earlier, one table, together with a second table of duplicate length, allowed for the assignment of unique country pair IDs to each international flight. For domestic flights, the country pair ID was just left blank.

Regional economic community pairs: For traffic within and between regional communities, a lookup table was created giving each regional community an ID number and a name. Beyond the generally discussed regional communities, groupings for all of North Africa, all of Central Africa, and an expanded version of the EAC including Sudan and Ethiopia were created. Beyond

an additional table which then listed all members of a community by their country ID, a table was created listing all possible regional community pairs, with their respective countries. Since some countries were members of both regional communities in a regional community pair, they were identified and then excluded from the regional community pair when summarizing traffic between the pairs.

Equipment master list: The equipment codes found in the SRS data were used to create an aircraft type master table, with capacities, size categories, and age categories where applicable. To simplify the processing, the age categories were "frozen" in time, that is, an aircraft considered old in 2007 was also categorized as old in 2001.

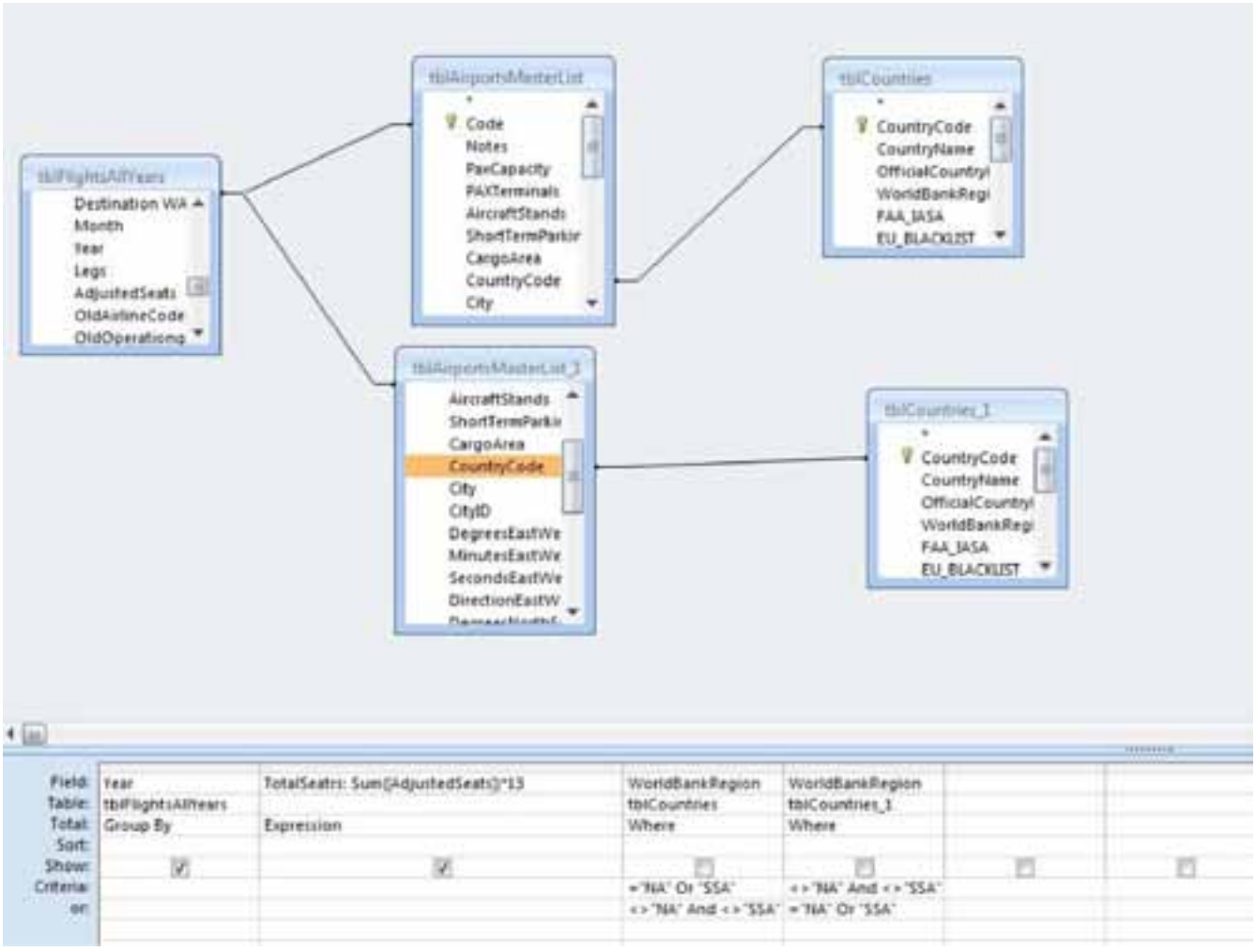
12.5 Data Processing

The air transport component is based to a large extent on highly granular data retrieved from a professional data provider. Though the ICAO is considered the mainstay of official data collection in the industry, many countries in client regions do not report their passenger data to ICAO on a regular basis, making time series analysis virtually impossible.

Analytical tools

The conversion of the raw Seabury SRS data on flights into useful air transport indicators is based on SQL. This needs to be done by an analyst with knowledge of relational theory and writing SQL queries. In the Access query designer, the query would be graphically shown as in Figure 12.6. This example provides a simple solution involving just one query; however, many indicators require the use of multiple queries building on one another, as shown in the example in Annex A12.4. Annex A12.4 contains a sample set of SQL queries looking for a simple time series in the number of airports being served in Africa. The understanding of the design of these queries is a litmus test for the skills needed to be able to create the indicators.

Figure 12.6 An example of an SQL access query



For the analysis, MS Access was used, which is quite robust and can easily handle the applicable data sets of 100,000-200,000 records. The query interface in MS Access speeds up the analysis process considerably, however, especially when considering that union queries, the capability of hand-typing SQL queries, and a robust knowledge of relational theory (normalization for clarity and denormalization for performance) are required. For much of the analysis, temporary subtables needed to be created in order to reduce calculation time, and the initial structuring and cleaning up of relational tables require a comprehensive understanding of key fields, the effect of (and identification of) duplications in records, and the vital functions of lookup tables.

Methodology

The various indicators that need to be computed are basically derived by summing the number of "estimated seats" across different subcategories of the data set. As an example, we will use the indicator "intercontinental market size." This indicator is defined as the sum of all estimated seats flying to or from individual African airports that include airports outside of Africa (for example, in the Americas, Asia, or Europe) as either their origin or destination.

The field to sum on using a summation query is "[EstimatedSeats]" in the main data table, categorized by year. Linked to the table would be the airports master table (twice, once to the origin field of the main table, and once to the destination field); and linked to the two occurrences of the airports master table would be the country master table. Two search conditions would be attached to each of the country master tables:

(i.) The first condition would specify that in the first occurrence of the country table, the region must be either North Africa or Sub-Saharan Africa, and that in the second occurrence of the country table the region cannot be either North Africa or Sub-Saharan Africa. If the first occurrence in the country table is linked to the origin airport, this implies that the flight originates out of Africa and terminates outside Africa.

(ii.) The second condition would specify the exact reverse. In the first occurrence of the country table the region cannot be either North Africa or Sub-Saharan Africa, while in the second occurrence of the country table (presumably linked to the destination airport) the region must be either North Africa or Sub-Saharan Africa. This would imply that the origin of the flight is outside Africa, terminating within Africa.

The sum of the estimated seats per year would then be the capacity for all intercontinental flights to and from Africa. The understanding of these mechanisms is vital for the accurate understanding of the definitions of the described indicators. The query would read as shown:

```
SELECT tblFlightsAllYears.Year, Sum ([Ad-
justedSeats])*13 AS TotalSeats
FROM ((tblFlightsAllYears INNER JOIN
(tblAirportsMasterList INNER JOIN tblCoun-
tries ON tblAirportsMasterList.CountryCode
= tblCountries.CountryCode) ON tblFlight-
sAllYears.Org = tblAirportsMasterList.Code)
INNER JOIN tblAirportsMasterList AS tblAir-
portsMasterList_1 ON tblFlightsAllYears.Dst
= tblAirportsMasterList_1.Code) INNER JOIN
tblCountries AS tblCountries_1 ON tblAir-
portsMasterList_1.CountryCode = tblCoun-
tries_1.CountryCode
WHERE (((tblCountries.WorldBankRegion) ="NA"
Or (tblCountries.WorldBankRegion) ="SSA")
AND ((tblCountries_1.WorldBankRegion)
<>"NA" And (tblCountries_1.WorldBankRegion)
<>"SSA")) OR (((tblCountries.WorldBankRe-
gion) <>"NA" And (tblCountries.WorldBank-
Region) <>"SSA") AND ((tblCountries_1.
WorldBankRegion) ="NA" Or (tblCountries_1.
WorldBankRegion) ="SSA"))
GROUP BY tblFlightsAllYears.Year;
```

Though many of the tables used in the report were created using Excel in their final format, in nearly all cases the actual analysis creating the tables were exports of SQL query results completed in MS Access. There are two important methodological details that need to be taken into account, namely the use of union queries and the procedure for aggregating results over the course of a year.

Use of union queries: Since the data set has airports identified in two locations, at the point of origin and the final destination, total capacity at a particular airport means summing all adjusted capacity for the same airport twice: once by identifying the airport in the origin column (and summing the passenger capacity numbers) and once by identifying the airport in the destination column. Using union queries allowed a quick, clean way of collapsing the origin and destination field into one, and then simply summing up the capacities (see Box 12.2).

Aggregation over time: In essence, a week from the second month of each quarter of the calendar year was extracted, making all monthly and annual figures extrapolations. One could easily assume that since each month has four weeks, and there are three

months per quarter, the correct annual extrapolation from the weekly data would be *weekly seats * 4* (to make four weeks) ** 3* (to make three months) for each quarter, to then be summed. Or, to be more abbreviated, one could sum all seats from all quarters and multiply the sum by 12 (4 weeks * 3 months). But 4 (the number of weeks in a month) * 3 (number of months in a quarter) * 4 (number of quarters in a year) = 48, that is, we can only extrapolate to 48 weeks. The year has 52 weeks. Rather than using the seemingly correct multiplier of 12, the correct multiplier for annualizing the sum of one-week data from each of the quarters is 13, providing the 4 extra weeks to complete the year. *It is important to remember that for all annual capacity summations, the correct calculation involves the sum of all adjusted seats for the year, multiplied by 13.*

Derived indicators

With suitable adaptations, this basic methodology can be used to derive all of the relevant access and usage indicators that are based on the Seabury SRS data. Annex A12.3 provides a detailed definition of each of these.

- *Market size*: This family of indicators is always calculated by summing all of the estimated seats on flights that meet the selected criteria. It can be calculated by airline, by airport, by time slot, by country, by regional economic

Box 12.2 The use of union queries

The data for an airport in the SRS Analyzer could be represented in the table below:

Departing airport	Arriving airport	Adjusted seats
A	B	128
B	A	128
C	A	210
A	C	210

In a normal SQL query, you would ask all data to be grouped, and then summed, by a value in a specific column. But when using two columns, this becomes tricky. Using a union query as shown below before summing resolves this issue. In this case the query would look as follows:

SELECT [Departing Airport] AS Airport, [Adjusted Seats] FROM TableAllData
UNION ALL
SELECT [Arriving Airport] AS Airport, [Adjusted Seats] FROM TableAllData;

The following would result (not always in this order, but for clarity shown in order):

Airport	Adjusted seats
A	128
A	128
A	210
A	210
B	128
B	128
C	120
C	120

A simple summation query would the collapse the table as follows, providing totals:

Airport	Adjusted seats
A	676
B	256
C	240

community, for Sub-Saharan and North Africa, for the African continent as a whole, and according to whether the flight makes use of 5th, 6th, or 7th freedoms as defined by the Yamoussoukro Decision.

- *Connectivity*: This family of indicators is always calculated by making a count of the number of distinct city or country pairs that exist in the final database extract for each calendar year. It can be calculated bilaterally for specific pairs of countries to form a connectivity matrix (Figure 12.4).

Once these indicators have been created, it is possible to do a number of normalizations of the indicators that facilitate their interpretation and cross-country comparison. These indicators include:

- *Market growth rates*. Geometric growth rate of any of the market size variables. The geometric growth rate is defined as $r = \sqrt[t]{\frac{y}{x}} - 1$, where t = the number of periods (years, y is the value at the end of the time period and x is the value at the beginning of the time period.)
- *Seats per capita*. Market size divided by the population of the relevant market.
- *Market shares*. Percentage of total market that is served by any given airline.
- *Herfindahl Index*. Sum of the squares of the market shares of all airlines in any given market, where s is the market share and N is the number of airlines in the market.

$$H = \sum_{i=1}^{N} s_i^2$$

- *Liberalization shares*. Percentage of flights in a given market that are flown under 5th, 6th, and 7th freedoms.
- *Capacity shares by size*. Percentage of capacity in a given market that is flown by aircraft of small, medium, and large size.
- *Capacity shares by age*. Percentage of capacity in a given market that is flown by aircraft of older or newer vintage/

A12. Annexes to Chapter 12: Transport infrastructure, air

Annex A12.1 Comprehensive list of indicators and definitions—Air Transport

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Access	at25	Airlines flying scheduled domestic (number)	For given country and year, number of airlines providing scheduled domestic passenger service.	National	Derived	Count (at3, across airlines)
	at21	Airlines servicing country (number)	For given year and country, number of airlines providing scheduled services to country.	National	Derived	Count (at12, across airlines)
	at26	Airlines within country (number)	For given year and country, number of airlines providing scheduled passenger service based in the country.	National	Raw	
	at22	Market share of airline, domestic (%)	Domestic traffic annual seats of scheduled airline divided by total annual seats of all domestically operating airlines in the given country.	Airline	Derived	100*at03/ sum(at03, over airlines)
	at23	Market share of airline, intercontinental (%)	Scheduled annual seats of airline flying between the given country and origins or destinations outside Africa, divided by total annual seats of all operating airlines flying between the given country and origins or destinations outside Africa.	Airline	Derived	100*at06/ sum(at06, over airlines)
	at24	Market share of airline, international within Africa (%)	Scheduled annual seats of airline flying between the given country and origins or destinations internationally within Africa, divided by total annual seats of all operating airlines flying between the given country and origins or destinations internationally within Africa.	Airline	Derived	100*at09/ sum(at09, over airlines)
	at20	City pairs (number)	Total number of city pairs with at least one city in the country receiving scheduled passenger services.	National	Derived	[at17 + at18 + at19]
	at17	City pairs, domestic (number)	Total number of city pairs with both cities in the country receiving scheduled passenger services.	National	Raw	
	at18	City pairs, intercontinental (number)	Total number of city pairs with one city in the country and the other within another continent receiving scheduled passenger services.	National	Raw	
	at19	City pairs, international within Africa (number)	Total number of city pairs with one city being in the country and the other within another African nation receiving scheduled passenger services.	National	Raw	
	at90	Herfindahl Index for the airline transport market (base 100)	Sum of squared market share percentages of all airlines providing scheduled services in given country and given year.	National	Raw	
	at15	Airports with scheduled services (number)	Total number of airports with scheduled passenger services in country.	National	Raw	

Policy	Tempo-rary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Access	at16	Land per airport with scheduled traffic (1,000 of sq km per airport)	Total number of square kilometers in country (in thousands) divided by total number of airports receiving scheduled services.	National	Derived	[(x007*1000)/ at15]
	at70	Terminal capacity, domestic, main airport (passengers)	Number of annual passengers the domestic terminal(s) at the country's main airport can handle without need for expansion.	Airport	Raw	
	at71	Terminal capacity, inter-national, main airport (passengers)	Number of annual passengers the international terminal(s) at the country's main airport can handle without need for expansion.	Airport	Raw	
	at67	Terminals, domestic, main airport (number)	For given year, number of domestic terminals at given country's main international airport.	Airport	Raw	
	at68	Terminals, international, main airport (number)	For given year, number of international terminals at given country's main international airport.	Airport	Raw	
	at69	Terminals, mixed use, main airport (number)	For given year, number of terminals that are both used for international and domestic travel at the same time at given country's main international airport.	Airport	Raw	
Usage	at99	Load factor (ratio)	Total number of scheduled passengers, divided by the total number of scheduled seats for given country.	National	Derived	[at90 / at10]
	at100	Load factor, domestic (ratio)	Total number of scheduled domestic passengers, divided by the total number of scheduled domes-tic seats for given country.	National	Derived	[at63 / at01]
	at101	Load factor, international (ratio)	Total number of scheduled international pas-sengers, divided by the total number of scheduled international seats for given country.	National	Derived	[at64 / at07]
	at91	Passengers (number)	For year, total number of air transport passengers, both internationally and domestic, for given country.	National	Derived	at63 + at64
	at63	Passengers, domestic (number)	For year, total number of domestic air transport passengers for given country.	National	Raw	
	at65	Passengers, domestic, main airport (number)	Number of passengers arriving and departing on domestic flights at the airport.	Airport	Raw	
	at64	Passengers, international (number)	For year, total number international air transport passengers for given country.	National	Raw	
	at66	Passengers, international, main airport (number)	Sum of international passengers arriving and departing at country's main international airport for given year.	Airport	Raw	
	at88	Usage ratio, domestic terminal, main airport (ratio)	For given year and country's main airport, the total number of domestic passengers divided by the airport's domestic terminal's annual domestic passenger capacity.	Airport	Derived	at63/at70
	at89	Usage ratio, international terminal, main airport (number)	For given year and country's main airport, the total number of international passengers divided by the airport's international terminal's annual international passenger capacity.	Airport	Derived	at64/at71

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Usage	at87x	Seat capacity growth (%)	For given year and given country, total scheduled seat capacity divided by total scheduled seat capacity of previous year.	National	Derived	(current year at10/ previous year at10)*100
	at87	Seat capacity growth compare to GDP growth (%)	For given year and given country, total scheduled seat capacity divided by total scheduled seat capacity of previous year, minus GDP growth for the same period.	National	Derived	at87x-x008
	at02	Seats for airport, estimated domestic (number)	For given airport and year, the total estimated number of scheduled seats with origins and destinations both in the same country.	Airport	Raw	
	at05	Seats for airport, estimated intercontinental (number)	For given airport and year, the total estimated number of scheduled seats with origins or destinations outside Africa.	Airport	Raw	
	at08	Seats for airport, estimated international within Africa (number)	For given airport and year, the total estimated number of scheduled seats with international origins or destinations within Africa.	Airport	Raw	
	at11	Seats for airport, estimated total (number)	For given airport and year, the total estimated number of scheduled seats.	Airport	Derived	(at02/2) + at05 + at08
	at13	Seats on annual growth rate over last 10 years (number)	For given year and given country, the geometric growth rate in estimated scheduled seats between the current year and ten years previous.	National	Derived	((First Year at10 / Last Year at10)^(1/no of years))-1
	at14	Seats per capita (ratio)	For given country and given year, estimated total number of scheduled seats divided by the given country's population.	National	Derived	[at10 / x001]
	at84	Seats per capita, domestic (ratio)	For given country and given year, estimated total number of scheduled seats with origins and destinations within the country divided by the given country's population.	National	Derived	[at01 / x001]
	at86	Seats per capita, intercontinental (ratio)	For given country and given year, estimated total number of scheduled seats with origins or destinations outside Africa divided by the given country's population.	National	Derived	[at04 / x002]
	at85	Seats per capita, international within Africa (ratio)	For given country and given year, estimated total number of scheduled seats with origins or destinations internationally within Africa divided by the given country's population.	National	Derived	[at07 / x001]
	at01	Seats, estimated domestic (number)	For given country and year, the sum of estimated seats with origins and destinations within the country.	National	Derived	sum(at02, over airports)/2
	at03	Seats, estimated domestic (number)	For given airline and year, the sum of estimated seats with origins and destinations within its country of registry.	Airline	Raw	
	at04	Seats, estimated intercontinental (number)	For given country and year, the sum of estimated seats with origins or destinations outside the African continent.	National	Derived	sum(at05, over airports)/2
	at06	Seats, estimated intercontinental (number)	For given airline and year, the sum of estimated seats for routes between Africa and other continents.	Airline	Raw	

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Usage	at07	Seats, estimated international within Africa (number)	For given country and year, the sum of estimated seats with international origins or destinations within Africa.	National	Derived	sum(at08, over airports)/2
	at09	Seats, estimated international within Africa (number)	For given airline and year, the sum of estimated seats for routes different countries within Africa.	Airline	Raw	
	at10	Seats, estimated total (number)	For given country and year, total number of estimated seats	National	Derived	sum (at01,at04,at07)
	at12	Seats, estimated total (number)	For given airline and year, total number of estimated seats	Airline	Derived	(at03/2) + at06 + at09
Financial	at73	Revenues from all charges from all airports, cumulative annual (LCU)	For given country and given year, the total revenues from passenger and aircraft airport charges, in local currency units.	National	Raw	
	at73-d	Revenues from all charges from all airports, cumulative annual (USD)	For given country and given year, the total revenues from passenger and aircraft airport charges, in U.S. dollars.	National	Derived	[at73 / x003]
	at72	Revenues from overflight charges, cumulative annual (LCU)	For given country and given year, the total revenues from aircraft overflight charges, in local currency units.	National	Raw	
	at72-d	Revenues from overflight charges, cumulative annual (USD)	For given country and given year, the total revenues from aircraft overflight charges, in U.S. dollars.	National	Derived	[at72 / x003]
Pricing	at82	Airport charges per seat (USD)	Sum of airport charges divided by the total number of arriving and departing scheduled seats for given airport and given year.	Airport	Derived	at73 / (at63 + at64)
	at81	Fuel price, main airport (LCU per Liter)	Price of Jet A Fuel per liter in local currency units.	Airport	Raw	
	at92	Fuel price, main airport (US$ per Liter)	Price of Jet Fuel per liter in U.S. dollars.	Airport	Derived	AT81/x003
	at83	Parking grace period, main airport (hours)	Number of hours an aircraft may be parked at an airport without accumulating parking charges.	Airport	Raw	
	at79	Passenger charges per ticket, domestic (LCU)	Charges levied by either the civil aviation authority or the airport, or both, on each domestic passenger ticket, in local currency units.	Airport	Raw	
	at97	Passenger charges per ticket, domestic (USD)	Charges levied by either the civil aviation authority or the airport, or both, on each domestic passenger ticket, in U.S. dollars.	Airport	Derived	at79/x003
	at80	Passenger charges per ticket, international (LCU)	Charges levied by either the civil aviation authority or the airport, or both, on each international passenger ticket, in U.S. dollars.	Airport	Raw	
	at98	Passenger charges per ticket, international (USD)	Charges levied by either the civil aviation authority or the airport, or both, on each international passenger ticket, in U.S. dollars.	Airport	Derived	at80/x003
Technical	at60	Seats on aircraft size large (%)	For given year and given country, number of scheduled seats available for all traffic in large aircraft divided by number of scheduled seats available in all aircraft of all sizes.	National	Derived	at44*100/at10

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Technical	at44	Seats on aircraft size large (number)	For given country and year, estimated scheduled seats in large aircraft.	National	Derived	at34+at35+at36
	at50	Seats on aircraft size large, domestic (%)	For given year and given country, number of domestic scheduled seats available for all traffic in large aircraft, divided by number of domestic scheduled seats available in all aircraft of all sizes.	National	Derived	at34*100/at01
	at34	Seats on aircraft size large, domestic (number)	For given country and year, estimated scheduled seats in large aircraft on routes strictly within the country.	National	Raw	
	at51	Seats on aircraft size large, intercontinental (%)	For given year and given country, number of scheduled seats available for all traffic in large aircraft flying between country and origins and destinations outside Africa, divided by number of scheduled seats available in all aircraft of all sizes flying between country and origins or destinations outside Africa.	National	Derived	at35*100/at04
	at35	Seats on aircraft size large, intercontinental (number)	For given country and year, estimated scheduled seats in large aircraft on routes with origins or destinations outside the African continent.	National	Raw	
	at36	Seats on aircraft size large, international within Africa (number)	For given country and year, estimated scheduled seats in large aircraft four routes with international origins or destinations within Africa.	National	Raw	
	at52	Seats on aircraft size large, international within Africa (%)	For given year and given country, number of scheduled seats available for all traffic in large aircraft flying between country and international origins and destinations within Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and international origins or destinations within Africa.	National	Derived	at36*100/at07
	at61	Seats on aircraft size medium (%)	For given year and given country, number of scheduled seats available for all traffic in medium-sized aircraft, divided by number of scheduled seats available in all aircraft of all sizes.	National	Derived	at45*100/at10
	at45	Seats on aircraft size medium (number)	For given country and year, estimated scheduled seats in medium sized aircraft.	National	Derived	at37+at38+at39
	at53	Seats on aircraft size medium, domestic (%)	For given year and given country, number of domestic scheduled seats available for all traffic in medium sized aircraft divided by number of domestic scheduled seats available in all aircraft of all sizes.	National	Derived	at37*100/at01
	at37	Seats on aircraft size medium, domestic (number)	For given country and year, estimated scheduled seats in medium sized aircraft on routes strictly within the country.	National	Raw	
	at54	Seats on aircraft size medium, intercontinental (%)	For given year and given country, number of scheduled seats available for all traffic in medium sized aircraft flying between country and origins and destinations outside Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and origins or destinations outside Africa.	National	Derived	at38*100/at04

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Technical	at38	Seats on aircraft size medium, intercontinental (number)	For given country and year, estimated scheduled seats in medium sized aircraft on routes with origins or destinations outside the African continent.	National	Raw	
	at55	Seats on aircraft size medium, international within Africa (%)	For given year and given country, number of scheduled seats available for all traffic in medium sized aircraft flying between country and international origins and destinations within Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and international origins or destinations within Africa.	National	Derived	at39*100/at07
	at39	Seats on aircraft size medium, international within Africa (number)	For given country and year, estimated scheduled seats in medium sized aircraft four routes with international origins or destinations within Africa.	National	Raw	
	at62	Seats on aircraft size small (%)	For given year and given country, number of scheduled seats available for all traffic in small aircraft divided by number of scheduled seats available in all aircraft of all sizes.	National	Derived	at46*100/at10
	at46	Seats on aircraft size small (number)	For given country and year, estimated scheduled seats in small aircraft.	National	Derived	at40+at41+at42
	at56	Seats on aircraft size small, domestic (%)	For given year and given country, number of domestic scheduled seats available for all traffic in small aircraft divided by number of domestic scheduled seats available in all aircraft of all sizes.	National	Derived	at40*100/at01
	at40	Seats on aircraft size small, domestic (number)	For given country and year, estimated scheduled seats in small aircraft on routes strictly within the country.	National	Raw	
	at57	Seats on aircraft size small, intercontinental (%)	For given year and given country, number of scheduled seats available for all traffic in small aircraft flying between country and origins and destinations outside Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and origins or destinations outside Africa.	National	Derived	at41*100/at04
	at41	Seats on aircraft size small, intercontinental (number)	For given country and year, estimated scheduled seats in small aircraft on routes with origins or destinations outside the African continent.	National	Raw	
	at58	Seats on aircraft size small, international within Africa (%)	For given year and given country, number of scheduled seats available for all traffic in small aircraft flying between country and international origins and destinations within Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and international origins or destinations within Africa.	National	Derived	at42*100/at07
	at42	Seats on aircraft size small, international within Africa (number)	For given country and year, estimated scheduled seats in small aircraft four routes with international origins or destinations within Africa.	National	Raw	
	at59	Seats on aircraft size unknown (%)	For given year and given country, number of scheduled seats available for all traffic in aircraft of unknown size divided by number of scheduled seats available in all aircraft of all sizes.	National	Derived	at43*100/at10

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Technical	at43	Seats on aircraft size unknown (number)	For given country and year, estimated scheduled seats in aircraft of unknown size.	National	Derived	at31+at32+at33
	at47	Seats on aircraft size unknown, domestic (%)	For given year and given country, number of domestic scheduled seats available for all traffic in aircraft of unknown size divided by number of domestic scheduled seats available in all aircraft of all sizes.	National	Derived	at031*100/at01
	at31	Seats on aircraft size unknown, domestic (number)	For given country and year, estimated scheduled seats in aircraft of unknown size on routes strictly within the country.	National	Raw	
	at48	Seats on aircraft size unknown, intercontinental (%)	For given year and given country, number of scheduled seats available for all traffic in aircraft of unknown size flying between country and origins and destinations outside Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and origins or destinations outside Africa.	National	Derived	at32*100/at04
	at32	Seats on aircraft size unknown, intercontinental (number)	For given country and year, estimated scheduled seats in aircraft of unknown size on routes with origins or destinations outside the African continent.	National	Raw	
	at49	Seats on aircraft size unknown, international within Africa (%)	For given year and given country, number of scheduled seats available for all traffic in aircraft of unknown size flying between country and international origins and destinations within Africa divided by number of scheduled seats available in all aircraft of all sizes flying between country and international origins or destinations within Africa.	National	Derived	at33*100/at07
	at33	Seats on aircraft size unknown, international within Africa (number)	For given country and year, estimated scheduled seats in aircraft of unknown size four routes with international origins or destinations within Africa.	National	Raw	
	at28	Airlines in country with IOSA registry (% on total)	For given country and year, percentage of number of airlines in country providing scheduled passenger service having passed the IATA IOSA audit and being in the IATA registry.	National	Derived	100*at27/at26
	at27	Airlines in country with IOSA registry (number)	For given country and year, number of airlines in country providing scheduled passenger service having passed the IATA IOSA audit and being in the IATA registry.	National	Raw	
	at29	Country appears on EU blacklist (Yes= 1, No = 0)	Binary indicator showing if any airline of a country appears on the EU blacklist of airlines not allowed to fly into any EU country.	National	Raw	
	at30	FAA IASA Audit Category (0 = none, 1 = pass, 2 = fail)	An indicator showing if the country has either (1) passed the U.S. FAA IASA safety audit, (2) failed the U.S. FAA safety audit, or (3) never been audited by the U.S. FAA IASA program.	National	Raw	
Institutional	at78	Airside investment, planned for the next 10 years, main airport (LCU)	Investments planned for the next ten years in airside infrastructures such as runways, taxiways, lighting, navigation installations, radar, etc. in local currency units.	Airport	Raw	

Policy	Temporary Code	Indicator Name	Definition (to be finalized)	Level	Raw/ Derived	Formula
Institutional	at94	Airside investment, planned for the next 10 years, main airport (USD)	Investments planned for the next ten years in airside infrastructures such as runways, taxiways, lighting, navigation installations, radar, etc. in U.S. dollars.	Airport	at78/ x003	
	at77	Airside Investment, planned for the next 5 years, main airport (LCU)	Investments planned for the next five years in airside infrastructures such as runways, taxiways, lighting, navigation installations, radar, etc. in local currency units.	Airport	Raw	
	at93	Airside investment, planned for the next 5 years, main airport (USD)	Investments planned for the next five years in airside infrastructures such as runways, taxiways, lighting, navigation installations, radar, etc., in U.S. dollars.	Airport	at77/ x003	
	at76	Government anticipates private investment for terminal capacity expansion in next 10 years, main airport (Yes= 1, No = 0)	Binary indicator for given country and given year that with value 1 shows that Government anticipates private investment for terminal capacity expansion in next 10 years at the main airport, and value 2 that the Government does not.	Airport	Raw	
	at74	Investment on terminals, planned for coming 10 years, main airport (LCU)	Investments planned for the next ten years in passenger terminals, in local currency units.	Airport	Raw	
	at95	Investment on terminals, planned for coming 10 years, main airport (US$)	Investments planned for the next ten years in existing or new passenger terminals, in U. S. dollars.	Airport	Derived	at74/x003
	at75	Investment on terminals, planned for coming 5 years, main airport (LCU)	Investments planned for the next five years in passenger terminals, in local currency units.	Airport	Raw	
	at96	Investment on terminals, planned for coming 5 years, main airport (USD)	Investments planned for the next five years in existing or new passenger terminals, in U. S. dollars.	Airport	Derived	at75/x003

Note: LCU = local currency unit; International Air Transport Association = IATA; IATA Operational Safety Audit = IOSA; European Union = EU; U.S. Federal Aviation Authority = FAA.

Annex A12.2 Target institutions

Table A12.2a Target institutions for national data collection template

Country	Name of civil aviation authority	Main international airports	Airport Code
Algeria	Department of Civil Aviation and Meteorology	Algiers	ALG
Angola	Department of Civil Aviation	Luanda	LAD
Benin	National Civil Aviation Administration	Cotonou	COO
Botswana	Civil Aviation Department	Gaborone	GBE
Burkina Faso	Directorate of Civil Aviation	Ouagadougou	OUA
Burundi	Ministry of Transport & Telecommunications	Bujumbura	BJM
Cameroon	Cameroon Civil Aviation Authority (CCAA)	Yaoundé	YAO
	Aeroports du Cameroun (ADC)	Douala	DLA
Cape Verde	Civil Aviation Department	Praia	RAI
Central African Republic	Ministry of Transport and Civil Aviation	Bangui	BGF
Chad	Directorate of Civil Aeronautics	Ndjamena	NDJ
Comoros	National Civil Aviation Administration	Anjouan	AJN
Congo Republic	National Agency of Civil Aviation (ANAC)	Brazzaville	BZV
Côte d'Ivoire	National Agency of Civil Aviation	Abidjan	ABJ
Djibouti	Directorate of Civil Aviation and Meteorology	Djibouti	JIB
Congo, Dem. Rep. of	Directorate of Civil Aeronautics	Kinshasa	FIH
Egypt	Egypt's Civil Aviation Authority (ECAA)	Cairo	CAI
Equatorial Guinea	Ministry of Communications and Transport	Malabo	SSG
Eritrea	Civil Aviation Authority	Assab	ASA
Ethiopia	Civil Aviation Authority	Addis Ababa	ADD
Gabon	Civil Aviation Department	Libreville	LBV
Gambia	Civil Aviation Authority	Banjul	BJL
Ghana	Civil Aviation Authority	Accra	ACC
Guinea	National Civil Aviation Administration	Conakry	CKY
Kenya	Directorate of Civil Aviation	Nairobi, Jomo Kenyatta	NBO
Lesotho	Department of Civil Aviation	Maseru	MSU
Liberia	National Civil Aviation Administration	Monrovia (Spriggs Payne)	MLW
Libya	Libyan Civil Aviation Authority	Tripoli	TIP
Madagascar	Aviation Civile de Madagascar	Antaninvarivo	TNR
Malawi	Department of Civil Aviation	Lilongwe	LLW
Mali	Directorate of Civil Aviation	Bamako	BKO
Mauritania	National Civil Aviation Administration	Nouakchott	NKC
Mauritius	Department of Civil Aviation	Mauritius	MRU
Morocco	Directorate of Civil Aeronautics	Casablanca	CMN
Mozambique	Directorate of Civil Aviation	Maputo	MPM

Country	Name of civil aviation authority	Main international airports	Airport Code
Namibia	Directorate of Civil Aviation	Windhoek	WDH
Niger	Direction de l'Aviation Civile	Niamey	NIM
Nigeria	Civil Aviation Authority	Lagos	LOS
Rwanda	Rwanda Civil Aviation Administration (RCCA)	Kigali	KGL
São Tomé and Príncipe	National Civil Aviation Administration	Sao Tome Is.	TMS
Senegal	Agence Nationale de l'Aviation Civile	Dakar	DKR
Seychelles	National Civil Aviation Administration	Mahe Island	SEZ
Sierra Leone	Sierra Leone Airport Authority	Freetown	FNA
South Africa	South African Civil Aviation Authority	Johannesburg	JNB
Sudan	Civil Aviation Authority	Khartoum	KRT
Swaziland	Swaziland Civil Aviation Authority	Manzini	MTS
Tanzania	Civil Aviation Authority	Julius Nyerere	DAR
Togo	Directorate of Civil Aviation	Lomé	LFW
Tunisia	Office de l'Avion Civile et des Aeroports	Tunis	TUN
Uganda	Civil Aviation Authority	Entebbe	EBB
Zambia	Department of Civil Aviation	Lusaka	LUN
Zimbabwe	Department of Civil Aviation	Harare	HRE

Table A12.2b Target institutions for national data collection template

Country	City	Code	Country	City	Code
Algeria	Adrar	AZR	Cape Verde	Boa Vista	BVC
	Algiers	ALG		Fogo	SFL
	Annaba	AAE		Maio	MMO
	Batna	BLJ		Praia	RAI
	Bechar	CBH		Sal Island	SID
	Bejaia	BJA		Santo Antao	NTO
	Biskra	BSK		Sao Nicolau	SNE
	Bordj Badji Mokhtar	BMW		Sao Vicente	VXE
	Chlef	CFK	Central African Republic	Bangui	BGF
	Constantine	CZL	Chad	Ndjamena	NDJ
	Djanet	DJG	Comoros	Anjouan	AJN
	El Golea	ELG		Dzaoudzi	DZA
	El Oved	ELU		Moheli	NWA
	Ghardala	GHA		Moroni	HAH
	Ghriss	MUW		Moroni (Hahaya/Iconi)	YVA
	Hassi Messaoud	HME	Congo, Rep. of	Brazzaville	BZV
	Illizi	VVZ		Impfondo	ION
	In Amenas	IAM		Loubomo	DIS
	In Salah	INZ		Nkayi	NKY
	Jijel	GJL		Ouesso	OUE
	L'Mekrareg	LOO		Pointe Noire	PNR
	Mechria	MZW	Congo, Dem. Rep. of	Boma	BOA
	Oran	ORN		Gbatolite	BDT
	Ouargla	OGX		Gemana	GMA
	Setif	QSF		Goma	GOM
	Tamanrasset	TMR		Kalemie	FMI
	Tbessa	TEE		Kananga	KGA
	Tiaret	TID		Kindu	KND
	Timimoun	TMX		Kinshasa	FIH
	Tindouf	TIN		Kisangani	FKI
	Tlemcen	TLM		Kolwezi	KWZ
	Touggourt (Sidi Mahdi),	TGR		Lubumbashi	FBM
Angola	Cabinda	CAB		Matadi	MAT
	Catumbela	CBT		Matari	IRP
	Dundo	DUE		Mbandaka	MDK
	Huambo (Nova Lisboa)	NOV		Mbuji Mayi	MJM
	Luanda	LAD		Moanda	MNB

Country	City	Code	Country	City	Code
Angola	Lubango	SDD	Côte d'Ivoire	Abidjan	ABJ
	Malange	MEG		Tingrela	TGX
	M'banza Congo	SSY	Djibouti	Djibouti	JIB
	Menogue	SPP	Egypt	Abu Simbel	ABS
	Namibe (Mocamedes New Airport)	MSZ		Al Arish	AAC
	Negage	GXG		Alexandria	ALY
	Ongiva	VPE		Assiut	ATZ
	Soyo	SZA		Aswan	ASW
Benin	Cotonou	COO		Borg El Arab (Alexandria)	HBE
Botswana	Francistown	FRW		Cairo	CAI
	Gaborone	GBE		Dakhla	DAK
	Kasane	BBK		Hurghada	HRG
	Maun	MUB		Kharga	UVL
	Tuli Lodge	TLD		Luxor	LXR
Burkina Faso	Bobo-Dioulasso	BOY		Marsa Alam	RMF
	Ouagadougou	OUA		Mersa Matruh	MUH
Burundi	Bujumbura	BJM		Sharm El Sheikh	SSH
Cameroon	Bafoussam	BFX		Taba	TCP
	Douala	DLA		Port Said	PSD
	Garoua	GOU		St. Catherine	SKV
	Marova	MVR		Tor Sinai	ELT
	Bamenda	BPC	Equatorial Guinea	Bata	BSG
	Bertoua	BTA		Malabo	SSG
	Ngaoundere	NGE	Eritrea	Asmara	ASM
	Yaounde	NSI		Assab International Airport	ASA
				Massawa	MSW
Ethiopia	Addis Ababa	ADD	Liberia	Monrovia	ROB
	Arba Mintch	AMH		Monrovia (Spriggs Payne)	MLW
	Asosa	ASO		Al Bayda, La Abraq	LAQ
	Axum	AXU		Benghazi	BEN
	Bahir Dar	BJR		Brack	BCQ
	Beica	BEI		Ghadames	LTD
	Beles	PWI		Ghat	GHT
	Debra Marcos	DBM		Houn	HUQ
	Debra Tabor	DBT		Kufrah	AKF
	Dembidollo	DEM		Misurata	MRA
	Dessie	DSE		Mitiga	MJI

Country	City	Code	Country	City	Code
Ethiopia	Dire Dawa	DIR	Liberia	Sebha	SEB
	Gambela	GMB		Sert	SRX
	Goba	GOB		Tobruk	TOB
	Gode/Iddidole	GDE		Tripoli	TIP
	Gondari	GDQ	Madagascar	Ambanja	IVA
	Gore	GOR		Ambatomainty	AMY
	Humera	HUE		Ambatondrazaka	WAM
	Indaselassie	SHC		Analalava	HVA
	Jijiga	JIJ		Ankavandra	JVA
	Jimma	JIM		Antalaha/Antsirabato	ANM
	Jinka	BCO		Antaninvarivo	TNR
	Kabri Dar	ABK		Antsalova	WAQ
	Lalibela	LLI		Antsiranana	DIE
	Makale	MQX		Antsohihy	WAI
	Mekane Selam	MKS		Belo	BMD
	Mizan Teferi	MTF		Besalampy	BPY
	Neghelli	EGL		Farafangana	RVA
	Shillavo	HIL		Fianarantsoa	WFI
	Tippi	TIE		Fort Dauphin	FTU
	Tum	TUJ		Mahanoro	VVB
Gabon	Franceville	MVB		Maintirano	MXT
	Gamba	GAX		Majunga	MJN
	Koulamoutou	KOU		Mampikony	WMP
	Libreville	LBV		Manakara	WVK
	Makokou	MKU		Mananara	WMR
	Mayoumba	MYB		Mananjary	MNJ
	Moanda	MFF		Mandritsara	WMA
	Mouila	MJL		Manja	MJA
	Ndjole	KDJ		Maroantsetra	WMN
	Omboue	OMB		Miandrivazo	ZVA
	Oyem	OYE		Morafenobe	TVA
	Port Gentil	POG		Morambe	MXM
	Tchibanga	TCH		Morondava	MOQ
Gambia	Banjul	BJL		Nossi-be	NOS
Ghana	Accra	ACC		Port Berge	WPB
	Kumasi	KMS		Sambava	SVB
	Sunyani	NYI		Sante Marie	SMS

Country	City	Code	Country	City	Code
Ghana	Tamale	TML	Madagascar	Soalala	DWB
Guinea	Conakry	CKY		Tamatave	TMM
Guinea-Bissau	Bissau	OXB		Tambohorano	WTA
Kenya	Amboseli	ASV		Tsaratanana	TTS
	Eldoret	EDL		Tsiroanomandidy	WTS
	Kisumu	KIS		Tulear	TLE
	Kiwayu	KWY		Vatomatry	VAT
	Lamu	LAU		Vohemar	VOH
	Lokichoggio	LKG	Malawi	Blantyre	BLZ
	Malindi	MYD		Chelinda	CEH
	Mara Lodges	MRE		Club Makokola	CMK
	Mombasa	MBA		Karonga	KGJ
	Nairobi, Jomo Kenyatta Intl	NBO		Lilongwe	LLW
	Nairobi, Wilson	WIL		Mvuu Camp	VUU
	Nanyuki	NYK		Mzuzu	ZZU
	Samburu	UAS		Salima	LMB
Lesotho	Maseru	MSU			
Mali	Bamako	BKO	Namibia	Tsumeb	TSB
	Gao	GAQ		Walvis Bay	WVB
	Goundam	GUD		Windhoek	WDH
	Kayes	KYS		Windhoek (Eros)	ERS
	Kenieba	KNZ	Niger	Agades	AJY
	Mopti	MZI		Niamey	NIM
	Nioro	NIX	Nigeria	Abuja	ABV
	Tombouctou	TOM		Benin City	BNI
	Yelimane	EYL		Calabar	CBQ
Mauritania	Aioun El Atrouss	AEO		Enugu	ENU
	Kiffa	KFA		Ibadan	IBA
	Nema	EMN		Ilorin	ILR
	Nouadhiba	NDB		Jos	JOS
	Nouakchott	NKC		Kaduna	KAD
	Selibaby	SEY		Kano	KAN
	Tioljikja	TIY		Lagos	LOS
	Zouerate	OUZ		Maiduguri	MIU
Mauritius	Mauritius	MRU		Port Harcourt	PHC
	Rodrigues Island	RRG		Port Harcourt	PHG
Morocco	Agadir	AGA		Qwerri	QOW

Country	City	Code	Country	City	Code
Morocco	Al Hoceima	AHU	Nigeria	Sokoto	SKO
	Casablanca, Anfa	CAS		Warri	QRW
	Casablanca, Mohamed V	CMN		Yola	YOL
	Dakhla	VIL	Rwanda	Gisenyi	GYI
	Er Rachidia	ERH		Kamembe	KME
	Essaouira	ESU		Kigali	KGL
	Fez	FEZ	São Tomé and Príncipe	Príncipe	PCP
	Goulimime	GLN		São Tomé Is.	TMS
	Laayoune	EUN	Senegal	Cap Skirring	CSK
	Marrakech	RAK		Dakar	DKR
	Nador	NDR		Saint Louis	XLS
	Ouarzazate	OZZ		Tambacounda	TUD
	Oujda	OUD		Ziguinchor	ZIG
	Rabat	RBA	Seychelles	Mahe Island	SEZ
	Tan Tan (Plage Blanche)	TTA		Praslin Island	PRI
	Tangier	TNG	Sierra Leone	Freetown, Lungi Intl	FNA
	Tetuan	TTU	Somalia	Berbera	BBO
Mozambique	Bazaruto Island	BZB		Borama	BXX
	Beira	BEW		Bosaso	BSA
	Benguera Island	BCW		Burao	BUO
	Chimoio	VPY		Galcaio	GLK
	Cuamba	FXO		Hargeisa	HGA
	Indigo Bay	IBL		Mogadishu	MGQ
	Inhambane	INH	South Africa	Alexander Bay	ALJ
	Lichinga	VXC		Bloemfontein	BFN
	Lumbo	LFB		Cape Town	CPT
	Maputo	MPM		Durban	DUR
	Nacala	MNC		East London	ELS
	Nampula	APL		George	GRJ
	Pemba	POL		Hoedspruit	HDS
	Quelimane	UEL		Johannesburg	JNB
	Tete	TCV		Kimberley	KIM
	Tete	TET		Kleinzee	KLZ
	Vilanculos	VNX		Lanseria	HLA
Namibia	Lianshulu	LHU		Mala Mala	AAM
	Luderitz	LUD		Malelane	LLE
	Mokuti Lodge	OKU		Margate	MGH

Country	City	Code	Country	City	Code
Namibia	Mpacha	MPA	South Africa	Mmabatho, Bophuthatswana (Int'l)	MBD
	Ondangwa	OND		Nelspruit	MQP
	Oranjemund	OMD		Nelspruit	NLP
	Rosh Pina	RHN		Phalaborwa	PHW
	Sesriem	SZM		Pietermaritzburg	PZB
	Swakopmund	SWP		Pietersburb	PTG
South Africa	Plettenburg Bay	PBZ	Tanzania	Pemba, Wawi	PMA
	Port Elizabeth	PLZ		Seronera	SEU
	Richards Bay	RCB		Shunyanga	SHY
	Skukuza	SZK		Tabora	TBO
	Springbok	SBU		Zanzibar, Kisauni	ZNZ
	Sun City	NTY	Togo	Lome	LFW
	Ulundi	ULD	Tunisia	Djerba	DJE
	Umtata	UTT		Gafsa	GAF
	Upington	UTN		Monastir	MIR
Sudan	Dongola	DOG		Sfax (Thyna)	SFA
	El Fasher	ELF		Tabarka	TBJ
	El Obeid	EBD		Tozeur	TOE
	Geneina	EGN		Tunis	TUN
	Juba	JUB	Uganda	Arua	RUA
	Khartoum	KRT		Entebbe	EBB
	Malakal	MAK		Gulu	ULU
	Merave	MWE		Jinja	JIN
	Nyala	UYL		Kasese	KSE
	Port Sudan	PZU		Moyo	OYG
	Rumbek	RBX		Pakuba	PAF
	Wadi Halfa	WHF	Zambia	Chipata	CIP
	Wau	WUU		Kasaba Bay	ZKB
Swaziland	Manzini	MTS		Kasama	KAA
Tanzania	Arusha	ARK		Kasompe	ZKP
	Bukoba	BKZ		Kitwe	KIW
	Dar Es Salaam	DAR		Livingstone	LVI
	Dodoma	DOD		Lusaka	LUN
	Kigoma	TKQ		Mangu	MNR
	Kilimanjaro	JRO		Mansa	MNS
	Kilwa	KIY		Mfume	MFU
	Lake Manyara	LKY		Ndola	NLA

Country	City	Code	Country	City	Code
Tanzania	Lindi	LDI	Zambia	Solwesi	SLI
	Mafia	MFA	Zimbabwe	Bulawayo	BUQ
	Mtwara	MYW		Harare	HRE
	Musoma	MUZ		Hwange Nat Park	HWN
	Mwanza	MWZ		Kariba	KAB
	Nachingwea	NCH		Victoria Falls	VFA

Annex A12.3 Data collection templates

Air transport template A. Collection from civil aviation association or main international airport

Country:
Sector: Ports
Utility Name: Non-applicable

Name of Data Collector:
Period of Data Collection:
Source Institution:
Name of Interviewee:

Policy Category	Temp Code	Indicator Name	New		History		
			2011	2010	2009	2008	2007
Access	at67	Terminals, Domestic, main airport (number)					
	at68	Terminals, International, main airport (number)					
	at69	Terminals, Mixed Use, main airport (number)					
	at70	Terminal Capacity, Domestic, main airport (passengers)					
	at71	Terminal Capacity, International, main airport (passengers)					
Pricing	at79	Passenger Charges per Ticket, Domestic (LCU)					
	at80	Passenger Charges per Ticket, International (LCU)					
	at81	Fuel Price, main airport (LCU per Liter)					
	at83	Parking Grace Period, main airport (hours)					
Usage	at63	Passengers, Domestic (number)					
	at64	Passengers, International (number)					
	at65	Passengers, Domestic, main airport (number)					
	at66	Passengers, International, main airport (number)					
Institutional	at74	Investment on terminals, planned for coming 10 years, main airport (LCU)					
	at75	Investment on terminals, planned for coming 5 years, main airport (LCU)					
	at76	Government anticipates private investment for terminal capacity expansion in next 10 years, main airport (Yes= 1, No = 0)					
	at77	Airside Investment, planned for the next 5 years, main airport (LCU)					
	at78	Airside Investment, planned for the next 10 years, main airport (LCU)					
Financial	at72	Revenues from Overflight Charges, cumulative annual (LCU)					
	at73	Revenues from all charges from all airports, cumulative annual (LCU)					

Annex A12.4 Sample SQL code for analysis of SRS data

The data description of each of the indicators discussed in the text needs to be translated into SQL queries for the actual calculations. Shown here is a sample of what a series of SQL queries might look like for determining the number of airports being served in North Africa and Sub-Saharan Africa. The basis of the queries is the data shown earlier. The main data table is named "tblFlightsAllYears." The result of the queries is a table appearing at the end of the query samples.

Step 1, Primary query (saved as qry_410a_No_of_Airports_Served_01):

```
SELECT tblFlightsAllYears.Org AS Airport,
tblFlightsAllYears.Year, tblCountries.World-
BankRegion
FROM tblFlightsAllYears INNER JOIN (tblCoun-
tries INNER JOIN tblAirportsMasterList ON
tblCountries.CountryCode = tblAirportsMasterL-
ist.CountryCode) ON tblFlightsAllYears.Org =
tblAirportsMasterList.Code
GROUP BY tblFlightsAllYears.Org, tblFlight-
sAllYears.Year, tblCountries.WorldBankRegion
HAVING (((tblCountries.WorldBankRegion)="SSA"
Or (tblCountries.WorldBankRegion)="NA"))
UNION ALL SELECT tblFlightsAllYears.Dst AS
Airport, tblFlightsAllYears.Year, tblCoun-
tries.WorldBankRegion
FROM (tblCountries INNER JOIN tblAirports-
MasterList ON tblCountries.CountryCode =
tblAirportsMasterList.CountryCode) INNER JOIN
tblFlightsAllYears ON tblAirportsMasterList.
Code = tblFlightsAllYears.Dst
GROUP BY tblFlightsAllYears.Dst, tblFlight-
sAllYears.Year, tblCountries.WorldBankRegion
HAVING (((tblCountries.WorldBankRegion)="SSA"
Or (tblCountries.WorldBankRegion)="NA"));
```

Step 2, secondary query (saved aqry_410b_No_of_Airports_Served_02):

```
SELECT qry_410a_No_of_Airports_Served_01.Air-
port, qry_410a_No_of_Airports_Served_01.Year,
qry_410a_No_of_Airports_Served_01.WorldBank-
Region
FROM qry_410a_No_of_Airports_Served_01
GROUP BY qry_410a_No_of_Airports_Served_01.
Airport, qry_410a_No_of_Airports_Served_01.
Year, qry_410a_No_of_Airports_Served_01.World-
BankRegion;
```

Step 3, which uses the previous as follows (saved as qry_410b_No_of_Airports_Served_02_Crosstab):

```
TRANSFORM Count(qry_410b_No_of_Airports_
Served_02.Airport) AS CountOfAirport
SELECT qry_410b_No_of_Airports_Served_02.
WorldBankRegion
FROM qry_410b_No_of_Airports_Served_02
GROUP BY qry_410b_No_of_Airports_Served_02.
WorldBankRegion
PIVOT qry_410b_No_of_Airports_Served_02.Year;
```

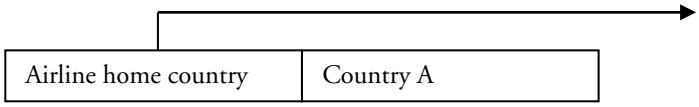
The final result appears as shown:

qry_410b_No_of_Airports_Served_02_Crosstab			
WorldBankRegion	2001	2004	2007
NA	77	73	71
SSA	318	276	261

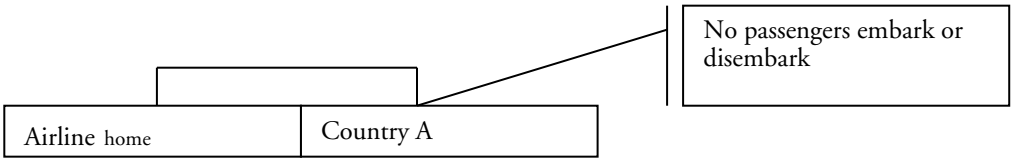
Annex A12.5 Analysis of freedoms of the air

ICAO defines nine freedoms of the air, which are found in (usually bilateral) air services agreements forged between countries. The first five are internationally recognized by treaty. The last four are concepts developed by ICAO.

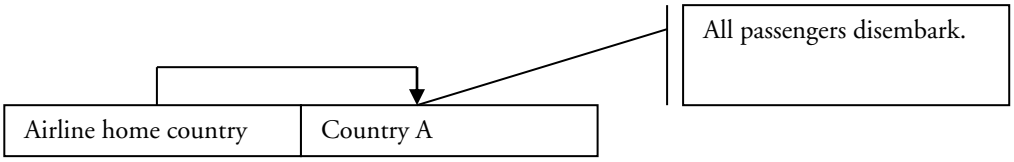
(1) First freedom of the air: Airline of home country can overfly another country (country A).



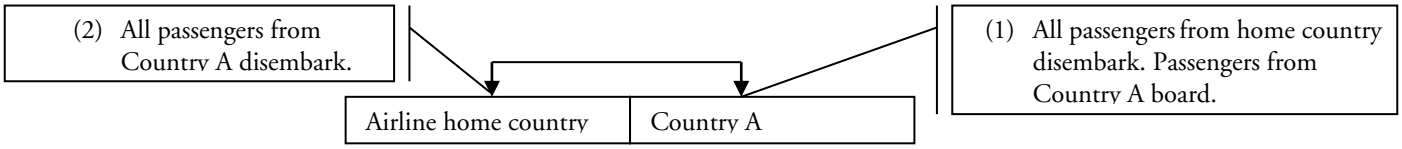
(2) Second freedom of the air: Airline of home country can do a technical stop for fuel, maintenance, supplies, and so on in another country (country A).



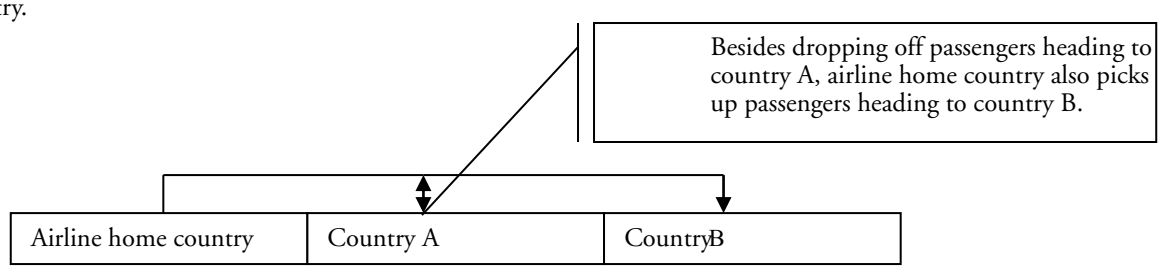
(3) Third freedom of the air: Airline of home country can land in another country (country A) to drop off passengers from home country.



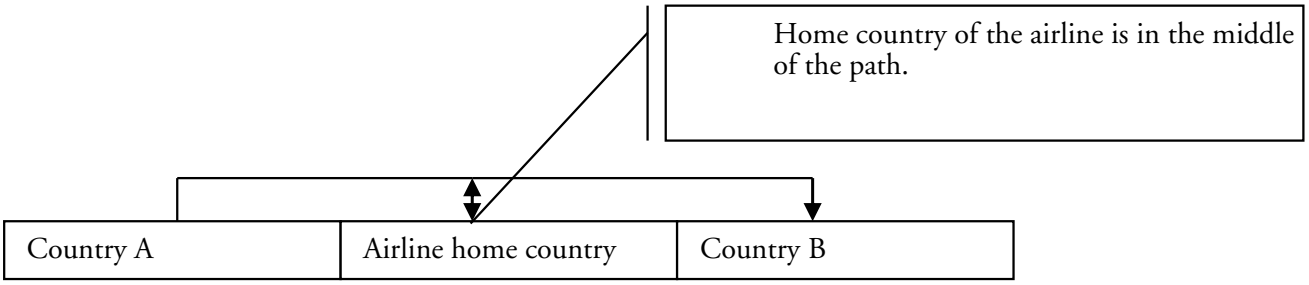
(4) Fourth freedom of the air: Airline of home country can land in another country (country A) to drop off passengers from home country and pick up passengers from country A going to home country.



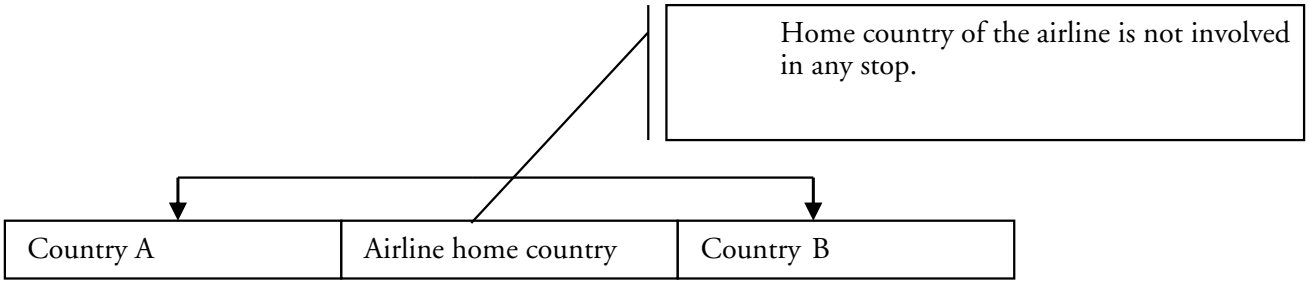
(5) Fifth freedom of the air: Airline of home country can pick up and drop off passengers in country A, with some passengers boarding in country A going to a third country C. The caveat is that this is an ongoing operation originating (or terminating) in the home country.



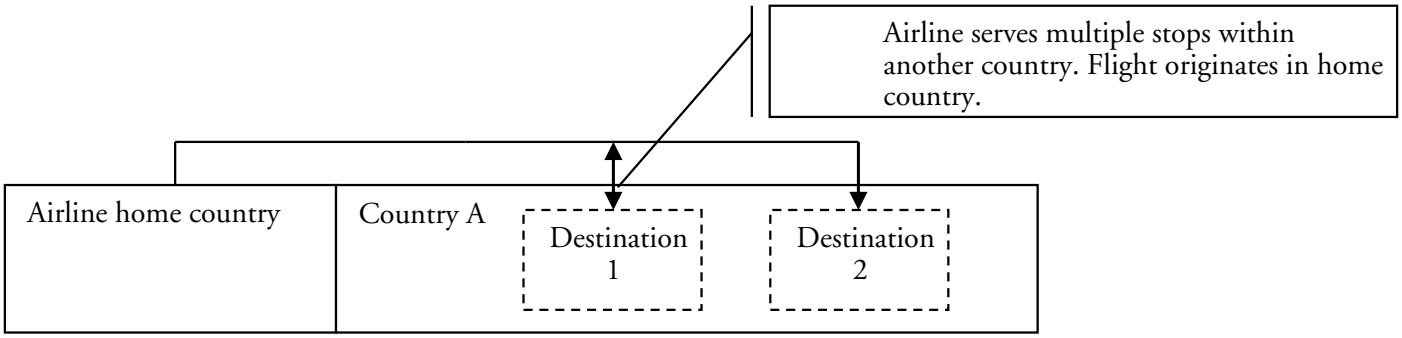
(6) Sixth freedom of the air: Traffic originates (or terminates) outside home country (say country A), and goes to (or comes from) a second country (say country B) via a stop at the home country of the airline.



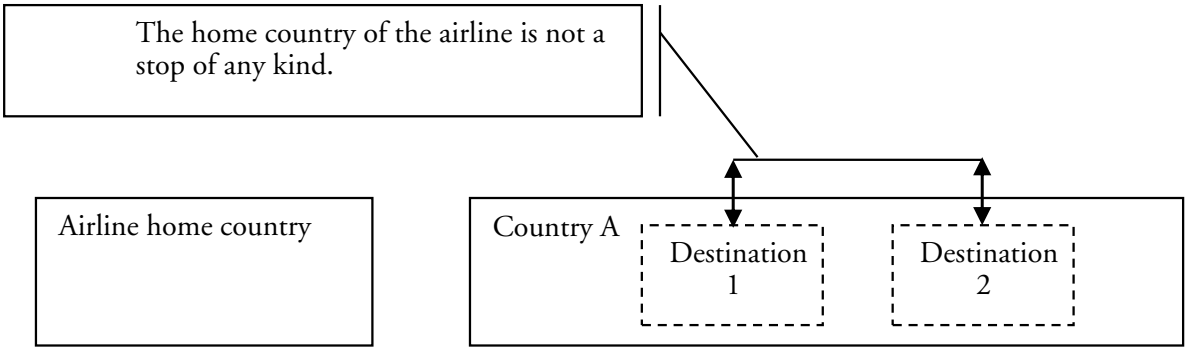
(7) Seventh freedom of the air: Airline from home country can travel between country A and country B without the home country being in the path (that is, no stop at the home country in any leg).



(8) Eighth freedom of the air: Airline from home country can serve several destinations in another country A in one flight, both picking up up and dropping off passengers, as long as the flight originates or terminates in home country.



(9) Ninth freedom of the air (also referred to as cabotage): Airline from home country services domestic stops within another country, without the home country being part of the flight.



Section 5

Household Viewpoint

13. Household Surveys

13.1 Motivation

Coverage of modern infrastructure services has been stagnant since the mid-1990s and remains strongly skewed toward more affluent households. In urban areas, those who fail to hook up to nearby networks form a significant share of the unserved population, suggesting that demand-side barriers are also at work. In these circumstances, the key questions are whether African households can afford to pay for modern infrastructure services, and if not, whether African governments can afford to subsidize them.

A subsistence power or water bill ranges between $2 and $8 a month. This cost is well within the affordable range for most households in Africa's middle-income countries (MICs) and for the more affluent segments that currently enjoy access to utilities in low-income countries (LICs). Affordability however would definitely become an issue for most people in the poorest LICs should access be broadened. African governments already spend $3.9 billion a year (0.6 percent of gross domestic product, GDP) on power and water subsidies that for the most part benefit only a small group of affluent customers. Expanding these levels of subsidy to the entire population would be fiscally unsustainable for most countries.

In the absence of modern infrastructure services, the next best option would be to reach households with lower-cost, second-best solutions such as standposts, improved latrines, or street lighting. The prevalence of these second-best solutions is surprisingly low in Africa, and those that exist tend to cater more to the higher-income groups than to the middle segment of the income distribution. The majority of Africans resort instead to traditional alternatives, such as wells, simple latrines, or kerosene lamps. Significant challenges exist in increasing the coverage of second-best alternatives which, as a public good, cannot operate in commercial basis.

The business-as-usual approach to expanding service coverage in Africa does not appear to be working. Turning this situation around will require rethinking service expansion in a number of ways. First, coverage expansion is not only about network rollout, but also about the need to address demand-side barriers such as high connection charges or legal tenure. Second, cost recovery for household services needs to be improved to ensure that utilities have the financial basis to invest in service expansion. Third, rethinking the design of utility subsidies to better target them and to accelerate service expansion is desirable. Fourth, any approach must consider the actual level of service that households can afford to pay for, or that governments can afford to subsidize, and put greater emphasis on second-best alternatives to modern infrastructure services.

13.2 Tracking Performance

Demand-side indicators of household access to infrastructure services are essential for guiding and evaluating policy on access to services and associated subsidies. Such indicators are necessary to measure the distributional and welfare impact of policy reforms or investments that change the coverage, price, or quality of infrastructure services. Furthermore, these data are essential for evaluating a country's progress toward achieving the infrastructure millenium development goals (World Bank 2004).

Such demand-side information provides a useful complement to the more supply-side indicators of service coverage from utilities. Statistics on the coverage of infrastructure services are typically based on data provided by utility companies and other service providers. While these supply-side data are important, they suffer from a number of limitations. Supply-side data usually focus on the level of coverage and development of networks, overlooking actual service hook-ups by households (particularly in poor and rural areas). Furthermore, data provided by utility companies tend to ignore informal service options and information on illegal connections, which are particularly relevant for the poor (Komives and others 2003; Scott 2003; Clarke and Wallsten 2003; Gómez-Lobo and others 2000). Finally, utility coverage data do not include information on the socioeconomic profile of connected households, and thus cannot be used to support analysis of poverty and inequality in relation to infrastructure service provision.

Demand- and supply-side measures of access can give significantly different results, and for good reason, since the two capture different realities. Demand-side measures of access to utility services are often significantly higher than supply-side ones because, in addition to the formal customers of the main utilities, they capture information on informal and clandestine

customers as well as the small-scale provisions of households themselves (that is, self-generated power) and of independent providers.

There are two obvious sources of demand-side data: population censuses and household surveys. Population censuses are the most representative demand-side instruments. But they are conducted at most once every 10 years and are expensive to implement. Census data include the basic demographic information and questions about the quality of housing and infrastructure, and also valuable information on the location of households and their proximity to physical infrastructure. Census data do not contain income or expenditure information, making it difficult, although not impossible, to establish a correlation between infrastructure services and the poverty status of households.[21] In contrast, multitopic household surveys are more frequently conducted and allow for the cross-tabulation of infrastructure access and poverty status.

There are two broad categories of household surveys relevant for infrastructure policy analysis: the Demographic and Health Survey/Multiple Indicator Cluster Survey (DHS/MICS) and the Living Standards Measurement Study/Income and Expenditure Survey (LSMS/IES). The first group of surveys (DHS/MICS), designed to track basic health and social indicators, covers many countries and usually repeated on a regular basis (every 3-5 years). From an infrastructure perspective, these surveys are valuable because they contain detailed information on household access to infrastructure services. They do not, however, provide information on household income (although wealth indices can be created based on household assets to provide a reasonable proxy for income) or on infrastructure spending. The second group of surveys (LSMS/IES) addresses both of these issues and provides the richest source of information on the consumption of infrastructure services by households. Nevertheless, due to their greater complexity, they are not so widely or frequently conducted.

Household surveys have long been used to explore poverty, inequality, and the welfare of vulnerable groups. Their use in understanding access to and the affordability of infrastructure services is somewhat recent but already essential. Household surveys are the only quantitative instrument that can establish a relationship between the use of infrastructure services (affected by socioeconomic variables) and government subsidy policies (Lobo, Foster, and Halpern 2000). Although the coverage of the infrastructure sectors in these surveys is not always as comprehensive as might be wished, the scope and depth of coverage of infrastructure issues has gradually improved over time and by now represents a substantial body of knowledge. The remainder of this section provides a brief synopsis of how these data can be used to create indicators relevant to informing infrastructure social policy.

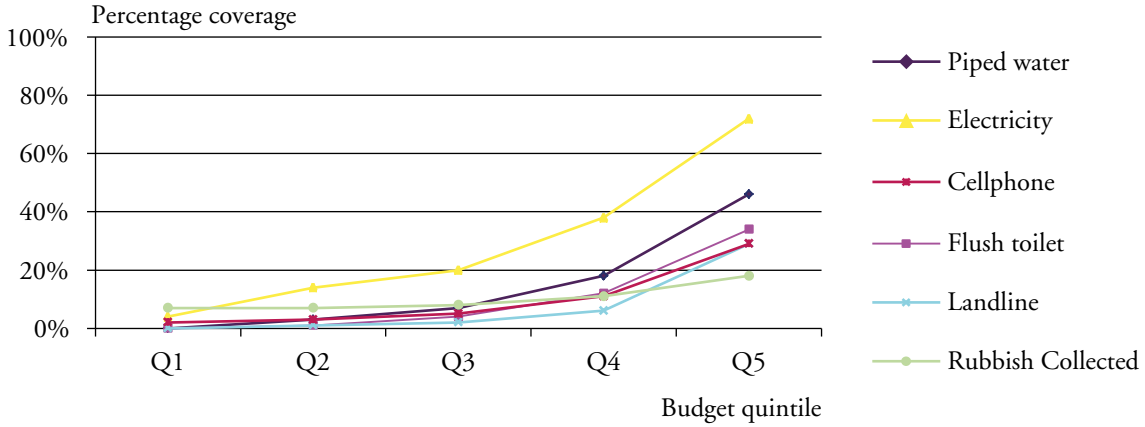
Access

The most fundamental indicator that can be derived from household surveys is that of the percentage of the population with access to a wide range of different infrastructure services. Such services include electricity, telephones, water (whether through private taps, public standposts, wells, or surface water), and sanitation (including flush toilets, improved latrines, traditional latrines, and open defecation). The particular value of the household survey data however is the ease with which they support more complex analysis of access patterns and trends along the following lines:

- *By quintile*. Access rates can be cross-tabulated against measures of income (such as budget quintiles) or wealth (such as asset quintiles). In this way, it is possible to see the degree of inequality in access to infrastructure services across the socioeconomic spectrum. For example, the analysis for Sub-Saharan Africa in the mid-2000s found highly inequitable patterns of access to modern infrastructure services such as piped water, flush toilets, electricity, landline phones, cell phones, and rubbish collection (Figure 13.1). In every case, access rates among the poorest 20 percent of the population averaged less than 10 percent and increased steeply to anywhere between 20 and 60 percent for the richest 20 percent of the population. Even among the richest, access to modern infrastructure services remains far from universal.
- *Time trends*. When multiple household surveys exist across time for a given country, it becomes possible to look at trends in access to infrastructure services over time. For example, the analysis for Sub-Saharan Africa shows that there was scant progress in expanding access to services between the early 1990s and the early 2000s (Figure 13.2). The greatest progress was made in the case of electricity, while access to piped water seems to have declined slightly.

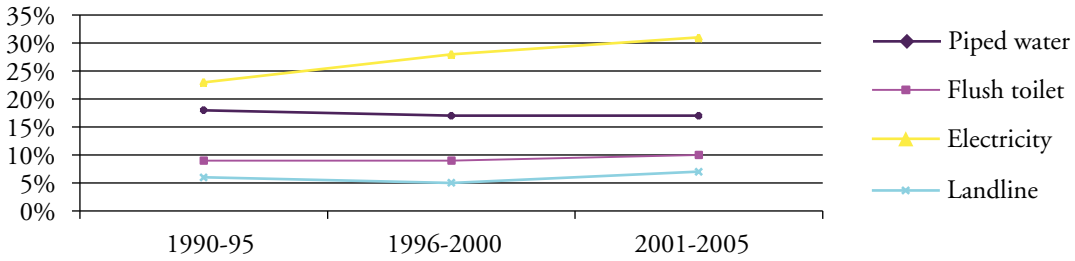
21 Census data can be combined with household budget surveys to create a poverty map, which is a process of imputing income information into the census data set. Although in principle poverty-mapping data could be combined with infrastructure indicators, this is a costly process and research in this direction is nascent. A recent example of poverty, forestry, and infrastructure mapping used in the evaluation of the impact of energy reforms in Azerbaijan is that described in Falkingham and others (2004) and World Bank (2003).

Figure 13.1 Coverage of modern network infrastructure services by budget quintile



Source: Banerjee and others 2008b.

Figure 13.2 Coverage of modern network infrastructure services over time

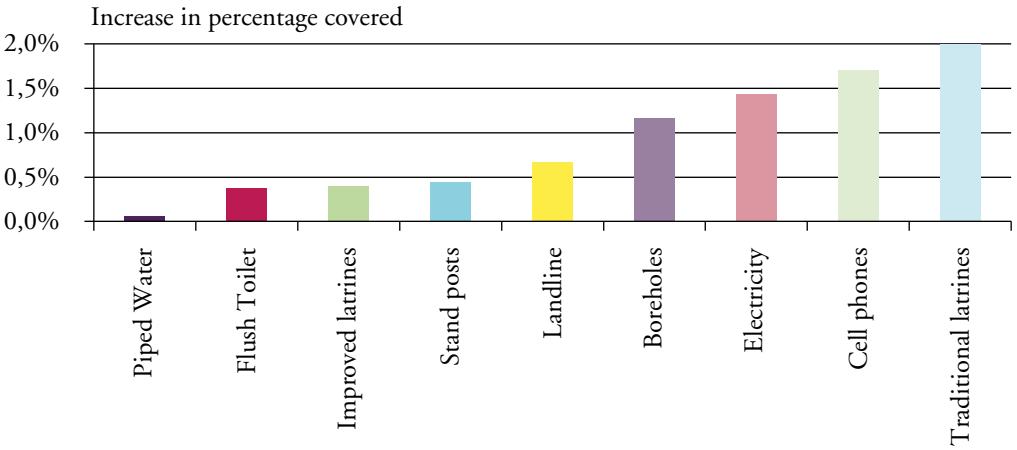


Source: Banerjee and others 2008b.

- *Rate of service expansion*. By analyzing multiple surveys over time, it is possible to estimate and compare the average rate of expansion in the access to services, in terms of the percentage of the population that has been connected each year in the recent past. For example, the analysis for Sub-Saharan Africa shows a wide variation in the rate of expansion of different services (Figure 13.3).

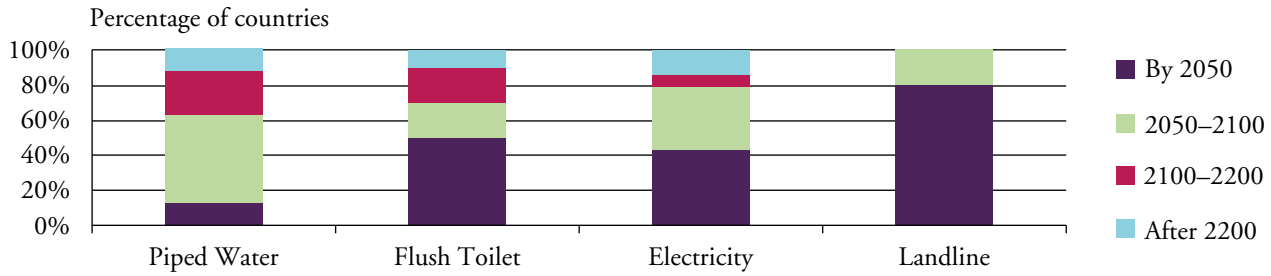
Some of the most rapidly expanding forms of service are boreholes, electricity, cellular telephones, and traditional latrines, with each of these services reaching an annual addition of 1-2 percent of the Sub-Saharan African population. By contrast, services such as piped water, flush toilets, improved latrines, and standposts are hardly growing, at annual expansion rates of less than 0.5 percentage point of the population.

Figure 13.3 Expansion of alternative versus modern services



Source: Banerjee and others 2008b.

Figure 13.4 Projected date of attainment of universal access to services in Sub-Saharan Africa



Source: Banerjee and others 2008b.

- *Time span for achieving universal service*. Once historical trends are established, it becomes possible to project these into the future and estimate the likely date that a country may achieve universal access to any given infrastructure service, under business-as-usual conditions. For example, Figure 13.4 indicates that fewer than half of Sub-Saharan African countries are likely to reach universal access to power and piped water by 2050, unless there is a substantial acceleration in recent access trends.
- Decomposition. An important policy question is why people are not accessing services. In some cases, people may simply live too far from infrastructure networks to be able to connect, and thus face a supply-side constraint. In other cases, people may live close to infrastructure networks yet fail to connect due to demand-side constraints: connection charges may be too high or lack of property tenure may discourage investment. Household surveys sample different clusters of the population, and so by examining people without access in clusters where infrastructure is available, it is possible to untangle the relative importance of demand- and supply-side constraints. For example, the analysis for Sub-Saharan Africa shows that the vast majority of those without access to piped water lack this access due to supply-side factors: they simply live too far away from the relevant infrastructure networks (Table 13.1). In the case of power services, however, a higher proportion of the unserved fails to connect due to demand-side factors.

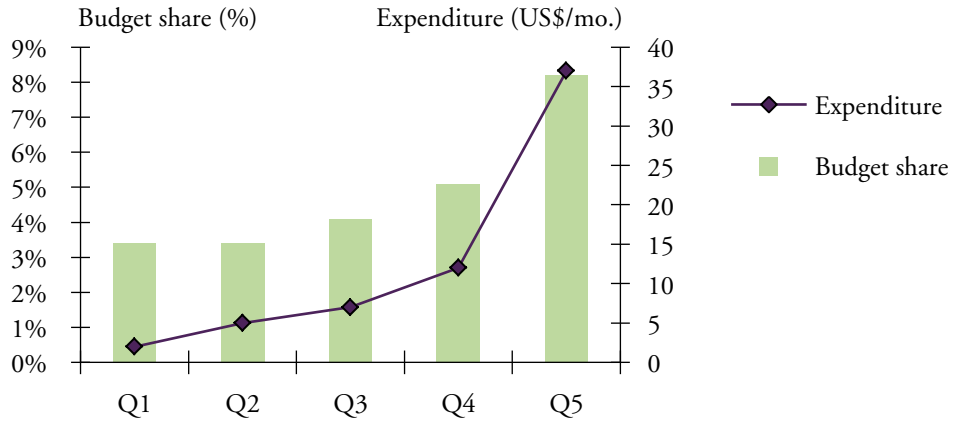
Table 13.1 Proportion of infrastructure coverage gap in urban Africa attributable to demand and supply factors

	Percentage (population-weighted average)				
	Decomposition of coverage*			Proportion of gap**	
Infrastructure	Access	Hook-up	Coverage	Supply	Demand
Piped water					
Low-income countries	68	42	31	86	14
Middle-income countries	91	74	69	64	36
Overall	73	48	38	81	19
Electricity					
Low-income countries	93	73	69	50	50
Middle-income countries	95	86	81	39	61
Overall	93	75	71	48	52

Source: Banerjee and others 2008b.

Note: Access is defined as the percentage of the population that lives physically close to infrastructure. Hook-up is defined as the percentage of the population that connects to infrastructure when it is available. Coverage is defined as the percentage of the population that is receiving the infrastructure service: it is essentially the product of access and hook-up. In calculating the distribution of the infrastructure coverage gap attributable to demand and supply factors, one considers the hook-up rate of the top budget quintile in each geographical area to be an upper bound on potential hook-ups, absent demand-side constraints.

Figure 13.5 Share of household budgets dedicated to infrastructure services as incomes rise



Source: Banerjee and others 2008b.

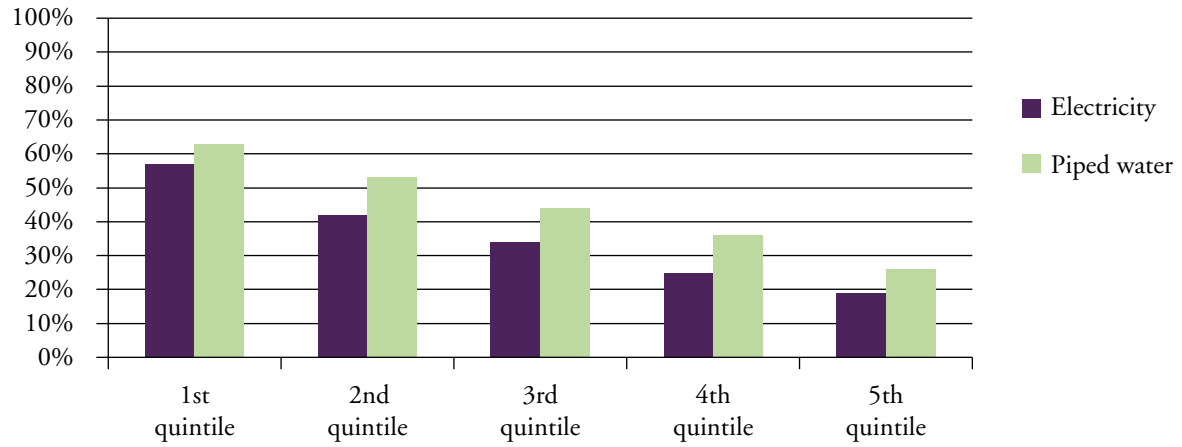
Note: Q = quintile.

Affordability

The other key social policy issue relevant to infrastructure is the extent to which services are affordable to the population, or whether government subsidies may be required. By providing information on expenditure patterns, household surveys can shed considerable light on this issue. The following types of analysis are particularly helpful:

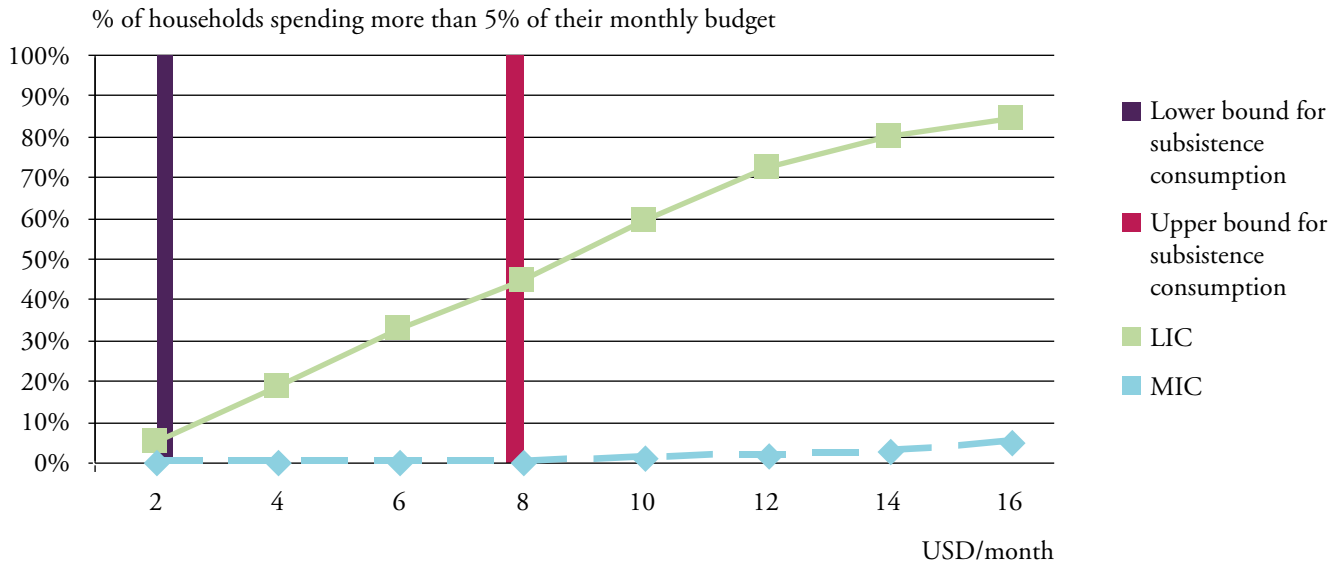
- *Budget shares.* Household surveys report the absolute amounts that households spend on different types of infrastructure services. These can be normalized against the total household budgets to get a sense of the economic burden that these services represent. For example, the analysis of Sub-Saharan Africa found that combined spending on infrastructure services ranges eightfold, from less than $5 per month for the poorest 20 percent of the population to almost $40 per month for the richest 20 percent of the population (Figure 13.5). Nevertheless, the budget shares are much more constant across the bottom 80 percent of the income distribution, with all households dedicating around 4 percent of their budgets to infrastructure services. Only among the richest 20 percent does this share jump to 8 percent.
- *Nonpayment.* Household expenditure services can provide unique insight into the prevalence of clandestine collections and service nonpayment. The reason is that using the survey, it is possible to identify households that are connected to services but do not pay for them. For example, the analysis for Sub-Saharan Africa shows that around 40 percent of the population who receives piped water and electricity services reported not paying for these services during the month of the survey (Figure

Figure 13.6 Share of population with service connections who do not pay for service



Source: Banerjee and others 2008b.

Figure 13.7 Subsistence consumption priced at cost-recovery levels



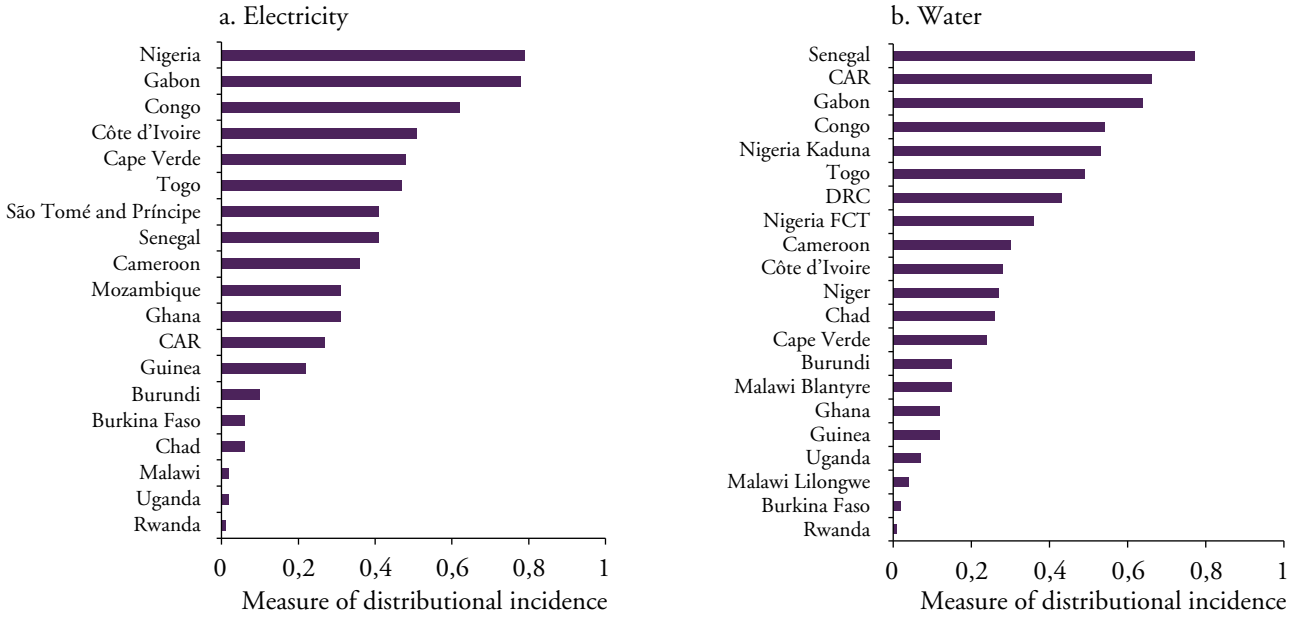
Source: Banerjee and others 2008b.

Note: LIC = low-income country; MIC = middle-income country.

13.6). Nonpayment is significantly higher for piped water than for electricity, and is more prevalent among poorer households.

- *Affordability*. A key policy question is the extent to which tariffs charged for basic infrastructure services render them affordable or unaffordable to the general population. A common assumption is that as long as a household needs to spend no more than 5 percent of its budget to secure a subsistence supply of a service, then that service is affordable. Using household survey evidence on total

Figure 13.8 Electricity and water subsidies that reach the poor (sample of largest national/metropolitan utilities)



Sources: Banerjee and others 2008b; Wodon and others 2007a, 2007b.

Note: A measure of distributional incidence captures the share of subsidies received by the poor divided by the proportion of the population in poverty. A value greater than 1 implies that the subsidy distribution is progressive (propoor), because the share of benefits allocated to the poor is larger than their share in the total population. A value less than 1 implies that the distribution is regressive (prorich). CAR = Central African Republic; DRC = Democratic Republic of Congo.

Table 13.2 Overview of primary household survey indicators

Policy category	Name	Formula	Subcategories	Relevant normalizations	Level of raw data	Suggested aggregation	Source
Access	Population access to service		Urban/rural Quintiles 1–5 Electricity Piped water Public tap or standpost Well or borehole Surface water Flush toilet or septic tank Improved latrines Traditional pit latrines Bucket or pan Other sanitation No sanitation facility/bush Solid waste disposal Landline Cell phone Internet Radio TV	% population	National		Household surveys
	Population take-up of service		Piped water/electricity Urban				
	Usage of fuels for cooking		Urban/rural Quintiles 1–5 Electricity/gas/kerosene Wood/charcoal/other fuels				
Affordability	Household spending		Urban/rural Quintiles 1–5 Electricity Gas Kerosene Wood/charcoal Other fuels Landline Cell phone	$ per month % household spending	National		Household surveys

Source: Own elaboration.

Note: In all cases, population is estimated by multiplying the number of households by the average household size of the country.

household budgets, it becomes possible to estimate what percentage of the population can afford monthly subsistence consumption of water or electricity at the prevailing tariffs. For example, the analysis for Sub-Saharan Africa shows that a monthly bill of $8 would exceed the affordability threshold for about 40 percent of households in the LICs, but would not represent an affordability issue in the MICs (Figure 13.7).

- *Subsidy incidence*. Given the widespread subsidization of infrastructure, it is relevant to ask whether subsidy funds are well targeted to reach poor households. Using household survey evidence on service expenditures, it is possible to estimate how much subsidy is captured by households across the socioeconomic spectrum, and then to calculate measures of distributional incidence. For example, the analysis for numerous Sub-Saharan countries clearly indicates that electricity and water subsidies are highly regressive, as the poor capture a disproportionately low share of these resources (Figure 13.8).

The synopsis of these scenarios highlights some of the key policy issues that can be addressed using household survey data. For more discussion and illustration of how household survey data can be used to inform policy analysis, the reader is referred to the following publication:

- Vivien Foster and Cecilia Briceño-Garmendia, *Africa's Infrastructure: A Time for Transformation*, chapter 3, "Dealing with Poverty and Inequality" (Washington, DC: World Bank, 2009).

13.3 Indicator Overview

A comprehensive list of all indicators derived from household survey data, together with their corresponding technical definitions, can be found in Annex A13.1. These indicators are also included as cross-references in the list of indicators of the corresponding sectoral chapters for information and communication technologies (ICT), power, and water. While the full list amounts to several hundred items, the indicators can easily be grouped around a smaller number of primary indicators (Table 13.2 provides a synthetic overview of these).

The Table clarifies how each primary indicator can be expressed in a number of different normalizations, and broken down into a number of different subcategories, giving rise to a host of secondary indicators related to the primary one. For example, the indicator "access to service" can be reported for a range of different services (electricity, piped water, flush toilets, cellular telephones, and so on). The indicator can also be broken down across urban and rural areas, as well as across different population quintiles. See Table 13.2 for an overview of the types of household data from which the indicators are generally derived. The process for obtaining household survey data will be described in greater detail later.

Where relevant, one can calculate benchmarks to facilitate cross-country comparisons. Table 13.3 compares access to power in Kenya against African low- and middle-income-country benchmarks to provide an example of how household survey indicators and their corresponding benchmarks can be used to inform infrastructure policy analysis. The analysis shows that Kenya's power access indicators do not compare all that favorably with those of other LICs in Africa, and lag far behind the level of MICs in Africa. The same pattern can be seen both in urban and rural areas.

Table 13.3 Example of benchmarking power access indicators for Kenya

	Unit	LIC	Kenya	MIC
Access to electricity	% population	15.4	18	59.9
Access to electricity, urban	% population	71	51	83.7
Access to electricity, rural	% population	12	4	33.4
Access to electricity, annual gain	% population/year	1.4	1	1.8

Source: Eberhard and others (2009), derived from AICD electricity database (http://www.infrastructureafrica.org/aicd/tools/data).

Note: LIC = low-income country; MIC = middle-income country.

13.4 Data from Secondary Sources

The Demographic and Health Survey (DHS) series, conducted by the Measure DHS Program (http://www.measuredhs.com) of MACRO International in the least-developed countries, is a significant boost to understanding access to and use of services. The DHS is primarily designed to look at one topic (health and fertility patterns) and collects comparable information across countries on health, HIV, and nutrition. The DHS has the advantage of collecting data on access to water, sanitation, and energy supply using formal and informal channels. The survey is the most standardized source of household data to date, and cover mostly LICs. Its main drawback is that it does not include information about household income or expenditure.

The DHS series implemented in Africa since 1990 make it possible to analyze the following service categories: water supply, sanitation, electricity, fuels for cooking, and telephone landlines. Because the series are conducted every few years, it is possible to track similar indicators over time. The DHS is conducted in phases, and there have been five phases since 1990. New questions are added in each phase, and these questions are relatively well harmonized across surveys. Questions on water supply, sanitation, and cooking fuels are available since 1990, while questions on electricity, rubbish disposal, and cell phones are more recent. In fact, even now, only five countries in the sample include questions on cell-phone use, which makes it difficult to track improvements in cell-phone usage over time. The poor coverage of infrastructure modules in the DHS is not surprising, as the objective of the surveys is to gather information on infrastructure that has direct relevance to health and nutrition.

To document access, the Africa Infrastructure Country Diagnostic (AICD) data subsequently transferred to the Africa Infrastructure Knowledge Program (AIKP) used all DHS data available between 1990 and 2005 (Annex A13.2) to create a baseline for access data. Thirty countries in Africa have had at least one DHS conducted since 1990; 22 are covered by at least two DHS data points between 1990 and 2005. The Central African Republic, Comoros, the Republic of Congo, Gabon, Lesotho and Togo are among those countries with only one data point during this period. In a few countries, such as the Democratic Republic of the Congo, Lesotho, and Sudan, where data are not available at all or only for a year, we use the MICS as a substitute. Implemented by the United Nations Children's Fund (UNICEF), the MICS was designed to report on the health of women and children (www.childinfo.org). The MICS enables countries to measure indicators in the field of health, education, HIV/AIDS, and child protection using internationally standardized surveys in developing countries. The UNICEF works closely with other household survey programs, in particular the DHS, to harmonize survey questions and modules and to ensure a coordinated approach to survey implementation, with the objective of providing comparability across surveys and avoiding duplication of efforts. The MICS is closer to the DHS than other survey series with respect to sampling strategy, but it covers only water and sanitation questions. Because of problems of comparability, the MICS results need to be used sparingly.

Income and Expenditure Surveys (IESs) have been carried out often with support from the World Bank and other international agencies to allow investigators to study patterns of household spending on infrastructure services. These surveys are known by a multitude of names in different countries and are usually modeled after the LSMS of the World Bank. The IES-type surveys provide a wealth of information on use and payment of infrastructure services in addition to data on the assets and expenditure patterns of households. Therefore, it is possible to draw inferences on spending patterns and the affordability of infrastructure using the income dimension. The expenditure baseline data created by the AICD and subsequently transferred to the AIKP is based on the processing of 30 recent surveys of African countries to document affordability (Annex A13.3). The time period of these surveys ranged between 1997 and 2005.

These surveys cover infrastructure sectors such as electricity, water, sanitation, and telecommunications, but substantive questions on access to transport infrastructure and services are conspicuously absent. There is scant information on the cost of these services or quality-related indicators. These surveys contain information on rubbish disposal and cell-phone services for a higher number of countries than the DHS. For this reason, the expenditure surveys are the primary source of information for understanding rubbish disposal and cell-phone use in Africa. They make it possible to draw inferences about spending patterns and the affordability of infrastructure for people at different income levels (Table 13.4).

There are some important caveats to the use of IES-type surveys. Data on infrastructure spending can be fraught with inaccuracies, as the data are self-reported by the surveyed households. The questions are based on actual payments, rather than billed amounts, and it is difficult to distinguish between arrears and current payments. Furthermore, the surveys do not ask questions about metering, so it cannot be known if the household's payments are based on its consumption or on some other form of assessment based on property values, number of rooms, or pipe diameter. The wording of the survey questions can also be confusing. The survey may ask respondents to declare the pay-

Table 13.4 List of complementary data variables and sources

Policy code	Variable	Source
Access	Population access to services	Demographic and Health Surveys (Multiple Indicator Cluster Surveys) (http://www.measuredhs.com)
Affordability	Household spending on electricity	Living Standards Measurement Surveys (Household Budget Surveys) (http://iresearch.worldbank.org/lsms/lsmssurveyFinder.html)

Source: Own elaboration

ment they made "last month," even though payments are not due monthly in many cases. Merging household data with utility data could provide a comprehensive picture of consumption and spending dynamics among different consumer groups. It is however difficult to do so in Africa since the common field for merging the two data sets is usually the address of the household, which is often not very well documented. Therefore, merging utility data with household data is not common in researching infrastructure in Africa, although it is prevalent in other regions.

13.5 Data Processing

This section provides practical guidance on processing the raw survey data obtained from the various sources described earlier.

Time period

The DHS series are available for various years across the countries studied in Africa. Household surveys are not available for every year, not only because they are very costly to implement but because, except when designed for specific purposes, the variables monitored by them do not change so fast as to justify the cost of undertaking this enormous exercise annually. To account for this structural characteristic of the household survey data samples, to enable standardization, and to carry out trend analysis, this Handbook uses five-year periods for data observation. For instance, in the AICD, the fifteen-year time period from 1990–2005 was divided into three five-year periods. In the case of IES, the survey for the latest available year was used to carry out the affordability analysis.

Extraction of raw variables and creation of asset quintiles

The procedures here differ according to the type of household survey involved.

- *Demographic and Health Surveys*. A select set of raw variables is extracted from DHS series encompassing a wide range of themes for the computation of asset quintiles including the entire set of socioeconomic and infrastructure variables. The variables included in the AICD/AIKP baseline are in Annex A13.4. The DHS does not collect any household income or spending information, so household welfare measures will need to be constructed to establish a correlation between access to infrastructure and income. Researchers and policy makers typically use an asset index as a proxy of household welfare level. An asset score is a composite index variable assigned to people or households, based on the number and types of assets they have. A low asset score equates with a low socioeconomic position and vice versa. Principal factor analysis can be used to construct the asset score (Filmer and Pritchett 1988). Given the high correlation between income and ownership of assets, such a measure can be assembled using information on ownership of assets. One problem is that the asset variables available for the construction of an index vary across countries and time periods. Thus, an asset index that was completely consistent would have to ignore data available for a significant number of surveys.

  Following Diallo and Wodon (2005), the asset index is constructed using principal components analysis based on the maximum amount of asset information available for each country. The asset index constructed for the AIKP includes variables that differ by country. These are: source of drinking water; time to reach water source; type of toilet facility and whether it is shared with other households/individuals; type of main floor material; electricity access; ownership of radio, TV, refrigerator, bicycle, car/motorcycle, livestock, farmland/other land, car/truck, telephone, and bed net for sleeping; and number of persons sleeping per room. Typically, these variables are housing attributes. Using the asset index, asset quintiles that divide the entire population into five equal groups according to their relative wealth are created using the "quintile" command in STATA. The STATA code for processing one of the DHS surveys can be found in Annex A13.5.

- *Income and Expenditure Surveys*. These surveys, carried out by different countries' statistical agencies, do not follow a standardized pattern. Therefore, to create the master data set, the same set of variables was extracted after standardization across each survey. An example of the STATA code for processing one of the surveys can be found in Annex A13.6. The STATA code for the creation of the master data set is in Annex A13.6 and variables in the master data set used for the AICD baseline is in Annex A13.7. The most critical element of the LSMS surveys is the availability of income and expenditure information from which the consumption aggregate is generated. The processed data sets include the consumption aggregate (monthly per capita expenditure). The expenditure quintile (which implies the division of the entire population into five categories of 20 percent each, based on income) was calculated from this consumption aggregate using the STATA command "quintile."

Standardization of derived variables

To achieve the comparability of different surveys across different time periods, variables have to be aggregated or reorganized. For instance, in a few household surveys, piped water in the house and in the neighborhood were separate categories, while in other household surveys, piped water formed a composite category. Therefore, for the former group of surveys, piped water in the house and neighborhood need to be aggregated. The standardization should be carried out after an exhaustive upstream analysis on how variables are available and coded in the surveys. The standardization is across socioeconomic and infrastructure variables. The infrastructure variables that require standardization are sources of water supply, toilet facility, lighting/cooking, and rubbish disposal (Table 13.5), while the socioeconomic variables that require standardization include education, wall material, floor material, and roof material (Tables 13.6).

The infrastructure categories used in the DHS and IES surveys vary widely. One solution is to standardize the relevant infrastructure and socioeconomic variables into categories that allow comparison across surveys. Although many local nuances are lost in the resulting aggregation, it is the only approach that allows for cross-country comparability. The standard categories of the infrastructure variables apply to both the DHS and IES. Infrastructure categories are added and changed in each survey phase, which makes it difficult to track the same category over time. Particularly for water and sanitation, in addition to the improved/unimproved categorization adopted in the Joint Monitoring Program (JMP), this Handbook also proposes a categorization based on modern, intermediate, and basic service options (Komives, Whittington, and Wu 1999).

Table 13.5 Standardization of infrastructure variables

Main source of water supply		Toilet facility	
1. Piped water into dwelling or yard	Improved/advanced	1. Flush toilet to network or septic tank	Improved/advanced
2. Public tap or communal standpipe	Improved/intermediate	2. VIP latrine or san plat or chemical toilet	Improved/advanced
3. Wells or boreholes or hand pumps or rainwater	Unimproved/intermediate	3. Traditional pit latrine	Unimproved/intermediate
4. Surface water (for example, lake, river, pond, dam, spring)	Unimproved/basic	4. Bucket or other container	Unimproved/basic
5. Vendors or tanker trucks	Unimproved/basic	5. Other	Unimproved/basic
6. Others (for example, bottled water)	Unimproved/basic	6. No facility or nature or bush	Unimproved/basic
Main source of lighting/cooking		**Rubbish disposal**	
1. Electricity	Improved/advanced	1. Collected from rubbish bin by government or private firm or nongovernmental organization (NGO)	Improved/advanced
2. Liquified petroleum gas (LPG) or natural gas	Improved/advanced	2. Rubbish pit	Improved/intermediate
3. Kerosene or paraffin or petrol or oil	Unimproved//intermediate	3. Rubbish heap	Unimproved/intermediate
4. Wood or charcoal/basic	Unimproved/basic	4. Thrown away or burnt or buried or dumped	Unimproved/basic
5. Crop residue or animal dung or leaves	Unimproved/basic	5. Other	Unimproved/basic
6. Other	Unimproved		

Source: Own elaboration.

Table 13.6 Standardization of socioeconomic and housing quality characteristics

Education		Wall material	
1. No education/preschool		1. Cement/concrete	Improved
2. Primary		2.Wood/cardboard/hardboard	Improved
3. Secondary 4. Vocational /specialized training		3. Ironsheets/tiles/asbestos/ plastic	Improved
5. Tertiary (BA, MA, PhD)		4. Bamboo/pole/pole and dagga grass/straw	Unimproved
		5. Mud/earth/mud brick	Unimproved
		6. Burnt brick/stone	Improved
		7. Other	Unimproved
Floot material		**Roof material**	
1. Sand, earth, mud, dung, straw	Unimproved	1. Iron sheets/plastic sheets/ asbestos sheets	Improved
2. Smoothed mud/grass/bamboo/ broken bricks	Unimproved	2. Clay tiles/asbestos tiles	Improved
3. Cement/concrete/stone/bricks	Improved	3. Cement/concrete/bricks	Improved
4. Wood/tile/linoleum/vinyl or asphalt strips/wood planks	Improved	4. Grass or straw/wood/mud/ mud bricks/ bamboo	Unimproved
5. Other	Unimproved	5. Other	Unimproved

Source: Own elaboration.

Calculation of coverage rate

The per capita coverage rates for infrastructure services across various dimensions such as time (across the selected time periods), location (urban, rural), and income (quintile) is derived from the DHS. The coverage rate reports the use of the service by the household, which is converted to an individual coverage rate by taking into account the household size.

Number of households using the infrastructure service = A
Household size = B
Total population = C
Coverage rate = (A*B)/C

Calculation of the Africa-wide coverage rate, weighted by population

The coverage rate of the latest available year for each country is weighted by population to arrive at Africa-wide, as well as country group, estimates of coverage. The calculations encompass various dimensions: income (middle income, low income), urbanization (high, medium, low), and region (central, south, east, west). The product of coverage rate and population is summed up across all the countries (or the categories of countries) and divided by the sum of population of all the countries (or categories of countries) to arrive at the population-weighted coverage rate.

If there are two countries in the sample:

For country 1
Coverage rate = A
Population = B

For country 2
Coverage rate = C
Population = D

$$\text{Population weighted coverage rate} = \frac{(A*B) + (C*D)}{B + D}$$

Calculation of trends in access

One difficulty in gauging an Africa-wide trend in access rates stems from the fact that the panel of countries available through the DHS surveys is not balanced for each of the three time periods. Countries have varying observations for different years. To account for this, three alternative methods can be used to estimate overall access trends. The first method includes only those countries for which there are data for the defined time periods. For instance, in the AICD analysis, data are consistently available in the three time periods 1990–1995, 1996–2000, and 2001–2005 in only 11 countries. The second method includes countries with data for only one or two time periods. For countries with data for only one time period, the same data are used for all three time periods assuming no change in access over time. If data are available for two periods, the annual growth rate in coverage between the two periods is used to estimate the rate for the third period. The third method is similar but assumes that access rates cannot decline more than

Table 13.7 Example of trends in piped water supply using the three methods for measuring access rates

Method	Piped water		
	1990–1995	1996–2000	2000–2005
National			
Method 1	12	13	10
Method 2	18	17	16
Method 3	18	17	17
Urban			
Method 1	38	34	25
Method 2	50	43	37
Method 3	50	43	39
Rural			
Method 1	4	4	4
Method 2	4	4	4
Method 3	4	4	4

Source: Banerjee and others 2008b

population growth. If access rates in the third period drop by more than what would be observed assuming no growth in the total number of connections, the survey data for the third period are replaced with the coverage rate in the second period, times the ratio of the population in the second period, divided by the population in the third period. In the case of landlines, due to a smaller number of observations and increasing access in most countries, only the second method is applicable. The third method is the most robust among the three and was consistently used in the AICD (Table 13.7).

Calculation of annual change in coverage

This analysis calculates the number and percentage of people gaining access to any infrastructure service. Annualized change in coverage of each infrastructure service is estimated by the number of people that, on average, gain coverage to each infrastructure modality every year, divided by the population in the end year.

Benin's estimated annual change in coverage of piped water supply is presented as an example:

	Coverage 1996–2000 (A)	Coverage 2001–2005 (B)	Population 1996–2000 (C)	Population 2001–2005 (D)	Population covered by piped water 1996–2000 (E)	Population covered by piped water 2001–2005 (F)	Change on Population (G)	% increase in access (H)	Year of survey T1, T2	No. of years I=T2-T1	% increase in access annualized H/I
Benin	23%	29%	6,790,609	7,925,476	1,571,808	2,278,009	706,201	8.91%	1996, 2001	5	1.78%

Source: Banerjee and others 2008b

Where:

- Access to piped water in time period 1 = A
- Access to piped water in time period 2 = B
- Population in time period 1 = C
- Population in time period 2 = D
- Population covered by piped water in time period 1 E = A*C
- Population covered by piped water in time period 1 F = B*D
- Delta population G = F-E
- Percentage increase in access H = G/B
- Year of survey = T2, T1
- Number of years between surveys I = T2-T1
- Annual change in coverage = H/I

Calculation of coverage, access, hook-up rates

One of the main areas of analysis relates to unraveling the reasons behind Africa's relatively low coverage rates. Household survey samples are based on geographic clusters that *at least for urban areas* are physically small, amounting to no more than a few city blocks. It is therefore possible, at least in urban areas, to study the extent to which people lacking access to infrastructure live in clusters where infrastructure is available, indicated by the fact that some of their immediate neighbors are hooked up to the service. The resulting analysis gives us a sense of the degree to which low access to services is driven by supply-side issues (infrastructure networks not reaching the areas where people live) or by demand-side issues (people not connecting to available infrastructure networks).

Box 13.1 Coverage, access, and hook-up rates: Some relationships and definitions

Coverage rate = Number of households using the service/total number of households
Access rate = Number of households living in communities or clusters where service is available/total number of households
Hook-up rate = Number of households using the service/number of households living in communities where service is available
Coverage = Access rate * hook-up rate

Unserved population = 100 – coverage rate
Pure demand-side gap = Access rate – coverage rate
Supply-side gap = Unserved population – pure demand-side gap
Pure supply-side gap = supply-side gap * hook-up rate
Mixed demand- and supply-side gap = supply-side gap * (100 – hook-up rate)

Proportion of deficit attributable to demand-side factors only = Pure demand-side gap/unserved population
Proportion of deficit attributable to supply-side factors only = Pure supply-side gap/unserved population
Proportion of deficit attributable to both demand- and supply-side factors only = Mixed demand- and supply-side gap/unserved population

Source: Foster and Araujo 2004.

The basic concepts used to analyze this issue are defined in Box 13.1. The main novelty is that we decompose the traditional measure of household *coverage* into two components (as per Foster and Araujo [2004] and Komives and others [2006]). The first, which we call *access*, gives the percentage of the population that lives in a cluster where at least one household has service coverage, indicating that the infrastructure is physically proximate and that there could be an opportunity to connect. The second, which we call *hook-up*, gives the percentage of the population living in clusters where the service is available and that actually make a connection. Using these two concepts it is possible to estimate the percentage of the unserved population that constitutes a supply-side deficit (meaning that they are too far from the network to make a connection until further rollout takes place) versus a demand-side deficit (meaning that something other than distance from the network is preventing them from taking up the service).

Calculation of spending on infrastructure in absolute and relative terms

The amount of household budget utilized to purchase infrastructure services was computed both in absolute terms and as a share of total budget. The absolute spending figures, typically available in local currency units (LCUs), can be converted into an international currency such as U.S. dollars in a specific year to arrive at a constant monetary amount. For instance, the absolute spending figures were converted into 2002 U.S. dollars. The steps are as follows:

- Absolute amount of infrastructure spending in LCUs (survey year) = A
- Official exchange rate = B
- Absolute amount of infrastructure spending in US$ (survey year) C = A/B
- US GDP deflator[22] = D (with the selected constant year = 100)
- Absolute amount of infrastructure spending in constant US$ E = C*D
- Share of infrastructure sector as percentage of total budget = Average spending of households connected to infrastructure service/average total budget of all households

Calculation of nonpayment rates

Household surveys provide unique insights into not only the connected consumers but also nonpaying consumers. There are those that do have a connection but do not register any expenditure, whether because they are in arrears or because the connection itself is a clandestine one. To the extent that nonpayment is higher among the poorest, it can be taken as an indicator that households are facing affordability problems. There are also households who do not have a connection but pay nevertheless in the form of informal payments or to a neighbor or illegal connection.

22 The figures for official exchange rate and U.S. gross domestic product (GDP) deflator can be extracted from the African Developmetn Bank's Data Portal http://www.afdb.org/en/knowledge/statistics/data-portal/

$$\text{Nonpayment rate} = \frac{\text{Number of households that are connected but show zero expenditure}}{\text{Total number of connected households}}$$

Calculation of subsidy needed to maintain the affordability of infrastructure services

To estimate the percentage of African households likely to face problems paying for modern infrastructure services, two elements are needed. First, some indicative values of the true cost of infrastructure services are needed as a reference point. Based on different assumptions about subsistence household consumption and the tariff applied, the absolute cost of the total monthly bill can be computed. For piped water service, subsistence consumption ranges between 4 cubic meters per month (m3/month), based on an absolute minimum consumption of 25 liters per capita per day for a family of five, and 10-m3/month based on a somewhat more comfortable, but still modest, level of 60 liters per capita per day for a family of five. The indicative tariff ranges between $0.40 and $0.80 per cubic meter, depending on whether operating or full capital cost recovery is envisaged. For electricity, subsistence consumption ranges from 25 kilowatt-hours per month (kWh/month) that would support use of two 100-watt light bulbs for four hours each day, to 50-kWh/month that would support limited use of an additional appliance, such as a radio. The indicative tariff ranges between $0.08 and $0.25 per kWh, reflecting the variation that exists between relatively low-cost hydropower-dominated systems and those based on diesel generators in landlocked countries with high import costs. In either case, the lower-bound monthly bill coincides at around $2; the upper-bound monthly bill is around $8 for piped water and $12 for electricity. This also suggests that at the lower bound a household could purchase both basic piped water and electricity services for around $4 per month, which would rise to around $20 per month at the upper bound.

Second, the household survey data on budget expenditures across households is used to estimate what percentage of households would hit the 5 percent affordability thresholds at different levels of absolute expenditure. For instance, if for 99 percent of the households in country X, the value of a subsistence bundle corresponding to operating cost recovery is higher than 5 percent of the household budget, then it can be concluded that 99 percent of households are unable to pay expenditures associated with operating cost recovery (Table 13.8).

Calculation of how well utility subsidies are being targeted

Customers receive substantial subsidies in most African countries, since residential electricity and water tariffs tend to be below utility costs. The working assumption is that the price per kilowatt-hour in the highest bracket of consumption in the tariff schedule can be used as a first approximation of the cost of providing the service (actually, the estimates of targeting performance are not very sensitive to that assumption). The targeting performance indicator used in the analysis, denoted by Ω (omega), is simply the share of the subsidies received by the poor divided by the proportion of the population in poverty. In other words, a value of 1 for Ω implies that the subsidy distribution among the poor is proportional to their share in the overall population. If the poor account for 30 percent of the population, then a neutral targeting mechanism would allocate 30 percent of the subsidy to the poor. A value lower (greater) than 1 implies that the subsidy distribution is regressive (progressive), since the share of benefits allocated to the poor is lower (larger) than its share in the total population. For instance, suppose that 30 percent of the population is poor and that they obtain 60 percent of the subsidy benefits. In such a case, Ω would be equal to 2, meaning that the poor are receiving twice as much subsidy as the population, on average.

While most indicators of targeting performance are silent as to why subsidies are targeted the way they are (they only give an idea of whether the subsidies reach the poor or not and to what extent), this framework allows for analyzing both "access" and "subsidy design" factors that affect targeting performance. Access factors are those related to the availability of electricity and water service in the area where a household lives and to the household's choice to connect to the network when service is available. Such access factors influence whether subsidies are well targeted or not, but are usually difficult to change in the short run. Subsidy factors are more susceptible to policy design; for example, changes in tariff structures affect who is targeted to receive the subsidies, as well as the rates of subsidization and the quantities of electricity and water consumed by the households that benefit from the subsidies.

The following section is reproduced from Angel-Urdinola and Wodon (2006). See also Komives and others (2005) for an application of the framework to a large number of countries worldwide. We use capital letters to denote means across the population as a whole or the poor and lower-case letters to define household-level variables. For instance, *SP* defines the amount of subsidy granted to the poor and *SH* that to the population as a whole. While we consider electricity subsidies here, the framework can be applied to any other type of subsidy. Our benefit targeting performance indicator, Ω, is defined as the share of the subsidy benefits received by the poor (*SP*/*SH*) divided by the proportion of the population in poverty (*P*/*H*), where *H* denotes

Table 13.8 Share of urban households unable to afford various monthly utility bills

Percent									
Group		Monthly bill ($)							
		$2	$4	$6	$8	$10	$12	$14	$16
1	Cape Verde	0	0	0	0	0	0	0	0
	Morocco	0	0	0	0	0	0	0	0
	Senegal	0	0	0	0	0	0	1	1
	South Africa	0	0	0	0	1	1	1	1
	Cameroon	0	0	0	0	1	2	7	17
	Côte d'Ivoire	0	0	1	2	3	5	7	10
	Congo, Rep. of	0	0	3	5	12	21	28	35
2	Ghana	0	2	7	11	30	46	55	67
	Benin	0	2	4	12	33	45	60	71
	Kenya	0	0	5	20	36	62	72	78
	Sierra Leone	0	4	16	30	44	54	62	67
	São Tomé and Príncipe	0	2	13	29	46	64	77	81
	Burkina Faso	0	4	20	34	47	62	72	78
	Zambia	0	4	18	35	50	58	67	76
	Nigeria	3	10	23	35	57	78	89	95
	Madagascar	0	16	28	47	61	68	78	85
3	Niger	1	11	28	55	70	79	89	93
	Tanzania	1	8	25	55	75	89	96	98
	Guinea-Bissau	0	6	38	65	81	89	91	93
	Uganda	2	17	45	65	82	90	96	97
	Burundi	7	29	53	72	82	90	97	100
	Malawi	2	32	66	78	87	92	93	94
	Congo, Dem. Rep. of	9	49	79	91	98	99	100	100
	Ethiopia	40	87	95	99	99	99	99	100
Summary	Low-income	5.0	18.4	32.4	44.5	59.5	72.3	79.7	84.3
	Middle-income	0.0	0.0	0.1	0.2	1.2	1.8	2.9	4.7
	All	3.7	13.7	24.2	33.2	44.7	54.3	60.2	64.1

Source: Banerjee and others 2008b

all households and P denotes the households who are poor. A value that is lower (greater) than 1 implies that the average subsidy for the poor is lower (greater) than the average subsidy received by the population as a whole. The parameter Ω can be computed from household surveys with data on expenditure or consumption of utility services, provided that information is also available on tariff structures. The value of Ω is:

$$\Omega = \frac{S_P}{S_H}\frac{H}{P} = \frac{\sum_{i=1}^{P} q_i(p_i - C)}{\sum_{i=1}^{H} q_i(p_i - C)}\frac{H}{P}, \qquad (1)$$

where q_i is the quantity consumed by household i and $p_i - C$ is the unit subsidy for household i (that is, the difference between

the average unit price for the household and the unit cost of service C assumed constant across households).

The parameter Ω can be decomposed by five key factors affecting its value: access, take-up, targeting, rate of subsidization, and quantity consumed. The first factor is access to networks in the neighborhood where the household lives, denoted by *A*; typically, access for the poor is lower than for the population as a whole (*AP*<*AH*). The second factor is take-up or usage of service when households have access, with often lower usage among the poor than the population as a whole, conditional on access (*UP*|*A*<*UH*|*A*). The product of *A* and *U* is the connection rate (share of households using network water or electricity). The variables *A* and *U* affect the targeting performance of subsidies since to receive a subsidy, households must first consume the good that is subsidized. The third factor is subsidy targeting (conditional on usage), which takes a value of 1 for households who receive a subsidy, and 0 otherwise. When utility consumption is subsidized for all users, we have *TP*|*U*=*TH*|*U*=*1*. Beneficiary incidence (the probability of receiving or not the subsidy among a specific population group) is:

$$B_H = A_H U_{H|A} T_{H|U} \quad (2.1)$$

$$B_P = A_P U_{P|A} T_{P|U} \quad (2.2)$$

To estimate benefit incidence (as opposed to beneficiary incidence), two more factors must be taken into account: the rate of subsidization and the quantity consumed among those who benefit from the subsidy. If the average quantity consumed by subsidy recipients in the population as a whole is QH|T, and the average expenditure on the good is EH|T, the average rate of subsidization is RH|T = 1 - EH|T / (QH|T C). The average value of the subsidy received among subsidy recipients is then RH|T QH|T C. For the poor, the average subsidy received among those who benefit from the subsidy is RP|T QP|T C. Overall, the average subsidy benefits, to the population as a whole and among the poor, are:

$$\frac{S_H}{H} = B_H R_{H|T} Q_{H|T} C \quad . \quad (3.1)$$

$$\frac{S_P}{P} = B_P R_{P|T} Q_{P|T} C \quad . \quad (3.2)$$

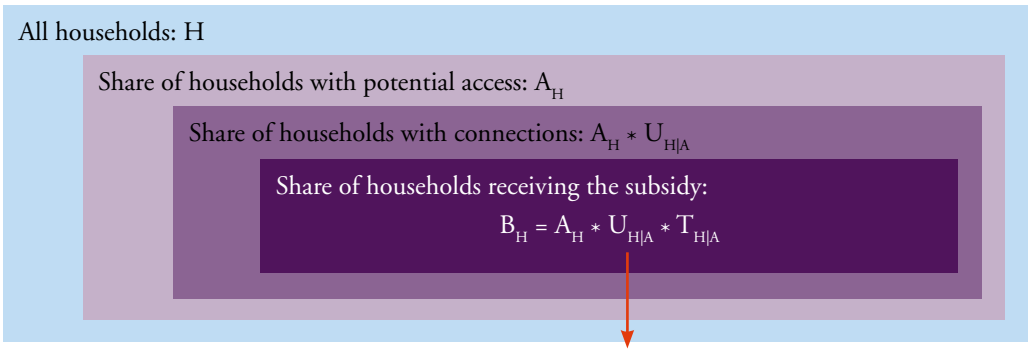
This implies that:

$$\Omega = \frac{A_P}{A_H} \frac{U_{P|A}}{U_{H|A}} \frac{T_{P|U}}{T_{H|U}} \frac{R_{P|T}}{R_{H|T}} \frac{Q_{P|T}}{Q_{H|T}} \quad . \quad (4)$$

Thus Ω is the product of five ratios for access, take-up, targeting, rate of subsidization, and quantity consumed. In most cases, the ratio of access rates will be lower than 1 (the poor tend to live in areas with lower access rates than the population as a whole), and the ratio of usage or take-up rates for the service will also be lower than 1 (when access is available in a neighborhood or village, the poor are less likely to be connected to the network than the population as a whole due to high costs of connection). Also, the quantities consumed in the population as a whole tend to be larger than those consumed by the poor (Table 13.9). This means that the design of the subsidy mechanisms (through the values of T and R for the poor and the population as a whole) must be pro-poor if overall targeting is to be pro-poor (that is, the value of Ω is larger than 1).

The reasoning behind the overall framework is represented in Figure 13.9, which visualizes the various groups for which key parameters must be estimated both among the population as a whole and among the poor in order to analyze the determinants of Ω.

Figure 13.9 Decomposing the targeting performance of electricity subsidies



Source: Komives and others (2005) based on Angel-Urdinola and Wodon (2006).

Table 13.9 Targeting performance of electricity subsidies

	An	Ap	Un	Up	Rn	Rp	Qn	Qp
	(A)		(UiA)		(RiT)		(QiT)	
	All Households	Poor Households	All Households	Poor Households	All Households	Poor Households	All Households	Poor Households
Uganda	0.41	0.29	0.18	0.02	0.16	0.16	80.12	30.41
Togo	0.47	0.32	0.50	0.34	0.31	0.31	31.67	31.70
Senegal	0.57	0.48	0.65	0.49	0.42	0.39	197.0	140.89
Sao Tome	0.85	0.73	0.49	0.32	0.51	0.59	153.43	98.31
Rwanda	0.12	0.04	0.3	0.01	0.48	0.48	88.26	38.46
Nigeria	1.00	0.99	0.30	0.23	0.19	0.21	87.32	80.41
Mozambique	0.18	0.15	0.33	0.14	0.40	0.49	187.17	137.61
Malawi	0.71	0.68	0.07	0.00	0.24	0.35	420.49	106.66
Guinea	0.25	0.09	0.61	0.42	0.71	0.74	90.30	79.74
Ghana	0.67	0.38	0.69	0.47	0.52	0.57	115.02	84.27
Gabon	0.86	0.74	0.66	0.57	0.27	0.35	185.86	146.30
Côte d'Ivoire	0.70	0.59	0.67	0.48	0.25	0.45	135.51	63.90
Congo	0.57	0.42	0.47	0.26	1.00	1.00	69.20	67.51
Chad	0.02	0.01	0.45	0.13	0.61	0.61	22.96	12.21
CAR	0.12	0.08	0.17	0.09	0.14	0.16	39.24	25.78
Cape Verde	0.82	0.72	0.54	0.34	0.06	0.11	111.72	56.83
Cameroon	0.66	0.47	0.65	0.43	0.20	0.26	71.06	42.79
Burundi	0.08	0.06	0.25	0.09	0.54	0.60	104.43	39.92
Burkina Faso	0.22	0.09	0.43	0.09	0.28	0.41	61.06	28.57

Source: Banerjee and others 2008b

A13 Annexes to Chapter 13: Household surveys

Annex A13.1 Comprehensive list of indicators and definitions--Household Survey

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W500	Population access to bucket/pan—National (% of population)	Share of national households that use a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W504	Population access to bucket/pan—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W505	Population access to bucket/pan—Quintile 2 (% of population)	Share of households in the second budget quintile that uses a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W506	Population access to bucket/pan—Quintile 3 (% of population)	Share of households in the third budget quintile that uses a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W507	Population access to bucket/pan—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W508	Population access to bucket/pan—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W502	Population access to bucket/pan—Rural (% of population)	Share of rural households that use a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	W503	Population access to bucket/pan—Urban (% of population)	Share of urban households that use a bucket or pan to collect faeces and then dispose of it in the vicinity.	Sanitation	National
	i013	Population access to cell phone—Capital city (% population)	Share of the population living in the capital city that has access to a cell phone.	ICT	National
	i010	Population access to cell phone—National (% population)	Share of the national population that has access to a cell phone.	ICT	National
	i014	Population access to cell phone—Quintile 1 (% population)	Population in the first budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i015	Population access to cell phone—Quintile 2 (% population)	Population in the second budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i016	Population access to cell phone—Quintile 3 (% population)	Population in the third budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i017	Population access to cell phone—Quintile 4 (% population)	Population in the fourth budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	i018	Population access to cell phone—Quintile 5 (% population)	Population in the fifth budget quintile population that has access to a cell phone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i011	Population access to cell phone—Rural (% population)	Share of the population living in rural areas that has access to a cell phone.	ICT	National
	i012	Population access to cell phone—Urban (% population)	Share of the population living in urban areas that has access to a cell phone.	ICT	National
	a001	Population access to electricity—National (% of population)	Share of the population living in communities or clusters where electricity is available.	Electricity	National
	a252	Population access to electricity—Quintile 1 (% of population)	Population in the first (poorest) budget quintile that has access to electricity including connection to the main grid and local grid as a share of population in that budget quintile.	Electricity	National
	a253	Population access to electricity—Quintile 2 (% of population)	Population in the second budget quintile that has access to electricity including connection to the main grid and local grid as a share of population in that budget quintile.	Electricity	National
	a254	Population access to electricity—Quintile 3 (% of population)	Population in the third budget quintile that has access to electricity including connection to the main grid and local grid as a share of population in that budget quintile.	Electricity	National
	a255	Population access to electricity—Quintile 4 (% of population)	Population in the fourth budget quintile that has access to electricity including connection to the main grid and local grid as a share of population in that budget quintile.	Electricity	National
	a256	Population access to electricity—Quintile 5 (% of population)	Population in the fifth (richest) budget quintile that has access to electricity including connection to the main grid and local grid as a share of population in that budget quintile.	Electricity	National
	a002	Population access to electricity—Rural (% of population)	Share of the rural population living in communities or clusters where electricity is available.	Electricity	National
	a003	Population access to electricity—Urban (% of population)	Share of the urban population living in communities or clusters where electricity is available.	Electricity	National
	a251	Population access to electricity—Capital city (% of population)	Population in the capital city that has access to electricity including connection to the main grid and local grid as a share of total population in the capital city.	Electricity	National
	W509	Population access to flush toilet/septic tank—National (% of population)	Share of national households that use a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W513	Population access to flush toilet/septic tank—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W514	Population access to flush toilet/septic tank—Quintile 2 (% of population)	Share of households in the second budget quintile that uses a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W515	Population access to flush toilet/septic tank—Quintile 3 (% of population)	Share of households in the third budget quintile that uses a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W516	Population access to flush toilet/ septic tank—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W517	Population access to flush toilet/ septic tank—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W510	Population access to flush toilet/ septic tank—Rural (% of population)	Share of rural households that use a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W511	Population access to flush toilet/ septic tank—Urban (% of population)	Share of urban households that use a toilet that is connected to water and allows faeces to be flushed away in a safe and sanitary manner either to an on-site septic tank or to a public sewer.	Sanitation	National
	W542	Population access to improved latrines—National (% of population)	Share of national households that uses an improved latrine (VIP latrine/san plan/chemical toilet/blair)	Sanitation	National
	W545	Population access to improved latrines—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses an improved latrine (VIP latrine/san plan/chemical toilet/ blair).	Sanitation	National
	W546	Population access to improved latrines—Quintile 2 (% of population)	Share of households in the second budget quintile that uses an improved latrine (VIP latrine/san plan/chemical toilet/blair).	Sanitation	National
	W547	Population access to improved latrines—Quintile 3 (% of population)	Share of households in the third budget quintile that uses an improved latrine (VIP latrine/san plan/chemical toilet/blair).	Sanitation	National
	W548	Population access to improved latrines—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses an improved latrine (VIP latrine/san plan/chemical toilet/blair).	Sanitation	National
	W549	Population access to improved latrines—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses an improved latrine (VIP latrine/san plan/chemical toilet/ blair).	Sanitation	National
	W543	Population access to improved latrines—Rural (% of population)	Share of rural households that use an improved latrine (VIP latrine/san plan/chemical toilet/blair).	Sanitation	National
	W544	Population access to improved latrines—Urban (% of population)	Share of urban households that use an improved latrine (VIP latrine/san plan/chemical toilet/blair).	Sanitation	National
	i004	Population access to landline telephone—Capital city (% population)	Share of the population living in the capital city that has access to a landline telephone.	ICT	National
	i001	Population access to landline telephone—National (% population)	Share of the population that has access to a landline telephone.	ICT	National
	i005	Population access to landline telephone—Quintile 1 (% population)	Population in the first budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	i006	Population access to landline telephone—Quintile 2 (% population)	Population in the second budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i007	Population access to landline telephone—Quintile 3 (% population)	Population in the third budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i008	Population access to landline telephone—Quintile 4 (% population)	Population in the fourth budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i009	Population access to landline telephone—Quintile 5 (% population)	Population in the fifth budget quintile population that has access to a landline telephone as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i002	Population access to landline telephone—Rural (% population)	Share of the population living in rural areas that has access to a landline telephone.	ICT	National
	i003	Population access to landline telephone—Urban (% population)	Share of the population living in urban areas that has access to a landline telephone.	ICT	National
	W526	Population access to other sanitation—National (% of population)	Share of national households that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W529	Population access to other sanitation—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W530	Population access to other sanitation—Quintile 2 (% of population)	Share of households in the second budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W531	Population access to other sanitation—Quintile 3 (% of population)	Share of households in the third budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W532	Population access to other sanitation—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W533	Population access to other sanitation—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W527	Population access to other sanitation—Rural (% of population)	Share of rural households that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National
	W528	Population access to other sanitation—Urban (% of population)	Share of urban households that use a form of sanitation different from no facility/nature/bush and that Is not considered improved as reported in the respective survey.	Sanitation	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W551	Population access to other water supply—National (% of population)	Share of national households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W554	Population access to other water supply—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W555	Population access to other water supply—Quintile 2 (% of population)	Share of households in the second budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W556	Population access to other water supply—Quintile 3 (% of population)	Share of households in the third budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W557	Population access to other water supply—Quintile 4 (% of population)	Share of households in the fourth budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W558	Population access to other water supply—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that has access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W552	Population access to other water supply—Rural (% of population)	Share of rural households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W553	Population access to other water supply—Urban (% of population)	Share of urban households that have access to water by means of collecting rainwater, buying bottled water, and the like, which do not guarantee the provision of safe water.	Water supply	National
	W559	Population access to piped water—National (% of population)	Share of national households that have a private residential connection inside the home.	Water supply	National
	W562	Population access to piped water—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that has a private residential connection inside the home.	Water supply	National
	W563	Population access to piped water—Quintile 2 (% of population)	Share of households in the second budget quintile that has a private residential connection inside the home.	Water supply	National
	W564	Population access to piped water—Quintile 3 (% of population)	Share of households in the third budget quintile that has a private residential connection inside the home.	Water supply	National
	W565	Population access to piped water—Quintile 4 (% of population)	Share of households in the fourth budget quintile that has a private residential connection inside the home.	Water supply	National
	W566	Population access to piped water—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that has a private residential connection inside the home.	Water supply	National
	W561	Population access to piped water—Rural (% of population)	Share of rural households that have a private residential connection inside the home.	Water supply	National
	W560	Population access to piped water—Urban (% of population)	Share of urban households that have a private residential connection inside the home.	Water supply	National
	W567	Population access to public tap/standpost—National (% of population)	Share of national households that have as a tap in the street that provides access to all local households.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W570	Population access to public tap/standpost—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that has a tap in the street that provides access to all local households.	Water supply	National
	W571	Population access to public tap/standpost—Quintile 2 (% of population)	Share of households in the second budget quintile that has a tap in the street that provides access to all local households.	Water supply	National
	W572	Population access to public tap/standpost—Quintile 3 (% of population)	Share of households in the third budget quintile that has a tap in the street that provides access to all local households.	Water supply	National
	W573	Population access to public tap/standpost—Quintile 4 (% of population)	Share of households in the fourth budget quintile that has a tap in the street that provides access to all local households.	Water supply	National
	W574	Population access to public tap/standpost—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that has a tap in the street that provides access to all local households.	Water supply	National
	W568	Population access to public tap/standpost—Rural (% of population)	Share of rural households that have a tap in the street that provides access to all local households.	Water supply	National
	W569	Population access to public tap/standpost—Urban (% of population)	Share of urban households that have a tap in the street that provides access to all local households.	Water supply	National
	W649	Population access to solid waste disposal by burning/burying—National (% of population)	Share of national households that dispose of solid waste by burning/burying.	Waste management	National
	W652	Population access to solid waste disposal by burning/burying—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that disposes of solid waste by burning/burying.	Waste management	National
	W653	Population access to solid waste disposal by burning/burying—Quintile 2 (% of population)	Share of households in the second budget quintile that disposes of solid waste by burning/burying.	Waste management	National
	W654	Population access to solid waste disposal by burning/burying—Quintile 3 (% of population)	Share of households in the third budget quintile that disposes of solid waste by burning/burying.	Waste management	National
	W655	Population access to solid waste disposal by burning/burying—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes of solid waste by burning/burying.	Waste management	National
	W656	Population access to solid waste disposal by burning/burying—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes of solid waste by burning/burying.	Waste management	National
	W650	Population access to solid waste disposal by burning/burying—Rural (% of population)	Share of rural households that dispose of solid waste by burning/burying.	Waste management	National
	W651	Population access to solid waste disposal by burning/burying—Urban (% of population)	Share of urban households that dispose of solid waste by burning/burying.	Waste management	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W657	Population access to solid waste disposal by government/ NGO/ private company collection—National (% of population)	Share of national households that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W660	Population access to solid waste disposal by government/NGO/ private company collection—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that dispose of solid waste using services provided by goverment/ NGO/ private company.	Waste management	National
	W661	Population access to solid waste disposal by government/NGO/ private company collection—Quintile 2 (% of population)	Share of households in the second budget quintile that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W662	Population access to solid waste disposal by government/NGO/ private company collection—Quintile 3 (% of population)	Share of households in the third budget quintile that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W663	Population access to solid waste disposal by government/NGO/ private company collection—Quintile 4 (% of population)	Share of households in the fourth budget quintile that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W664	Population access to solid waste disposal by government/NGO/ private company collection—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that dispose of solid waste using services provided by goverment/ NGO/ private company.	Waste management	National
	W658	Population access to solid waste disposal by government/NGO/ private company collection—Rural (% of population)	Share of rural households that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W659	Population access to solid waste disposal by government/NGO/ private company collection—Urban (% of population)	Share of urban households that dispose of solid waste using services provided by goverment/NGO/ private company.	Waste management	National
	W665	Population access to solid waste disposal by other means—National (% of population)	Share of national households that dispose of solid waste by other means.	Waste management	National
	W668	Population access to solid waste disposal by other means—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that dispose of solid waste by other means.	Waste management	National
	W669	Population access to solid waste disposal by other means—Quintile 2 (% of population)	Share of households in the second budget quintile that dispose of solid waste by other means.	Waste management	National
	W670	Population access to solid waste disposal by other means—Quintile 3 (% of population)	Share of households in the third budget quintile that dispose of solid waste by other means.	Waste management	National
	W671	Population access to solid waste disposal by other means—Quintile 4 (% of population)	Share of households in the fourth budget quintile that disposes solid waste by other means.	Waste management	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W672	Population access to solid waste disposal by other means—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that disposes of solid waste by other means.	Waste management	National
	W666	Population access to solid waste disposal by other means—Rural (% of population)	Share of rural households that dispose of solid waste by other means.	Waste management	National
	W667	Population access to solid waste disposal by other means—Urban (% of population)	Share of urban households that dispose of solid waste by other means.	Waste management	National
	W673	Population access to solid waste disposal by pit/heap—National (% of population)	Share of national households that dispose of solid waste by pit/heap.	Waste management	National
	W676	Population access to solid waste disposal by pit/heap—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that dispose of solid waste by pit/heap.	Waste management	National
	W677	Population access to solid waste disposal by pit/heap—Quintile 2 (% of population)	Share of households in the second budget quintile that dispose of solid waste by pit/heap.	Waste management	National
	W678	Population access to solid waste disposal by pit/heap—Quintile 3 (% of population)	Share of households in the third budget quintile that dispose of solid waste by pit/heap.	Waste management	National
	W679	Population access to solid waste disposal by pit/heap—Quintile 4 (% of population)	Share of households in the fourth budget quintile that dispose of solid waste by pit/heap.	Waste management	National
	W680	Population access to solid waste disposal by pit/heap—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that dispose of solid waste by pit/heap.	Waste management	National
	W674	Population access to solid waste disposal by pit/heap—Rural (% of population)	Share of rural households that dispose of solid waste by pit/heap.	Waste management	National
	W675	Population access to solid waste disposal by pit/heap—Urban (% of population)	Share of urban households that dispose of solid waste by pit/heap.	Waste management	National
	W575	Population access to surface water—National (% of population)	Share of national households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W578	Population access to surface water—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W579	Population access to surface water—Quintile 2 (% of population)	Share of households in the second budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W580	Population access to surface water—Quintile 3 (% of population)	Share of households in the third budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W581	Population access to surface water—Quintile 4 (% of population)	Share of households in the fourth budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W582	Population access to surface water—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that relies on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W576	Population access to surface water—Rural (% of population)	Share of rural households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W577	Population access to surface water—Urban (% of population)	Share of urban households that rely on surface water (that is, rivers, lakes, and ponds in the vicinity) as the main source of water supply.	Water supply	National
	W534	Population access to traditional pit latrine—National (% of population)	Share of national households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W537	Population access to traditional pit latrine—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W538	Population access to traditional pit latrine—Quintile 2 (% of population)	Share of households in the second budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W539	Population access to traditional pit latrine—Quintile 3 (% of population)	Share of households in the third budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W540	Population access to traditional pit latrine—Quintile 4 (% of population)	Share of households in the fourth budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W541	Population access to traditional pit latrine—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W535	Population access to traditional pit latrine—Rural (% of population)	Share of rural households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W536	Population access to traditional pit latrine—Urban (% of population)	Share of urban households that uses an on-site sanitation facility that consists of some kind of hole and pit, but that is constructed in a more precarious manner according to local practice and not informed by sanitary guidelines.	Sanitation	National
	W583	Population access to water from vendor—National (% of population)	Share of national households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W586	Population access to water from vendor—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W587	Population access to water from vendor—Quintile 2 (% of population)	Share of households in the second budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W588	Population access to water from vendor—Quintile 3 (% of population)	Share of households in the third budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W589	Population access to water from vendor—Quintile 4 (% of population)	Share of households in the fourth budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W590	Population access to water from vendor—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W585	Population access to water from vendor—Rural (% of population)	Share of rural households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W584	Population access to water from vendor—Urban (% of population)	Share of urban households that acquires water from carts with small tanks/ drums, tanker trucks, or similar, which do not guarantee the provision of safe water, as the main source of water.	Water supply	National
	W591	Population access to well/borehole—National (% of population)	Share of national households that rely on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W594	Population access to well/borehole—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W595	Population access to well/borehole—Quintile 2 (% of population)	Share of households in the second budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W596	Population access to well/borehole—Quintile 3 (% of population)	Share of households in the third budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W597	Population access to well/borehole—Quintile 4 (% of population)	Share of households in the fourth budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W598	Population access to well/borehole—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that relies on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W593	Population access to well/borehole—Rural (% of population)	Share of rural households that rely on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W592	Population access to well/borehole—Urban (% of population)	Share of urban households that rely on some kind of subterranean source of water of varying depths and solidity of construction as the main source of water.	Water supply	National
	W518	Population access to no facility/ nature /bush as the main form of sanitation—National (% of population)	Share of national households that rely on no facility/nature/ bush as the main form of sanitation.	Sanitation	National
	W521	Population access to no facility/ nature/ bush as the main form of sanitation—Quintile 1 (% of population)	Share of households in the first (poorest) budget quintile that relies on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W522	Population access to no facility / nature/ bush as the main form of sanitation—Quintile 2 (% of population)	Share of households in the second budget quintile that relies on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W523	Population access to no facility/ nature/ bush as the main form of sanitation—Quintile 3 (% of population)	Share of households in the third budget quintile that relies on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W524	Population access to no facility/ nature/ bush as the main form of sanitation—Quintile 4 (% of population)	Share of households in the fourth budget quintile that relies on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W525	Population access to no facility/ nature/ bush as the main form of sanitation—Quintile 5 (% of population)	Share of households in the fifth (richest) budget quintile that relies on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W520	Population access to no facility/ nature/ bush as the main form of sanitation—Rural (% of population)	Share of rural households that rely on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	W519	Population access to no facility/ nature/ bush as the main form of sanitation—Urban (% of population)	Share of urban households that rely on no facility/nature/bush as the main form of sanitation.	Sanitation	National
	a005	Population take-up of electricity —National (% of population)	Share of the population living in communities or clusters where electricity is available that actually is connected and uses the service.	Electricity	National
	a007	Population take-up of electricity —Rural (% of population)	Share of the rural population living in communities or clusters where electricity is available that actually is connected and uses the service.	Electricity	National
	a006	Population take-up of electricity —Urban (% of population)	Share of the urban population living in communities or clusters where electricity is available that actually is connected and uses the service.	Electricity	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	W550	Population take-up of flush toilet to network/septic tank—Urban (% of population)	Share of urban population that has water or wastewater service available to them that actually make a connection to the service.	Sanitation	National
	i162	Population take-up of landline telephones—Urban (% population)	Share of the urban population living in communities or clusters where landline telephone is available that actually is connected and uses the service.	ICT	National
	W648	Population take-up of piped water—Urban (% of population)	Share of urban population that has water service available to them that actually make a connection to the service.	Water supply	National
	a118	Usage of charcoal/wood for cooking—National (% of population)	Percentage of population that uses charcoal/wood for cooking.	None-lectricity energy	National
	a121	Usage of charcoal/wood for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a122	Usage of charcoal/wood for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a123	Usage of charcoal/wood for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a124	Usage of charcoal/wood for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a125	Usage of charcoal/wood for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses charcoal/wood for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a120	Usage of charcoal/wood for cooking—Rural (% of population)	Percentage of population in rural areas that uses charcoal/wood for cooking.	None-lectricity energy	National
	a119	Usage of charcoal/wood for cooking—Urban (% of population)	Percentage of population in urban areas that uses charcoal/wood for cooking.	None-lectricity energy	National
	a094	Usage of electricity for cooking — National (% of population)	Percentage of population in the country that uses electricity for cooking.	Electricity	National
	a097	Usage of electricity for cooking — Quintile 1 (% of population)	Population in the first budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a098	Usage of electricity for cooking — Quintile 2 (% of population)	Population in the second budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a099	Usage of electricity for cooking — Quintile 3 (% of population)	Population in the third budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	a100	Usage of electricity for cooking — Quintile 4 (% of population)	Population in the fourth budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a101	Usage of electricity for cooking — Quintile 5 (% of population)	Population in the fifth budget quintile that uses electricity for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a096	Usage of electricity for cooking — Rural (% of population)	Percentage of population in rural areas that uses electricity for cooking.	Electricity	National
	a095	Usage of electricity for cooking — Urban (% of population)	Percentage of population in urban areas that uses electricity for cooking.	Electricity	National
	a110	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—National (% of population)	Percentage of population that uses kerosene/gasoline/gasoil/ paraffin for cooking.	None-lectricity energy	National
	a113	Usage of kerosene/gasoline/ gas-oil/ paraffin for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses kerosene/gaso-line/gasoil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a114	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses kerosene/ gasoline/gasoil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a115	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses kerosene/ gasoline/gasoil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a116	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses kerosene/ gasoline/gasoil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a117	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that useskerosene/gaso-line/gasoil/paraffin for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a112	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Rural (% of population)	Percentage of population in rural areas that uses kerosene/ gasoline/gasoil/paraffin for cooking.	None-lectricity energy	National
	a111	Usage of kerosene/gasoline/ gasoil/ paraffin for cooking—Urban (% of population)	Percentage of population in urban areas that uses kerosene/ gasoline/gasoil/paraffin for cooking.	None-lectricity energy	National
	a102	Usage of LPG for cooking—Na-tional (% of population)	Percentage of population that uses LPG for cooking.	None-lectricity energy	National
	a104	Usage of LPG for cooking—Quin-tile 1 (% of population)	Population in the first budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a105	Usage of LPG for cooking—Quin-tile 2 (% of population)	Population in the second budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Access	a106	Usage of LPG for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a107	Usage of LPG for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a108	Usage of LPG for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses LPG for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a103	Usage of LPG for cooking— Rural (% of population)	Percentage of population in rural areas that uses LPG for cooking.	None-lectricity energy	National
	a109	Usage of LPG for cooking—Urban (% of population)	Percentage of population in urban areas that uses LPG for cooking.	None-lectricity energy	National
	a126	Usage of residual/dung/other fuel for cooking—National (% of population)	Percentage of population that uses residual/dung/other fuel for cooking.	None-lectricity energy	National
	a130	Usage of residual/dung/other fuel for cooking—Quintile 2 (% of population)	Population in the second budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a132	Usage of residual/dung/other fuel for cooking—Quintile 4 (% of population)	Population in the fourth budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a128	Usage of residual/dung/other fuel for cooking—Rural (% of population)	Percentage of population in rural areas that uses residual/dung/other fuel for cooking.	None-lectricity energy	National
	a129	Usage of residual/dung/other fuel for cooking—Quintile 1 (% of population)	Population in the first budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a131	Usage of residual/dung/other fuel for cooking—Quintile 3 (% of population)	Population in the third budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a133	Usage of residual/dung/other fuel for cooking—Quintile 5 (% of population)	Population in the fifth budget quintile that uses residual/dung/other fuel for cooking as a share of population in that budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a127	Usage of residual/dung/other fuel for cooking—Urban(% of population)	Percentage of population in urban areas that uses residual/dung/other fuel for cooking.	None-lectricity energy	National
Affordability	i099	HH spending on cell phone—National (% HH spending)	Household spending on cell phone as a share of monthly household spending.	ICT	National
	i020	HH spending on cell phone—National (2002 US$)	Monthly household spending on a cell phone at the national level expressed in US$.	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i019	HH spending on cell phone—National (LCU)	Monthly household spending on a cell phone at the national level expressed in LCUs.	ICT	National
	i102	HH spending on cell phone—Quintile 1 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i026	HH spending on cell phone—Quintile 1 (2002 US$)	Monthly household spending on a cell phone by the first (and poorest) budget quintile of the population.	ICT	National
	i025	HH spending on cell phone—Quintile 1 (LCU)	Household spending on a cell phone in the first (poorest) quintile expressed in LCUs.	ICT	National
	i103	HH spending on cell phone—Quintile 2 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i028	HH spending on cell phone—Quintile 2 (2002 US$)	Monthly household spending on a cell phone by the second budget quintile of the population.	ICT	National
	i027	HH spending on cell phone—Quintile 2 (LCU)	Household spending on a cell phone in the second budget quintile expressed in LCUs.	ICT	National
	i104	HH spending on cell phone—Quintile 3 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i030	HH spending on cell phone—Quintile 3 (2002 US$)	Monthly household spending on a cell phone by the third budget quintile of the population.	ICT	National
	i029	HH spending on cell phone—Quintile 3 (LCU)	Household spending on a cell phone in the third budget quintile expressed in LCUs.	ICT	National
	i105	HH spending on cell phone—Quintile 4 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i032	HH spending on cell phone—Quintile 4 (2002 US$)	Monthly household spending on a cell phone by the fourth budget quintile of the population.	ICT	National
	i031	HH spending on cell phone—Quintile 4 (LCU)	Household spending on a cell phone in the fourth budget quintile expressed in LCUs.	ICT	National
	i106	HH spending on cell phone—Quintile 5 (% HH spending)	Household spending on cell phone as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i034	HH spending on cell phone—Quintile 5 (2002 US$)	Monthly household spending on a cell phone by the fifth (and richest) budget quintile of the population.	ICT	National
	i033	HH spending on cell phone—Quintile 5 (LCU)	Household spending on a cell phone in the fifth (richest) quintile expressed in LCUs.	ICT	National
	i100	HH spending on cell phone—Rural (% HH spending)	Household spending on cell phone as a share of monthly household spending in rural areas.	ICT	National
	i024	HH spending on cell phone—Rural (2002 US$)	Monthly household spending on a cell phone in rural areas expressed in US$.	ICT	National
	i023	HH spending on cell phone—Rural (LCU)	Monthly household spending on a cell phone in rural areas expressed in LCUs.	ICT	National
	i101	HH spending on cell phone—Urban (% HH spending)	Household spending on cell phone as a share of monthly household spending in rural areas.	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i022	HH spending on cell phone—Urban (2002 US$)	Monthly household spending on a cell phone in urban areas expressed in US$.	ICT	National
	i021	HH spending on cell phone—Urban (LCU)	Monthly household spending on a cell phone in urban areas expressed in LCUs.	ICT	National
	a151	HH spending on charcoal/wood—National (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending.	None-lectricity energy	National
	a044	HH spending on charcoal/wood—National (2002 US$)	Monthly household spending on charcoal/wood at the national level expressed in 2002 US$.	None-lectricity energy	National
	a041	HH spending on charcoal/wood—National (LCU)	Monthly household spending on charcoal/wood at the national level expressed in LCUs.	None-lectricity energy	National
	a154	HH spending on charcoal/wood—Quintile 1 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a047	HH spending on charcoal/wood—Quintile 1 (2002 US$)	Monthly household spending on charcoal/wood by the first (and poorest) budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a233	HH spending on charcoal/wood—Quintile 1 (LCU)	Household spending on charcoal/wood in the first (poorest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a155	HH spending on charcoal/wood—Quintile 2 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a048	HH spending on charcoal/wood—Quintile 2 (2002 US$)	Monthly household spending on charcoal/wood by the second budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a234	HH spending on charcoal/wood—Quintile 2 (LCU)	Household spending on charcoal/wood in the second budget quintile expressed in LCUs.	None-lectricity energy	National
	a156	HH spending on charcoal/wood—Quintile 3 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a049	HH spending on charcoal/wood—Quintile 3 (2002 US$)	Monthly household spending on charcoal/wood by the third budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a235	HH spending on charcoal/wood—Quintile 3 (LCU)	Household spending on charcoal/wood in the third budget quintile expressed in LCUs.	None-lectricity energy	National
	a157	HH spending on charcoal/wood—Quintile 4 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a050	HH spending on charcoal/wood—Quintile 4 (2002 US$)	Monthly household spending on charcoal/wood by the fourth budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a236	HH spending on charcoal/wood —Quintile 4 (LCU)	Household spending on charcoal/wood in the fourth budget quintile expressed in LCUs.	None-lectricity energy	National
	a158	HH spending on charcoal/wood —Quintile 5 (% of HH spending)	Household spending on charcoal/wood as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a051	HH spending on charcoal/wood —Quintile 5 (2002 US$)	Monthly household spending on charcoal/wood by the fifth (and richest) budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a237	HH spending on charcoal/wood —Quintile 5 (LCU)	Household spending on charcoal/wood in the fifth (richest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a153	HH spending on charcoal/wood —Rural (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending in rural areas.	None-lectricity energy	National
	a046	HH spending on charcoal/wood —Rural (2002 US$)	Monthly household spending on charcoal/wood in rural areas expressed in 2002 US$.	None-lectricity energy	National
	a043	HH spending on charcoal/wood —Rural (LCU)	Monthly household spending on charcoal/wood in rural areas expressed in LCUs.	None-lectricity energy	National
	a152	HH spending on charcoal/wood —Urban (% of HH spending)	Household spending on charcoal/wood as a share of monthly household spending in urban areas.	None-lectricity energy	National
	a045	HH spending on charcoal/wood —Urban (2002 US$)	Monthly household spending on charcoal/wood in urban areas expressed in 2002 US$.	None-lectricity energy	National
	a042	HH spending on charcoal/wood —Urban (LCU)	Monthly household spending on charcoal/wood in urban areas expressed in LCUs.	None-lectricity energy	National
	a159	HH spending on electricity—National (% of HH spending)	Household spending on electricity as a share of monthly household spending.	Electricity	National
	a162	HH spending on electricity—Quintile 1 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a163	HH spending on electricity—Quintile 2 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a164	HH spending on electricity—Quintile 3 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a165	HH spending on electricity—Quintile 4 (% of HH spending)	Household spending on electricity as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National
	a166	HH spending on electricity—Quintile 5 (% of HH spending)	Household spending on electricity as a share of total household spending in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Electricity	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a161	HH spending on electricity—Rural (% of HH spending)	Household spending on electricity as a share of monthly household spending in rural areas.	Electricity	National
	a160	HH spending on electricity—Urban (% of HH spending)	Household spending on electricity as a share of monthly household spending in urban areas.	Electricity	National
	a011	HH spending on electricity—National (2002 US$)	Monthly household spending on electricity for the national level expressed in 2002 US$.	Electricity	National
	a008	HH spending on electricity—National (LCU)	Monthly household spending on electricity at the national level expressed in LCUs.	Electricity	National
	a014	HH spending on electricity—Quintile 1 (2002 US$)	Monthly household spending on electricity by the first (and poorest) budget quintile of the population expressed in 2002 US$.	Electricity	National
	a218	HH spending on electricity—Quintile 1 (LCU)	Household spending on electricity in the first (poorest) budget quintile expressed in LCUs.	Electricity	National
	a015	HH spending on electricity—Quintile 2 (2002 US$)	Monthly household spending on electricity by the second budget quintile of the population expressed in 2002 US$.	Electricity	National
	a219	HH spending on electricity—Quintile 2 (LCU)	Household spending on electricity in the second budget quintile expressed in LCUs.	Electricity	National
	a016	HH spending on electricity—Quintile 3 (2002 US$)	Monthly household spending on electricity by the third budget quintile of the population expressed in 2002 US$.	Electricity	National
	a220	HH spending on electricity—Quintile 3 (LCU)	Household spending on electricity in the third budget quintile expressed in LCUs.	Electricity	National
	a017	HH spending on electricity—Quintile 4 (2002 US$)	Monthly household spending on electricity by the fourth budget quintile of the population expressed in 2002 US$.	Electricity	National
	a221	HH spending on electricity—Quintile 4 (LCU)	Household spending on electricity in the fourth budget quintile expressed in LCUs.	Electricity	National
	a018	HH spending on electricity—Quintile 5 (2002 US$)	Monthly household spending on electricity by the fifth (and richest) budget quintile of the population expressed in 2002 US$.	Electricity	National
	a217	HH spending on electricity—Quintile 5 (LCU)	Household spending on electricity in the fifth (richest) budget quintile expressed in LCUs.	Electricity	National
	a012	HH spending on electricity—Rural (2002 US$)	Monthly household spending on electricity in rural areas level expressed in 2002 US$.	Electricity	National
	a009	HH spending on electricity—Rural (LCU)	Monthly household spending on electricity in rural areas level expressed in LCUs.	Electricity	National
	a013	HH spending on electricity—Urban (2002 US$)	Monthly household spending on electricity in urban areas expressed in 2002 US$.	Electricity	National
	a010	HH spending on electricity—Urban (LCU)	Monthly household spending on electricity in urban areas expressed in LCUs.	Electricity	National
	a250	HH spending on energy—National (% of HH spending)	Household spending on energy as a share of household spending.	Non-electricity energy	National
	a066	HH spending on energy—National (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) at the national level expressed in 2002 US$.	Non-electricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a265	HH spending on energy—Quintile 1 (% of total HH spending)	Household spending on energy in the first (poorest) budget quintile as a share of total household spending.	None-lectricity energy	National
	a069	HH spending on energy—Quintile 1 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the first (and poorest) budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a243	HH spending on energy—Quintile 1 (LCU)	Household spending on energy in the first (poorest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a266	HH spending on energy—Quintile 2 (% of total HH spending)	Household spending on energy in the second budget quintile as a share of total household spending.	None-lectricity energy	National
	a070	HH spending on energy—Quintile 2 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the second budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a244	HH spending on energy—Quintile 2 (LCU)	Household spending on energy in the second budget quintile expressed in LCUs.	None-lectricity energy	National
	a267	HH spending on energy—Quintile 3 (% of total HH spending)	Household spending on energy in the third budget quintile as a share of total household spending.	None-lectricity energy	National
	a071	HH spending on energy—Quintile 3 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the third budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a245	HH spending on energy—Quintile 3 (LCU)	Household spending on energy in the third budget quintile expressed in LCUs.	None-lectricity energy	National
	a268	HH spending on energy—Quintile 4 (% of total HH spending)	Household spending on energy in the fourth budget quintile as a share of total household spending.	None-lectricity energy	National
	a072	HH spending on energy—Quintile 4 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the fourth budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a246	HH spending on energy—Quintile 4 (LCU)	Household spending on energy in the fourth budget quintile expressed in LCUs.	None-lectricity energy	National
	a269	HH spending on energy—Quintile 5 (% of total HH spending)	Household spending on energy in the fifth (richest) budget quintile as a share of total household spending.	None-lectricity energy	National
	a073	HH spending on energy—Quintile 5 (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) by the fifth (and richest) budget quintile of the population expressed in 2002 US$.	None-lectricity energy	National
	a247	HH spending on energy—Quintile 5 (LCU)	Household spending on energy in the fifth (richest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a248	HH spending on energy—Rural (% of HH spending)	Household spending on energy in rural areas as a share of total household spending.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a067	HH spending on energy—Rural (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in rural areas expressed in 2002 US$.	None-lectricity energy	National
	a064	HH spending on energy—Rural (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in rural areas expressed in LCUs.	None-lectricity energy	National
	a074	HH spending on energy—Urban (% of total HH spending)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) as a share of total household spending.	None-lectricity energy	National
	a068	HH spending on energy—Urban (2002 US$)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in urban areas expressed in 2002 US$.	None-lectricity energy	National
	a063	HH spending on energy—National (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) at the national level expressed in LCUs.	None-lectricity energy	National
	a065	HH spending on energy—Urban (LCU)	Monthly household spending on energy (electricity, gas, kerosene, charcoal/wood, and others) in urban areas expressed in LCUs.	None-lectricity energy	National
	a167	HH spending on gas—National (% of HH spending)	Household spending on gas as a share of monthly household spending.	None-lectricity energy	National
	a170	HH spending on gas—Quintile 1 (% of HH spending)	Household spending on gas as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a025	HH spending on gas—Quintile 1 (2002 US$)	Monthly household spending on gas by the first (and poorest) budget quintile of the population.	None-lectricity energy	National
	a223	HH spending on gas—Quintile 1 (LCU)	Household spending on gas in the first (poorest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a171	HH spending on gas—Quintile 2 (% of HH spending)	Household spending on gas as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a026	HH spending on gas—Quintile 2 (2002 US$)	Monthly household spending on gas by the second budget quintile of the population.	None-lectricity energy	National
	a224	HH spending on gas—Quintile 2 (LCU)	Household spending on gas in the second budget quintile expressed in LCUs.	None-lectricity energy	National
	a172	HH spending on gas—Quintile 3 (% of HH spending)	Household spending on gas as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a027	HH spending on gas—Quintile 3 (2002 US$)	Monthly household spending on gas by the third budget quintile of the population.	None-lectricity energy	National
	a225	HH spending on gas—Quintile 3 (LCU)	Household spending on gas in the third budget quintile expressed in LCUs.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a173	HH spending on gas—Quintile 4 (% of HH spending)	Household spending on gas as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a028	HH spending on gas—Quintile 4 (2002 US$)	Monthly household spending on gas by the fourth budget quintile of the population.	None-lectricity energy	National
	a226	HH spending on gas—Quintile 4 (LCU)	Household spending on gas in the fourth budget quintile expressed in LCUs.	None-lectricity energy	National
	a174	HH spending on gas—Quintile 5 (% of HH spending)	Household spending on gas as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a029	HH spending on gas—Quintile 5 (2002 US$)	Monthly household spending on gas by the fifth (and richest) budget quintile of the population.	None-lectricity energy	National
	a227	HH spending on gas—Quintile 5 (LCU)	Household spending on gas in the fifth (richest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a169	HH spending on gas—Rural (% of HH spending)	Household spending on gas as a share of monthly household spending in rural areas.	None-lectricity energy	National
	a168	HH spending on gas—Urban (% of HH spending)	Household spending on gas as a share of monthly household spending in urban areas.	None-lectricity energy	National
	a022	HH spending on gas—National (2002 US$)	Monthly household spending on gas at the national level expressed in 2002 US$.	None-lectricity energy	National
	a019	HH spending on gas—National (LCU)	Monthly household spending on gas at the national level expressed in LCUs.	None-lectricity energy	National
	a024	HH spending on gas—Rural (2002 US$)	Monthly household spending on gas in rural areas expressed in 2002 US$.	None-lectricity energy	National
	a021	HH spending on gas—Rural (LCU)	Monthly household spending on gas in rural areas expressed in LCUs.	None-lectricity energy	National
	a023	HH spending on gas—Urban (2002 US$)	Monthly household spending on gas in urban areas expressed in 2002 US$.	None-lectricity energy	National
	a020	HH spending on gas—Urban (LCU)	Monthly household spending on gas in urban areas expressed in LCUs.	None-lectricity energy	National
	a035	HH spending on kerosene—Rural (2002 US$)	Monthly household spending on kerosene in rural areas expressed in 2002 US$.	None-lectricity energy	National
	a175	HH spending on kerosene—National (% of HH spending)	Household spending on kerosene as a share of monthly household spending.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a033	HH spending on kerosene—National (2002 US$)	Monthly household spending on kerosene at the national level expressed in 2002 US$.	None-lectricity energy	National
	a030	HH spending on kerosene—National (LCU)	Monthly household spending on kerosene at the national level expressed in LCUs.	None-lectricity energy	National
	a036	HH spending on kerosene—Quintile 1 (2002 US$)	Monthly household spending on kerosene by the first (and poorest) budget quintile of the population.	None-lectricity energy	National
	a228	HH spending on kerosene—Quintile 1 (LCU)	Household spending on kerosene in the first (poorest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a179	HH spending on kerosene—Quintile 2 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a037	HH spending on kerosene—Quintile 2 (2002 US$)	Monthly household spending on kerosene by the second budget quintile of the population.	None-lectricity energy	National
	a229	HH spending on kerosene—Quintile 2 (LCU)	Household spending on kerosene in the second budget quintile expressed in LCUs.	None-lectricity energy	National
	a038	HH spending on kerosene—Quintile 3 (2002 US$)	Monthly household spending on kerosene by the third budget quintile of the population.	None-lectricity energy	National
	a230	HH spending on kerosene—Quintile 3 (LCU)	Household spending on kerosene in the third budget quintile expressed in LCUs.	None-lectricity energy	National
	a181	HH spending on kerosene—Quintile 4 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a039	HH spending on kerosene—Quintile 4 (2002 US$)	Monthly household spending on kerosene by the fourth budget quintile of the population.	None-lectricity energy	National
	a231	HH spending on kerosene—Quintile 4 (LCU)	Household spending on kerosene in the fourth budget quintile expressed in LCUs.	None-lectricity energy	National
	a040	HH spending on kerosene—Quintile 5 (2002 US$)	Monthly household spending on kerosene by the fifth (and richest) budget quintile of the population.	None-lectricity energy	National
	a232	HH spending on kerosene—Quintile 5 (LCU)	Household spending on kerosene in the fifth (richest) budget quintile expressed in LCUs.	None-lectricity energy	National
	a177	HH spending on kerosene—Rural (% of HH spending)	Household spending on kerosene as a share of monthly household spending in rural areas.	None-lectricity energy	National
	a032	HH spending on kerosene—Rural (LCU)	Monthly household spending on kerosene in rural areas expressed in LCUs.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a034	HH spending on kerosene—Urban (2002 US$)	Monthly household spending on kerosene in urban areas expressed in 2002 US$.	None-lectricity energy	National
	a031	HH spending on kerosene—Urban (LCU)	Monthly household spending on kerosene in urban areas expressed in LCUs.	None-lectricity energy	National
	a178	HH spending on kerosene—Quintile 1 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a180	HH spending on kerosene—Quintile 3 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a182	HH spending on kerosene—Quintile 5 (% of HH spending)	Household spending on kerosene as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a176	HH spending on kerosene—Urban (% of HH spending)	Household spending on kerosene as a share of monthly household spending in urban areas.	None-lectricity energy	National
	i115	HH spending on landline telephone—National (% HH spending)	Household spending on landline telephone as a share of monthly household spending.	ICT	National
	i164	HH spending on landline telephone—National (2002 US$)	Monthly household spending on a landline telephone for the national level expressed in US$.	ICT	National
	i163	HH spending on landline telephone—National (LCU)	Monthly household spending on a landline telephone at the national level expressed in LCUs.	ICT	National
	i118	HH spending on landline telephone—Quintile 1 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i170	HH spending on landline telephone—Quintile 1 (2002 US$)	Monthly household spending on a landline telephone by the first (and poorest) budget quintile of the population.	ICT	National
	i169	HH spending on landline telephone—Quintile 1 (LCU)	Household spending on a landline telephone in the first (poorest) quintile expressed in LCUs.	ICT	National
	i119	HH spending on landline telephone—Quintile 2 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i172	HH spending on landline telephone—Quintile 2 (2002 US$)	Monthly household spending on a landline telephone by the second budget quintile of the population.	ICT	National
	i171	HH spending on landline telephone—Quintile 2 (LCU)	Household spending on a landline telephone in the second budget quintile expressed in LCUs.	ICT	National
	i120	HH spending on landline telephone—Quintile 3 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i174	HH spending on landline telephone—Quintile 3 (2002 US$)	Monthly household spending on a landline telephone by the third budget quintile of the population.	ICT	National
	i173	HH spending on landline telephone—Quintile 3 (LCU)	Household spending on a landline telephone in the third budget quintile expressed in LCUs.	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i121	HH spending on landline telephone—Quintile 4 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i176	HH spending on landline telephone—Quintile 4 (2002 US$)	Monthly household spending on a landline telephone by the fourth budget quintile of the population.	ICT	National
	i175	HH spending on landline telephone—Quintile 4 (LCU)	Household spending on a landline telephone in the fourth budget quintile expressed in LCUs.	ICT	National
	i122	HH spending on landline telephone—Quintile 5 (% HH spending)	Household spending on landline telephone as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i178	HH spending on landline telephone—Quintile 5 (2002 US$)	Monthly household spending on a landline telephone by the fifth (and richest) budget quintile of the population.	ICT	National
	i177	HH spending on landline telephone—Quintile 5 (LCU)	Household spending on a landline telephone in the fifth (richest) quintile expressed in LCUs.	ICT	National
	i116	HH spending on landline telephone—Rural (% HH spending)	Household spending on landline telephone as a share of monthly household spending in rural areas.	ICT	National
	i168	HH spending on landline telephone—Rural (2002 US$)	Monthly household spending on a landline telephone in rural areas expressed in US$.	ICT	National
	i167	HH spending on landline telephone—Rural (LCU)	Monthly household spending on a landline telephone in rural areas expressed in LCUs.	ICT	National
	i117	HH spending on landline telephone—Urban (% HH spending)	Household spending on landline telephone as a share of monthly household spending in rural areas.	ICT	National
	i166	HH spending on landline telephone—Urban (2002 US$)	Monthly household spending on a landline telephone in urban areas level expressed in US$.	ICT	National
	i165	HH spending on landline telephone—Urban (LCU)	Monthly household spending on a landline telephone in urban areas expressed in LCUs.	ICT	National
	i123	HH spending on network services—National (% HH spending)	Household spending on network services as a share of monthly household spending.	ICT	National
	i052	HH spending on network services—National (2002 US$)	Monthly household spending network services for the national level expressed in US$.	ICT	National
	i051	HH spending on network services—National (LCU)	Monthly household spending on network services at the national level expressed in LCUs.	ICT	National
	i126	HH spending on network services—Quintile 1 (% HH spending)	Household spending on network services as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest)	ICT	National
	i058	HH spending on network services—Quintile 1 (2002 US$)	Monthly household spending on network services by the first (and poorest) budget quintile of the population.	ICT	National
	i057	HH spending on network services—Quintile 1 (LCU)	Household spending on network services in the first (poorest) quintile expressed in LCUs.	ICT	National
	i127	HH spending on network services—Quintile 2 (% HH spending)	Household spending on network services as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i060	HH spending on network services—Quintile 2 (2002 US$)	Monthly household spending on network services by the second budget quintile of the population.	ICT	National
	i059	HH spending on network services—Quintile 2 (LCU)	Household spending on network services the second budget quintile expressed in LCUs.	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i128	HH spending on network services—Quintile 3 (% HH spending)	Household spending on network services as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i062	HH spending on network services—Quintile 3 (2002 US$)	Monthly household spending on network services by the third budget quintile of the population.	ICT	National
	i061	HH spending on network services—Quintile 3 (LCU)	Household spending on network services in the third budget quintile expressed in LCUs.	ICT	National
	i129	HH spending on network services—Quintile 4 (% HH spending)	Household spending on network services as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i064	HH spending on network services—Quintile 4 (2002 US$)	Monthly household spending on network services by the fourth budget quintile of the population.	ICT	National
	i063	HH spending on network services—Quintile 4 (LCU)	Household spending on network services in the fourth budget quintile expressed in LCUs.	ICT	National
	i130	HH spending on network services—Quintile 5 (% HH spending)	Household spending on network services as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i066	HH spending on network services—Quintile 5 (2002 US$)	Monthly household spending on network services by the fifth (and richest) budget quintile of the population.	ICT	National
	i065	HH spending on network services—Quintile 5 (LCU)	Household spending on network services in the fifth (richest) quintile expressed in LCUs.	ICT	National
	i124	HH spending on network services—Rural (% HH spending)	Household spending on network services as a share of monthly household spending in rural areas.	ICT	National
	i056	HH spending on network services—Rural (2002 US$)	Monthly household spending on network services in rural areas level expressed in US$.	ICT	National
	i055	HH spending on network services—Rural (LCU)	Monthly household spending on network services in rural areas expressed in LCUs.	ICT	National
	i125	HH spending on network services—Urban (% HH spending)	Household spending on network services as a share of monthly household spending in rural areas.	ICT	National
	i054	HH spending on network services—Urban (2002 US$)	Monthly household spending on network services in urban areas level expressed in US$.	ICT	National
	i053	HH spending on network services—Urban (LCU)	Monthly household spending on network services in urban areas expressed in LCUs.	ICT	National
	i131	HH spending on nonnetwork services—National (% HH spending)	Household spending on nonnetwork services as a share of monthly household spending.	ICT	National
	i068	HH spending on nonnetwork services—National (2002 US$)	Monthly household spending nonnetwork services for the national level expressed in US$.	ICT	National
	i067	HH spending on nonnetwork services—National (LCU)	Monthly household spending on nonnetwork services at the national level expressed in LCUs.	ICT	National
	i134	HH spending on nonnetwork services—Quintile 1 (% HH spending)	Household spending on nonnetwork services as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i074	HH spending on nonnetwork services—Quintile 1 (2002 US$)	Monthly household spending on nonnetwork services by the first (and poorest) budget quintile of the population.	ICT	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i073	HH spending on nonnetwork services—Quintile 1 (LCU)	Household spending on nonnetwork services in the first (poorest) quintile expressed in LCUs.	ICT	National
	i135	HH spending on nonnetwork services—Quintile 2 (% HH spending)	Household spending on nonnetwork services as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i076	HH spending on nonnetwork services—Quintile 2 (2002 US$)	Monthly household spending on nonnetwork services by the second budget quintile of the population.	ICT	National
	i075	HH spending on nonnetwork services—Quintile 2 (LCU)	Household spending on nonnetwork services by the second budget quintile expressed in LCUs.	ICT	National
	i136	HH spending on nonnetwork services—Quintile 3 (% HH spending)	Household spending on nonnetwork services as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i078	HH spending on nonnetwork services—Quintile 3 (2002 US$)	Monthly household spending on nonnetwork services by the third budget quintile of the population.	ICT	National
	i077	HH spending on nonnetwork services—Quintile 3 (LCU)	Household spending on nonnetwork services in the third budget quintile expressed in LCUs.	ICT	National
	i137	HH spending on nonnetwork services—Quintile 4 (% HH spending)	Household spending on nonnetwork services as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i080	HH spending on nonnetwork services—Quintile 4 (2002 US$)	Monthly household spending on nonnetwork services by the fourth budget quintile of the population.	ICT	National
	i079	HH spending on nonnetwork services—Quintile 4 (LCU)	Household spending on nonnetwork services in the fourth budget quintile expressed in LCUs.	ICT	National
	i138	HH spending on nonnetwork services—Quintile 5 (% HH spending)	Household spending on nonnetwork services as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	ICT	National
	i082	HH spending on nonnetwork services—Quintile 5 (2002 US$)	Monthly household spending on nonnetwork services by the fifth (and richest) budget quintile of the population.	ICT	National
	i081	HH spending on nonnetwork services—Quintile 5 (LCU)	Household spending on nonnetwork services in the fifth (richest) quintile expressed in LCUs.	ICT	National
	i132	HH spending on nonnetwork services—Rural (% HH spending)	Household spending on nonnetwork services as a share of monthly household spending in rural areas.	ICT	National
	i072	HH spending on nonnetwork services—Rural (2002 US$)	Monthly household spending on nonnetwork services in rural areas level expressed in US$.	ICT	National
	i071	HH spending on nonnetwork services—Rural (LCU)	Monthly household spending on nonnetwork services in rural areas expressed in LCUs.	ICT	National
	i133	HH spending on nonnetwork services—Urban (% HH spending)	Household spending on nonnetwork services as a share of monthly household spending in rural areas.	ICT	National
	i070	HH spending on nonnetwork services—Urban (2002 US$)	Monthly household spending on nonnetwork services in urban areas level expressed in US$.	ICT	National
	i069	HH spending on nonnetwork services—Urban (LCU)	Monthly household spending on nonnetwork services in urban areas expressed in LCUs.	ICT	National
	a183	HH spending on other fuels—National (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending.	None-lectricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a055	HH spending on other fuels—National (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) at the national level expressed in 2002 US$.	Non-electricity energy	National
	a052	HH spending on other fuels—National (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) at the national level expressed in LCUs.	Non-electricity energy	National
	a058	HH spending on other fuels—Quintile 1 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the first (and poorest) budget quintile of the population expressed in 2002 US$.	Non-electricity energy	National
	a238	HH spending on other fuels—Quintile 1 (LCU)	Household spending on other fuels in the first (poorest) budget quintile expressed in LCUs.	Non-electricity energy	National
	a187	HH spending on other fuels—Quintile 2 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Non-electricity energy	National
	a059	HH spending on other fuels—Quintile 2 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the second budget quintile of the population expressed in 2002 US$.	Non-electricity energy	National
	a239	HH spending on other fuels—Quintile 2 (LCU)	Household spending on other fuels in the second budget quintile expressed in LCUs.	Non-electricity energy	National
	a060	HH spending on other fuels—Quintile 3 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the third budget quintile of the population expressed in 2002 US$.	Non-electricity energy	National
	a240	HH spending on other fuels—Quintile 3 (LCU)	Household spending on other fuels in the third budget quintile expressed in LCUs.	Non-electricity energy	National
	a189	HH spending on other fuels—Quintile 4 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Non-electricity energy	National
	a241	HH spending on other fuels—Quintile 4 (LCU)	Household spending on other fuels in the fourth budget quintile expressed in LCUs.	Non-electricity energy	National
	a061	HH spending on other fuels—Quintile 4 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the fourth budget quintile of the population expressed in 2002 US$.	Non-electricity energy	National
	a062	HH spending on other fuels—Quintile 5 (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) by the fifth (and richest) budget quintile of the population expressed in 2002 US$.	Non-electricity energy	National
	a242	HH spending on other fuels—Quintile 5 (LCU)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) in the fifth (richest) budget quintile expressed in LCUs.	Non-electricity energy	National
	a185	HH spending on other fuels—Rural (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending in rural areas.	Non-electricity energy	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	a056	HH spending on other fuels—Rural (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in rural areas expressed in 2002 US$.	None-lectricity energy	National
	a053	HH spending on other fuels—Rural (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in rural areas expressed in LCUs.	None-lectricity energy	National
	a057	HH spending on other fuels—Urban (2002 US$)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in urban areas expressed in 2002 US$.	None-lectricity energy	National
	a054	HH spending on other fuels—Urban (LCU)	Monthly household spending on other fuels (straw, hay, dung, and other basic forms of energy) in urban areas expressed in LCUs.	None-lectricity energy	National
	a186	HH spending on other fuels—Quintile 1 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a188	HH spending on other fuels—Quintile 3 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a190	HH spending on other fuels—Quintile 5 (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of total household spending for people in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	None-lectricity energy	National
	a184	HH spending on other fuels—Urban (% of HH spending)	Household spending on other fuels (straw, hay, dung, and other basic forms of energy) as a share of monthly household spending in urban areas.	None-lectricity energy	National
	W681	HH spending on solid waste disposal—National (% of HH spending)	Household spending on solid waste disposal as a share of total household spending at the national level.	Waste management	National
	W690	HH spending on solid waste disposal—National (2002 US$)	Monthly household spending on solid waste disposal at the national level expressed in 2002 US$.	Waste management	National
	W689	HH spending on solid waste disposal—National (LCU)	Monthly household spending on solid waste disposal at the national level expressed in LCUs.	Waste management	National
	W684	HH spending on solid waste disposal—Quintile 1 (% of HH spending)	Household spending on solid waste disposal by the first (poorest) budget quintile as a share of total household spending in urban areas.	Waste management	National
	W698	HH spending on solid waste disposal—Quintile 1 (2002 US$)	Monthly household spending on solid waste disposal by the first (poorest) budget quintile expressed in 2002 US$.	Waste management	National
	W697	HH spending on solid waste disposal—Quintile 1 (LCU)	Monthly household spending on solid waste disposal by the first (poorest) budget quintile expressed in LCUs.	Waste management	National
	W685	HH spending on solid waste disposal—Quintile 2 (% of HH spending)	Household spending on solid waste disposal by the second budget quintile as a share of total household spending in urban areas.	Waste management	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	W700	HH spending on solid waste disposal—Quintile 2 (2002 US$)	Monthly household spending on solid waste disposal by the second budget quintile expressed in 2002 US$.	Waste management	National
	W699	HH spending on solid waste disposal—Quintile 2 (LCU)	Monthly household spending on solid waste disposal by the second budget quintile expressed in LCUs.	Waste management	National
	W686	HH spending on solid waste disposal—Quintile 3 (% of HH spending)	Household spending on solid waste disposal by the third budget quintile as a share of total household spending in urban areas.	Waste management	National
	W702	HH spending on solid waste disposal—Quintile 3 (2002 US$)	Monthly household spending on solid waste disposal by the third budget quintile expressed in 2002 US$.	Waste management	National
	W701	HH spending on solid waste disposal—Quintile 3 (LCU)	Monthly household spending on solid waste disposal by the third budget quintile expressed in LCUs.	Waste management	National
	W687	HH spending on solid waste disposal—Quintile 4 (% of HH spending)	Household spending on solid waste disposal by the fourth budget quintile as a share of total household spending in urban areas.	Waste management	National
	W704	HH spending on solid waste disposal—Quintile 4 (2002 US$)	Monthly household spending on solid waste disposal by the fourth budget quintile expressed in 2002 US$.	Waste management	National
	W703	HH spending on solid waste disposal—Quintile 4 (LCU)	Monthly household spending on solid waste disposal by the fourth budget quintile expressed in LCUs.	Waste management	National
	W688	HH spending on solid waste disposal—Quintile 5 (% of HH spending)	Household spending on solid waste disposal by the fifth (richest) budget quintile as a share of total household spending in urban areas.	Waste management	National
	W706	HH spending on solid waste disposal—Quintile 5 (2002 US$)	Monthly household spending on solid waste disposal by the fifth (richest) budget quintile expressed in 2002 US$.	Waste management	National
	W705	HH spending on solid waste disposal—Quintile 5 (LCU)	Monthly household spending on solid waste disposal by the fifth (richest) budget quintile expressed in LCUs.	Waste management	National
	W682	HH spending on solid waste disposal—Rural (% of HH spending)	Household spending on solid waste disposal as a share of total household spending in rural areas.	Waste management	National
	W692	HH spending on solid waste disposal—Rural (2002 US$)	Monthly household spending on solid waste disposal in rural areas expressed in 2002 US$.	Waste management	National
	W691	HH spending on solid waste disposal—Rural (LCU)	Monthly household spending on solid waste disposal in rural areas expressed in LCUs.	Waste management	National
	W683	HH spending on solid waste disposal—Urban (% of HH spending)	Household spending on solid waste disposal as a share of total household spending in urban areas.	Waste management	National
	W694	HH spending on solid waste disposal—Urban (2002 US$)	Monthly household spending on solid waste disposal in urban areas expressed in 2002 US$.	Waste management	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	W693	HH spending on solid waste disposal—Urban (LCU)	Monthly household spending on solid waste disposal in urban areas expressed in LCUs.	Waste management	National
	i139	HH spending on transport—National (% HH spending)	Household spending on transport at the national level as a share of monthly household spending.	Transport	National
	i084	HH spending on transport—National (2002 US$)	Monthly household spending on transport at the national level expressed in US$.	Transport	National
	i083	HH spending on transport—National (LCU)	Monthly household spending on transport at the national level expressed in LCUs.	Transport	National
	i142	HH spending on transport—Quintile 1 (% HH spending)	Household spending on transport as a share of total household spending for people in the first budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Transport	National
	i090	HH spending on transport—Quintile 1 (2002 US$)	Monthly household spending on transport by the first (and poorest) budget quintile of the population.	Transport	National
	i089	HH spending on transport—Quintile 1 (LCU)	Household spending on transport in the first (poorest) quintile expressed in LCUs.	Transport	National
	i143	HH spending on transport—Quintile 2 (% HH spending)	Household spending on transport as a share of total household spending for people in the second budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Transport	National
	i092	HH spending on transport—Quintile 2 (2002 US$)	Monthly household spending on transport by the second budget quintile of the population.	Transport	National
	i091	HH spending on transport—Quintile 2 (LCU)	Household spending on transport in the second budget quintile expressed in LCUs.	Transport	National
	i144	HH spending on transport—Quintile 3 (% HH spending)	Household spending on transport as a share of total household spending for people in the third budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Transport	National
	i094	HH spending on transport—Quintile 3 (2002 US$)	Monthly household spending on transport by the third budget quintile of the population.	Transport	National
	i093	HH spending on transport—Quintile 3 (LCU)	Household spending on transport in the third budget quintile expressed in LCUs.	Transport	National
	i145	HH spending on transport—Quintile 4 (% HH spending)	Household spending on transport as a share of total household spending for people in the fourth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Transport	National
	i096	HH spending on transport—Quintile 4 (2002 US$)	Monthly household spending on transport by the fourth budget quintile of the population.	Transport	National
	i095	HH spending on transport—Quintile 4 (LCU)	Household spending on transport in the fourth budget quintile expressed in LCUs.	Transport	National
	i146	HH spending on transport—Quintile 5 (% HH spending)	Household spending on transport as a share of total household spending in the fifth budget quintile (first budget quintile: poorest, fifth budget quintile: richest).	Transport	National
	i098	HH spending on transport—Quintile 5 (2002 US$)	Monthly household spending on transport by the fifth (and richest) budget quintile of the population.	Transport	National
	i097	HH spending on transport—Quintile 5 (LCU)	Household spending on transport by the fifth (and richest) budget quintile of the population.	Transport	National
	i140	HH spending on transport—Rural (% HH spending)	Household spending on transport as a share of monthly household spending in rural areas.	Transport	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	i088	HH spending on transport—Rural (2002 US$)	Monthly household spending on transport in rural areas expressed in US$.	Transport	National
	i087	HH spending on transport—Rural (LCU)	Monthly household spending on transport in rural areas expressed in LCUs.	Transport	National
	i141	HH spending on transport—Urban (% HH spending)	Household spending on transport as a share of monthly household spending.	Transport	National
	i086	HH spending on transport—Urban (2002 US$)	Monthly household spending on transport in urban areas expressed in US$.	Transport	National
	i085	HH spending on transport—Urban (LCU)	Monthly household spending on transport in urban areas expressed in LCUs.	Transport	National
	W631	HH spending on water from vendors—National (% of HH spending)	Household spending on water from vendors as a share of total household spending at the national level.	Water supply	National
	W600	HH spending on water from vendors—National (2002 US$)	Monthly household spending on water from vendors at the national level expressed in 2002 US$.	Water supply	National
	W599	HH spending on water from vendors—National (LCU)	Monthly household spending on water from vendors at the national level expressed in LCUs.	Water supply	National
	W634	HH spending on water from vendors—Quintile 1 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the first (poorest) budget quintile.	Water supply	National
	W606	HH spending on water from vendors—Quintile 1 (2002 US$)	Monthly household spending on water from vendors in the first (poorest) budget quintile expressed in 2002 US$.	Water supply	National
	W605	HH spending on water from vendors—Quintile 1 (LCU)	Monthly household spending on water from vendors in the first (poorest) budget quintile expressed in LCUs.	Water supply	National
	W635	HH spending on water from vendors—Quintile 2 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the second budget quintile.	Water supply	National
	W608	HH spending on water from vendors—Quintile 2 (2002 US$)	Monthly household spending on water from vendors in the second budget quintile expressed in 2002 US$.	Water supply	National
	W607	HH spending on water from vendors—Quintile 2 (LCU)	Monthly household spending on water from vendors in the second budget quintile expressed in LCUs.	Water supply	National
	W636	HH spending on water from vendors—Quintile 3 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the third budget quintile.	Water supply	National
	W610	HH spending on water from vendors—Quintile 3 (2002 US$)	Monthly household spending on water from vendors in the third budget quintile expressed in 2002 US$.	Water supply	National
	W609	HH spending on water from vendors—Quintile 3 (LCU)	Monthly household spending on water from vendors in the third budget quintile expressed in LCUs.	Water supply	National
	W637	HH spending on water from vendors—Quintile 4 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the fourth budget quintile.	Water supply	National
	W612	HH spending on water from vendors—Quintile 4 (2002 US$)	Monthly household spending on water from vendors in the fourth budget quintile expressed in 2002 US$.	Water supply	National
	W611	HH spending on water from vendors—Quintile 4 (LCU)	Monthly household spending on water from vendors in the fourth budget quintile expressed in LCUs.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	W638	HH spending on water from vendors—Quintile 5 (% of HH spending)	Household spending on water from vendors as a share of total household spending by the fifth (richest) budget quintile.	Water supply	National
	W614	HH spending on water from vendors—Quintile 5 (2002 US$)	Monthly household spending on water from vendors in the fifth (richest) budget quintile expressed in 2002 US$.	Water supply	National
	W613	HH spending on water from vendors—Quintile 5 (LCU)	Monthly household spending on water from vendors in the fifth (richest) budget quintile expressed in LCUs.	Water supply	National
	W632	HH spending on water from vendors—Rural (% of HH spending)	Household spending on water from vendors as a share of total household spending in rural areas.	Water supply	National
	W602	HH spending on water from vendors—Rural (2002 US$)	Monthly household spending on water from vendors in rural areas expressed in 2002 US$.	Water supply	National
	W601	HH spending on water from vendors—Rural (LCU)	Monthly household spending on water from vendors in rural areas expressed in LCUs.	Water supply	National
	W633	HH spending on water from vendors—Urban (% of HH spending)	Household spending on water from vendors as a share of total household spending in urban areas.	Water supply	National
	W604	HH spending on water from vendors—Urban (2002 US$)	Monthly household spending on water from vendors in urban areas expressed in 2002 US$.	Water supply	National
	W603	HH spending on water from vendors—Urban (LCU)	Monthly household spending on water from vendors in urban areas expressed in LCUs.	Water supply	National
	W639	HH spending on water—National (% of HH spending)	Household spending on water as a share of total household spending at the national level as a share of total household spending in urban areas.	Water supply	National
	W616	HH spending on water—National (2002 US$)	Monthly household spending on water at the national level expressed in 2002 US$.	Water supply	National
	W615	HH spending on water—National (LCU)	Monthly household spending on water at the national level expressed in LCUs.	Water supply	National
	W642	HH spending on water—Quintile 1 (% of HH spending)	Household spending on water by the first (poorest) budget quintile as a share of total household spending in urban areas.	Water supply	National
	W622	HH spending on water—Quintile 1 (2002 US$)	Monthly household spending on water by the first (poorest) budget quintile expressed in 2002 US$.	Water supply	National
	W621	HH spending on water—Quintile 1 (LCU)	Monthly household spending on water by the first (poorest) budget quintile expressed in LCUs.	Water supply	National
	W643	HH spending on water—Quintile 2 (% of HH spending)	Household spending on water by the second budget quintile as a share of total household spending in urban areas.	Water supply	National
	W624	HH spending on water—Quintile 2 (2002 US$)	Monthly household spending on water by the second budget quintile expressed in 2002 US$.	Water supply	National
	W623	HH spending on water—Quintile 2 (LCU)	Monthly household spending on water by the second budget quintile expressed in LCUs.	Water supply	National
	W644	HH spending on water—Quintile 3 (% of HH spending)	Household spending on water by the third budget quintile as a share of total household spending in urban areas.	Water supply	National
	W626	HH spending on water—Quintile 3 (2002 US$)	Monthly household spending on water by the third budget quintile expressed in 2002 US$.	Water supply	National
	W625	HH spending on water—Quintile 3 (LCU)	Monthly household spending on water by the third budget quintile expressed in LCUs.	Water supply	National

Policy	Temp code	Indicator name	Definition	Sector	Level
Affordability	W645	HH spending on water—Quintile 4 (% of HH spending)	Household spending on water by the fourth budget quintile as a share of total household spending in urban areas.	Water supply	National
	W628	HH spending on water—Quintile 4 (2002 US$)	Monthly household spending on water by the fourth budget quintile expressed in 2002 US$.	Water supply	National
	W627	HH spending on water—Quintile 4 (LCU)	Monthly household spending on water by the fourth budget quintile expressed in LCUs.	Water supply	National
	W646	HH spending on water—Quintile 5 (% of HH spending)	Household spending on water by the fifth (richest) budget quintile as a share of total household spending in urban areas.	Water supply	National
	W630	HH spending on water—Quintile 5 (2002 US$)	Monthly household spending on water by the fifth (richest) budget quintile expressed in 2002 US$.	Water supply	National
	W629	HH spending on water—Quintile 5 (LCU)	Monthly household spending on water by the fifth (richest) budget quintile expressed in LCUs/	Water supply	National
	W640	HH spending on water—Rural (% of HH spending)	Household spending on water as a share of total household spending in rural areas as a share of total household spending in urban areas.	Water supply	National
	W618	HH spending on water—Rural (2002 US$)	Monthly household spending on water in rural areas expressed in 2002 US$.	Water supply	National
	W617	HH spending on water—Rural (LCU)	Monthly household spending on water in rural areas expressed in LCUs.	Water supply	National
	W641	HH spending on water—Urban (% of HH spending)	Household spending on water as a share of total household spending in urban areas.	Water supply	National
	W620	HH spending on water—Urban (2002 US$)	Monthly household spending on water in urban areas expressed in 2002 US$.	Water supply	National
	W619	HH spending on water—Urban (LCU)	Monthly household spending on water in urban areas expressed in LCUs.	Water supply	National

Source Own elaboration.

Note: HH = household; ICT = information and communication technology; LCU = local currency unit; NGO = nongovernmental organization.

Annex A13.2 DHS/MICS surveys processed to create AICD baseline up to and including 2005

Country	Available observations			Year of survey		Included in the trend analysis*
	1990–95	1996–00	2001–05	DHS	MICS	
Benin		√	√	1996, 2001		X
Burkina Faso	√	√	√	1993, 1999, 2003		X
Central African Republic	√			1995		
Cameroon	√	√	√	1991, 1998, 2004		X
Chad		√	√	1997, 2004		X
Comoros		√		1996		
Congo, Dem. Rep. of	√		√		2000	X
Congo, Rep. of			√	2005		
Côte d'Ivoire	√	√		1994, 1999		X
Ethiopia		√	√	2000, 2005		X
Gabon		√		2000		
Ghana	√	√	√	1993, 1998, 2003		X
Guinea			√	1999, 2005		X
Kenya	√	√	√	1993, 1998, 2003		X
Lesotho		√	√	2005	2000	X
Madagascar	√	√	√	1992, 1997, 2004		X
Malawi	√	√	√	1992, 2000, 2004		X
Mali		√	√	1996, 2001		X
Mauritania			√	2001		
Mozambique		√	√	1997, 2003		X
Namibia	√	√		1992, 2000		X
Niger	√	√		1992, 1998		X
Nigeria	√	√	√	1990, 1999, 2003		X
Rwanda	√	√	√	1992, 2000, 2005		X
Senegal	√	√	√	1993, 1997, 2005		X
South Africa		√		1998		
Sudan		√			2000	
Tanzania	√	√	√	1992, 1999, 2004		X
Togo		√		1998		
Uganda	√		√	1995, 2001		X
Zambia	√	√	√	1992, 1996, 2002		X
Zimbabwe	√	√		1994, 1999		X

Source: Own elaboration

Note: AICD= Africa Infratructure Country Diagnostic; DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey.

Annex A13.3 LSMS/IES surveys processed to create AICD baseline up to and including 2005

	Country	Type and year of survey	Sample size	Water supply	Sanitation
1	Angola	Integrated Expenditure Survey 2000	10,116	Yes	No
2	Benin	Core Welfare Indicators Questionnaire 2002	5,350	Yes	Yes
3	Burkina Faso	Core Welfare Indicators Questionnaire 2003	8,500	Yes	Yes
4	Burundi	Priority Survey 1998	6,668	Yes	No
5	Chad	Enquête sur la consommation et le secteur informel au Tchad, 2002	10,992	Yes	Yes
6	Cameroon	Enquête Camerounaise auprès des ménages II 2001	4,584	Yes	Yes
7	Cape Verde	Integrated Expenditure Survey 2001		Yes	Yes
8	Côte d'Ivoire	Integrated Expenditure Survey 2002	5,002	Yes	Yes
9	Congo, Rep. of	Enquête Congolaise auprès des ménages pour l'évaluation de la pauvreté, 2005	12,097	Yes	Yes
10	Congo, Dem. Rep. of	Integrated Expenditure Survey 2005	10,801	Yes	Yes
11	Ethiopia	Welfare Monitoring Survey 2000	16,672	Yes	Yes
12	Gabon	Core Welfare Indicators Questionnaire 2005	7,902	Yes	Yes
13	Ghana	Ghana Living Standards Survey 1998/99	5,991	Yes	Yes
14	Guinea-Bissau	Core Welfare Indicators Questionnaire 2002	3,216	Yes	Yes
15	Kenya	Welfare Monitoring Survey 1997	10,874	Yes	Yes
16	Madagascar	Enquête prioritaire des ménages 2001	5,081	Yes	Yes
17	Malawi	Integrated Household Survey 2003	11,280	Yes	Yes
18	Mauritania	Enquête permanente sur les conditions de vie des ménages 2000	5,865	Yes	Yes
19	Morocco	Integrated Household Survey 2003	5,129	Yes	Yes
20	Mozambique	Inquérito aos agregados familiares sobre orçamento familiar 2002/3	8,703	Yes	Yes
21	Niger	Integrated Household Survey 2005	6,690	Yes	Yes
22	Nigeria	Nigeria Living Standards Survey 2003	19,158	Yes	Yes
23	Rwanda	Enquête intégrale sur les conditions de vie des ménages (avec module budget et consommation) 1999	6,420	Yes	Yes
24	São Tomé and Príncipe	Enquête sur les conditions de vie des ménages 2000		Yes	Yes
25	Senegal	Integrated Expenditure Survey 2001	2,418	Yes	Yes
26	Sierra Leone	Integrated Household Survey 2003	3,713	Yes	Yes
27	South Africa	Integrated Expenditure Survey 2000		Yes	Yes
28	Tanzania	Household Budget Survey 2000	22,207	Yes	Yes
29	Uganda	National Household Survey 2002	9,710	Yes	Yes
30	Zambia	Living Conditions Monitoring Survey 2002	9,715	Yes	Yes
		Total	267,711	30	28

Source: Own elabotation.

Note: AIKP= African Infrastructure Knowledge Program; IES = Income and Expenditure Survey; LSMS = Living Standards Measurement Study.

Annex A13.4 Variables in DHS/MICS survey master database

Source of drinking water
Source of nondrinking water
Same source of water
Time to get to water source
Type of toilet facility
Has electricity
Has radio
Has television
Has refrigerator
Has bicycle
Has motorcycle/scooter
Has car/truck
Main floor material
Main wall material
Main roof material
Rooms for sleeping
Has telephone
Share toilet with other households/individuals
Type of cooking fuel
Have bednet for sleeping
Children under 5 slept under bednet
Place for hand washing
Items present: Tap/water
Items present: Soap/other cleansing agent
Items present: Basin
Test salt for Iodine
Urban area
Region

Source: Own elaboration.

Note: DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey.

Annex A13.5 STATA code for standardization of a DHS/MICS Survey

The code is based on the example of Ghana 1998.

```
/*************************************************************************
Ghana/GLSS4
Created: Uddin Helal
Date: October 8, 2006
Revised:
Notes:
Prepresentative:
1) National
2) Regional(11)
*************************************************************************/
clear
set mem 200m
set more off
**********
*1. ID
use "C:\DATA\GHA\Data\POV_GH.DTA", clear
keep clust nh pid sexhead agehead hhsize eqsc region month year weight expend expendc fexpendc

egen hid=concat(clust nh)
destring hid, replace
*/nh-HH ID
*/clust-Enumeration area number
rename clust psu
label var psu "Primary sampling unit"
*/region-Administrative region
rename region reg1
label var reg1 "region"
*/day-Day of the interview-NA
gen day=.
*/month-Month of the interview
*/year-Year of the interview
replace year=1998 if year==98
replace year=1999 if year==99
*/fexpendc-Total food expenditure
gen fd_exp=fexpendc/12
label var fd_exp " Monthly food expenditure of HH"
drop fexpendc
*/weight-Sample weight
*/expendc-Total nominal expenditure-Corrected
gen lc_exp=expendc/12
label var lc_exp "HH expenditure/consumption,local currency"
xtile dec_e1=lc_exp/hhsize [w=weight*hhsize], n(10)
xtile qnt_e1=lc_exp/hhsize [w=weight*hhsize], n(5)
xtile dec_e2=lc_exp [w=weight], n(10)
xtile qnt_e2=lc_exp [w=weight], n(5)
*/eqsc-Equivalent Scale
gen aesize=eqsc
label var aesize "Adult Equivalent hh size"
```

```
*2. HH head
*/sexhead- Household head's Sex
recode sexhead 1=0 2=1
*rel-Relationship to household
rename sexhead hh_sex
label var hh_sex "Household head's Sex-0-male,1-female"
*/agehead-Household Head's Age
rename agehead hh_age
label var hh_age "Household Head's Age in years"
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
use "C:\DATA\GHA\Data\SEC0A.DTA", clear
keep nh clust loc2 loc3
egen hid=concat(clust nh)
destring hid, replace
*/Creating urban-rural dummy
gen ur=.
replace ur=1 if loc2==1
replace ur=0 if loc2==2
label var ur "Urban-1, rural-0"
*/Creating location variable
rename loc3 loc
label var loc "Capital-1, other urban-2, rural-3"
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
use "C:\DATA\GHA\Data\SEC1.dta",clear
keep nh clust rel s1q9
keep if rel==1
egen hid=concat(clust nh)
destring hid, replace
*s1q9-religion
recode s1q9 1 2 3 4 5 6 7=1 8=2 9 10 96=3
gen hh_rel=.
replace hh_rel=s1q9 if rel==1
label var hh_rel "Household Head's Religion"
drop s1q9
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
```

```
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
use "C:\DATA\GHA\Data\SEC4A.DTA", clear
keep nh pid clust s4aq6
egen hid=concat(clust nh)
destring hid, replace
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
keep if rel==1
*s4aq6-Household head's main activity
recode s4aq6 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34=1 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68=0
gen hh_agr2=.
replace hh_agr2=0 if s4aq6==0 & rel==1
replace hh_agr2=1 if s4aq6==1& rel==1
label var hh_agr2 "1-HH head employed in Agriculture; 0-others"
drop s4aq6
keep if pid==1
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
*3. hh head's Education
use "C:\DATA\GHA\Data\SEC2A.dta",clear
keep nh clust pid s2aq3
egen hid=concat(clust nh)
destring hid, replace
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
keep if rel==1
keep if pid==1
*/s2aq3- Highest educational qualification
recode s2aq3 3 4 5 6=3 7 8 9 10 11=4 12 13 14 96=5
gen hh_ed=.
replace hh_ed=s2aq3
label var hh_ed "hh head's educ level"
```

```
*/Please remember that option "96" that represent others is included as tertiary. It looks like we should consider for alternative grouping
drop s2aq3
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
*4. Dwelling
use "C:\DATA\GHA\Data\SEC7.DTA", clear
keep nh clust s7aq1 s7aq2 s7aq3 s7bq1 s7cq1a s7cq1b s7dq13 s7eq1 s7eq2 s7eq3
egen hid=concat(clust nh)
destring hid, replace
*/s7aq1-Dwelling Type
recode s7aq1 1=4 3 4=1 5 6=3 7=5
rename s7aq1 dw_type
label var dw_type "Dwelling Type"
*/s7bq1-Ownership
recode s7bq1 4=3
rename s7bq1 dw_own
label var dw_own "Dwelling Ownership"
*s7aq3-Is Dwelling shared with other households?
recode s7aq3 2=0
rename s7aq3 dw_sh
label var dw_sh "Dwelling shared with other households"
*/s7eq2-Floor material
gen dw_fm=s7eq2
recode dw_fm 2=4 4 6=5 5=3
label var dw_fm "Floor Material"
*/s7eq1-Wall material
gen dw_wm=s7eq1
recode dw_wm 1=6 4=7 5=1 6=8
label var dw_wm "Wall Material"
*/s7eq3-Roof material
gen dw_rm=s7eq3
recode dw_rm 1=4 2=4 3=1 4=3 5=2 6=5
label var dw_rm "Roof Material"
*/s7cq1a-Paid rent amount; s7cq1b-Time unit--day, week, month, quarterly, half yearly and yearly
gen dw_rent=s7cq1a
replace dw_rent=dw_rent*30 if s7cq1b==1
replace dw_rent=dw_rent*4 if s7cq1b==2
replace dw_rent=dw_rent/3 if s7cq1b==4
replace dw_rent=dw_rent/6 if s7cq1b==5
replace dw_rent=dw_rent/12 if s7cq1b==6
label var dw_rent "Monthly rent"
*/dw_room-# of rooms-not available
gen dw_room=.
*/s7aq2-# of rooms occupied
rename s7aq2 dw_roomocc
label var dw_roomocc "room-# of rooms occupied by the household"
*/How old is the dwelling (in years)-NA
```

```
gen dw_year=.
*/dw_tar-Total area of dwelling-NA)
gen dw_tar=.
*/dw_tar-living area of dwelling-NA)
gen dw_lar=.
*/s7dq13-Toilet facility
recode s7dq13 2=3 3=4 4=2 5=6
rename s7dq13 dw_tf
label var dw_tf "Toilet facility"
drop s7cq1a s7cq1b s7eq1 s7eq2 s7eq3
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
*/5. Water
use "C:\DATA\GHA\Data\SEC7.DTA", clear
keep nh clust s7dq1 s7dq2a s7dq2b s7dq4a s7dq4b s7dq5
egen hid=concat(clust nh)
destring hid, replace
*/s7dq1-source of water
gen wr_ms=s7dq1
recode wr_ms 2=1 3 4=5 5=2 6=1 7=2 8 9=3 10=4 11=3 12=6
recode wr_ms 2=1 3=2 4=3 5=4 6=5 7=6
label var wr_ms "Main source of Water"
*/wr_dt1-time distance to water source-NA
gen wr_dt1=.
*/ Time distance to main source of water, Standardized-NA
gen wr_dt2=.
*/s7dq2a-distance to water source (meter)
gen wr_dk1=s7dq2a
replace wr_dk1=wr_dk1*.9144 if s7dq2b==1
replace wr_dk1=wr_dk1*1000 if s7dq2b==3
replace wr_dk1=wr_dk1*1609.344 if s7dq2b==4
label var wr_dk1 "Distance to water source(meter)"
recode s7dq1 2=1
*/wr_dk2-Distance to water source (meter)-Standardized
gen wr_dk2=.
replace wr_dk2=1 if s7dq1==1
replace wr_dk2=2 if wr_dk1<=500 & s7dq1!=1
replace wr_dk2=3 if wr_dk1>500 & s7dq1!=1 & wr_dk1<=1000 & s7dq1!=1
replace wr_dk2=4 if wr_dk1>1000 & s7dq1!=1
label var wr_dk2 "Distance to water source (meter)-Standardized"
*/ s7dq4a -Total cost of drinking water last bill
gen wr_wt21=s7dq4a
replace wr_wt21=wr_wt21*30 if s7dq4b==1
```

```
replace wr_wt21=wr_wt21/3 if s7dq4b==4
replace wr_wt21=wr_wt21/6 if s7dq4b==5
label var wr_wt21 “HH expenditure on drinking water “
*/s7dq5-expenditure on drinking water from private vendor in the last 2 weeks
gen wr_wt22=s7dq5
replace wr_wt22=wr_wt22*2
label var wr_wt21 “HH expenditure on drinking water from private vendor”
drop s7dq1 s7dq2a s7dq2b s7dq4a s7dq4b s7dq5
sort hid
merge hid using “C:\DATA\GHA\Data\test”
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
*6. Waste
use “C:\DATA\GHA\Data\SEC7.DTA”, clear
keep nh clust s7dq11 s7dq12a s7dq12b
egen hid=concat(clust nh)
destring hid, replace
*/s7dq11-what knd of rubbish disposal facilities
gen ws_ru=s7dq11
recode ws_ru 2=4 3=4
label var ws_ru “knd of rubbish disposal facilities”
*/s7dq12a-Expenditure on rubbish disposal
gen ws_ru2=s7dq12a
replace ws_ru2=ws_ru2*30 if s7dq12b==1
replace ws_ru2=ws_ru2*4 if s7dq12b==2
replace ws_ru2=ws_ru2/3 if s7dq12b==4
label var ws_ru2 “Expenditure on rubbish disposal”
drop s7dq11 s7dq12a s7dq12b
sort hid
merge hid using “C:\DATA\GHA\Data\test”
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
*7. Energy
use “C:\DATA\GHA\Data\SEC7.DTA”, clear
keep nh clust s7dq8 s7dq10 s7dq9a s7dq9b
egen hid=concat(clust nh)
destring hid, replace
*/ s7dq8-Main source of lighting
```

```
gen en_lf= s7dq8
recode en_lf 2=6 4=6 5=6
label var en_lf “Main source of lighting”
*/s7dq10-Main source of cooking fuel
gen en_cf=s7dq10
recode en_cf 1 2=4 3=2 4=1 5=3
label var en_cf “Main source of Cooking fuel”
*/s7dq9a-last light bill; assumed it is for electricity; s7dq9b-time unit
gen en_el=s7dq9a
replace en_el=. if s7dq9b==0
replace en_el=en_el*30 if s7dq9b==1
replace en_el=en_el*4 if s7dq9b==2
replace en_el=en_el/3 if s7dq9b==4
replace en_el=en_el/6 if s7dq9b==5
replace en_el=en_el/12 if s7dq9b==6
label var en_el “Total expenditure on electricity”
drop s7dq8 s7dq10 s7dq9a s7dq9b
sort hid
merge hid using “C:\DATA\GHA\Data\test”
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
use “C:\DATA\GHA\Data\SEC9A2.DTA”, clear
keep nh clust nfdex2cd s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6
egen hid=concat(clust nh)
destring hid, replace
*310-gas for cooking, 311-Kerosine and other liquid, 312-Charcoal, 313-Firewood and other solid fuel
recode nfdex2cd 312=313
keep if nfdex2cd==310 | nfdex2cd==311 | nfdex2cd==313
collapse (sum) s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6, by (hid nfdex2cd)
egen en_gs=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==310
replace en_gs=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var en_gs “Total expenditure on Gas”
egen en_ke=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==311
replace en_ke=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var en_ke “Total expenditure on kerosene/Oil/paraffin/petrol”
egen en_cw=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==313
replace en_cw=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var en_cw “Total expenditure on charcoal& wood”
gen e_1=0
replace e_1=1 if en_gs!=.
gen e_2=0
replace e_2=1 if en_ke!=.
gen e_3=0
replace e_3=1 if en_cw!=.
```

```
collapse (sum) e_* en_gs en_ke en_cw, by (hid)
replace en_gs=. if e_1==0
replace en_ke=. if e_2==0
replace en_cw=. if e_3==0
drop e_*
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
*/en_t; expenditure total for energy-created
egen en_t=rsum(en_el en_gs en_ke en_cw)
replace en_t=. if en_el==. & en_gs==. & en_ke==. & en_cw==.
label var en_t "Total expenditure on all energy"
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
*8. Transport $ Communication
use "C:\DATA\GHA\Data\SEC9A2.DTA", clear
keep nh clust nfdex2cd s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6
egen hid=concat(clust nh)
destring hid, replace

*608-petrol for transport, 610-Inter City bus ,611-City bus, 612-Other (rail, air, boats,)
recode nfdex2cd 610=611
keep if nfdex2cd==608|nfdex2cd==611 | nfdex2cd==612
collapse (sum) s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6, by (hid nfdex2cd)
egen tr_pt=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==608
replace tr_pt=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var tr_pt "HH Exp on petrol/ Motor car fuel"
egen tr_bs=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==611
replace tr_bs=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var tr_bs "HH Exp on Bus"
egen tr_ot=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==612
replace tr_ot=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var tr_ot "HH Exp on Others"
gen t_1=0
replace t_1=1 if tr_pt!=.
gen t_2=0
replace t_2=1 if tr_bs!=.
gen t_3=0
replace t_3=1 if tr_ot!=.
collapse (sum) t_* tr_pt tr_bs tr_ot, by (hid)
replace tr_pt=. if t_1==0
replace tr_bs=. if t_2==0
replace tr_ot=. if t_3==0
drop t_*
egen tr_t=rsum(tr_pt tr_bs tr_ot)
```

```
replace tr_t=. if tr_pt==. & tr_bs==. & tr_ot==.
label var tr_t "Total HH Exp on Transport"
gen tr_rl=.
gen tr_bt=.
gen tr_ar=.
gen tr_tx=.
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
*9. Communication
use "C:\DATA\GHA\Data\SEC9A2.DTA", clear
keep nh clust nfdex2cd s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6
egen hid=concat(clust nh)
destring hid, replace
*613-Postal charges including, 614-Telegrams,telephones, Fax etc
keep if nfdex2cd==613| nfdex2cd==614
collapse (sum) s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6, by (hid nfdex2cd)
egen cm_pst=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==613
replace cm_pst=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var cm_pst "Expenditure on Postage stamps or other postal fees"
egen cm_ttph=rsum(s9a2q1 s9a2q2 s9a2q3 s9a2q4 s9a2q5 s9a2q6) if nfdex2cd==614
replace cm_ttph=. if s9a2q1==. & s9a2q2==. & s9a2q3==. & s9a2q4==. & s9a2q5==. & s9a2q6==.
label var cm_ttph "Expenditure on telegrams,telephones, fax etc"
gen t_1=0
replace t_1=1 if cm_pst!=.
gen t_2=0
replace t_2=1 if cm_ttph!=.
collapse (sum) t_* cm_pst cm_ttph, by (hid)
replace cm_pst=. if t_1==0
replace cm_ttph=. if t_2==0
drop t_*
*/cm_t; expenditure total for Communication-created
egen cm_t=rsum(cm_pst cm_ttph)
replace cm_t=. if cm_pst==. & cm_ttph==.
label var cm_t "Total expenditure on communication"
*/HH has a telephone-NA
gen cm_tph1=.
gen cm_tph2=.
*/g25-someone in the HH has a cellphone
gen cm_cph1=.
gen cm_cph2=.
**********
**********
*10. Distances
```

```
gen ds_1t=.
gen ds_1k=.
gen ds_2t=.
gen ds_2k=.
gen ds_3t=.
gen ds_3k=.
gen ds_4t=.
gen ds_4k=.
gen ds_5t=.
gen ds_5k=.
gen ds_6t=.
gen ds_6k=.
gen ds_7t=.
gen ds_7k=.
gen ds_8t=.
gen ds_8k=.
sort hid
merge hid using “C:\DATA\GHA\Data\test”
tab _
drop _
sort hid
save C:\DATA\GHA\Data\test, replace
clear
**********
**********
**********
*11. Asset Ownership
use “C:\DATA\GHA\Data\SEC12B.DTA”, clear
keep nh clust hassetcd s12bq1
egen hid=concat(clust nh)
destring hid, replace
*/hassetcd-Item code
*/s12bq1-Does your household own a (specific)item?
gen ao_4=0
replace ao_4=1 if s12bq1==1& hassetcd==307|hassetcd==308|hassetcd==309|hassetcd==310
gen ao_5=0
replace ao_5=1 if s12bq1==1& hassetcd==311|hassetcd==313|hassetcd==314
gen ao_6=0
replace ao_6=1 if s12bq1==1& hassetcd==304
gen ao_7=0
replace ao_7=1 if s12bq1==1& hassetcd==305
gen ao_9=0
replace ao_9=1 if s12bq1==1& hassetcd==303
gen ao_10=0
replace ao_10=1 if s12bq1==1& hassetcd==315
gen ao_11=0
replace ao_11=1 if s12bq1==1& hassetcd==306
gen ao_12=0
replace ao_12=1 if s12bq1==1&hassetcd==302|hassetcd==312
gen ao_16=0
```

```
replace ao_16=1 if s12bq1==1& hassetcd==301
gen ao_17=0
replace ao_17=1 if s12bq1==1& hassetcd==319
gen ao_18=0
replace ao_18=1 if s12bq1==1& hassetcd==320
gen ao_19=0
replace ao_19=1 if s12bq1==1& hassetcd==315|hassetcd==316|hassetcd==317
gen ao_20=0
replace ao_20=1 if s12bq1==1& hassetcd==318
gen ao_22=0
replace ao_22=1 if s12bq1==1& hassetcd==322|hassetcd==323|hassetcd==324
*/ao_23-Others; Shares
gen ao_23=0
replace ao_23=1 if s12bq1==1& hassetcd==321
collapse (sum) ao_*, by (hid)
foreach var of varlist ao_* {
replace `var'=1 if `var'>1 & `var'!=.}
gen ao_1=.
gen ao_2=.
gen ao_3=.
gen ao_8=.
gen ao_13=.
gen ao_14=.
gen ao_15=.
gen ao_21=.
aorder
sort hid
merge hid using "C:\DATA\GHA\Data\test"
tab _
drop _
rename hid hhid
label var hhid "Unique hh id"
order hhid weight hhsize aesize hh_* day year month ur loc fd_exp lc_exp dec_e1 qnt_e1 ws_* dw_* wr_* en_* cm_t tr_* ao_*
keep if rel==1
drop nh clust pid rel loc2 eqsc
gen hh_agr1=.
gen dw_own_s=.
gen en_ot=.
sort hhid
compress
save C:\Flagdata\GHA_1998, replace
*********
```

Source: Own elaboration.

Note: DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey

Annex A13.6 STATA code for standardization of an expenditure survey

```
/*********************************************************************
Master: All countries in one file
Created: Taras Pushak
Date: November 26, 2006
Notes:
*********************************************************************/
clear
set mem 500m
set more off
*cd "C:\Taras\SSA_06\Flagship2006\Inf_indic\II_dta"
cd "C:\Documents and Settings\wb241550\SSA_06\Flagship2006\Inf_indic\II_dta"
**********
capture program drop a
program define a
keep hhid month year psu reg* ur loc hhsize aesize weight fd_exp lc_exp dec_e* qnt_e* ///
hh_sex hh_age hh_rel hh_ed hh_agr1 hh_agr2 dw_type dw_sh dw_rm dw_wm dw_fm dw_own dw_own_s ///
dw_rent dw_room dw_roomocc dw_year dw_tar dw_lar dw_tf wr_ms wr_dt1 wr_dt2 wr_dk1 wr_dk2 ///
wr_wt21 wr_wt22 ws_ru ws_ru2 en_lf en_cf en_el en_gs en_ke en_cw en_ot en_t tr_bs tr_rl ///
tr_bt tr_ar tr_tx tr_ot tr_pt tr_t cm_tph1 cm_cph1 cm_tph2 cm_cph2 cm_pst cm_t ao_1 ao_2 ///
ao_3 ao_4 ao_5 ao_6 ao_7 ao_8 ao_9 ao_10 ao_11 ao_12 ao_13 ao_14 ao_15 ao_16 ao_17 ao_18 ///
ao_19 ao_20 ao_21 ao_22 ds_1t ds_1k ds_2t ds_2k ds_3t ds_3k ds_4t ds_4k ds_5t ds_5k ds_6t ///
ds_6k ds_7t ds_7k ds_8t ds_8k
end
use "NGA_2003", clear
tempfile a1
a
gen country="NGA"
order country
sort hhid
save `a1', replace
local c ETH_2000 KEN_1997 MDG_2001 SEN_2001 UGA_2002 ZMB_2002 MWI_2004 ///
BEN_2002 BFA_2003 CIV_2002 CMR_2001 GHA_1998 NER_2005 TZA_2000 CPV_2001 ///
BDI_1998 MOZ_2003 GAB_2005 STP_2000 ZAF_2000 GNB_2002 AGO_2000 ZAR_2005 ///
COG_2005 MRT_2000 TCD_2002 SLE_2004 MAR_1998 RWA_1998
foreach x of local c {
use `x', clear
a
gen country=substr("`x'",1,3)
order country
sort hhid
append using `a1'
save `a1', replace
}
**********
*** Sequence ***
**********
/*clear
input str3 country
"RWA"
```

```
end
append using `a1'*/
gen t=1 if coun=="AGO"
recode t .=2 if coun=="BEN"
recode t .=3 if coun=="BFA"
recode t .=4 if coun=="BDI"
recode t .=5 if coun=="TCD"
recode t .=6 if coun=="CMR"
recode t .=7 if coun=="CPV"
recode t .=8 if coun=="CIV"
recode t .=9 if coun=="COG"
recode t .=10 if coun=="ZAR"
recode t .=11 if coun=="ETH"
recode t .=12 if coun=="GAB"
recode t .=13 if coun=="GHA"
recode t .=14 if coun=="GNB"
recode t .=15 if coun=="KEN"
recode t .=16 if coun=="MDG"
recode t .=17 if coun=="MWI"
recode t .=18 if coun=="MRT"
recode t .=19 if coun=="MAR"
recode t .=20 if coun=="MOZ"
recode t .=21 if coun=="NER"
recode t .=22 if coun=="NGA"
recode t .=23 if coun=="RWA"
recode t .=24 if coun=="STP"
recode t .=25 if coun=="SEN"
recode t .=26 if coun=="SLE"
recode t .=27 if coun=="ZAF"
recode t .=28 if coun=="TZA"
recode t .=29 if coun=="UGA"
recode t .=30 if coun=="ZMB"
label define t 1 "AGO" 2 "BEN" 3 "BFA" 4 "BDI" 5 "TCD" 6 "CMR" 7 "CPV" 8 "CIV" ///
 9 "COG" 10 "ZAR" 11 "ETH" 12 "GAB" 13 "GHA" 14 "GNB" 15 "KEN" 16 "MDG" ///
 17 "MWI" 18 "MRT" 19 "MAR" 20 "MOZ" 21 "NER" 22 "NGA" 23 "RWA" 24 "STP" ///
 25 "SEN" 26 "SLE" 27 "ZAF" 28 "TZA" 29 "UGA" 30 "ZMB"
label values t t
rename country scountry
rename t country
order coun scoun
notes drop _all
notes drop _dta
* Get rid of the labels since they are coutnry specific:
rename reg1 regg1
rename reg2 regg2
gen reg1=regg1
gen reg2=regg2
drop regg1 regg2
order coun scoun hhid month year psu reg1 reg2 ur loc hhsize aesize weight fd_exp lc_exp dec_e1 dec_e2 ///
```

```
qnt_e1 qnt_e2 hh_rel hh_sex hh_age hh_ed hh_agr1 hh_agr2 dw_type dw_rent dw_sh dw_rm dw_wm dw_fm ///
dw_own_s dw_room dw_roomocc dw_year dw_tar dw_lar dw_tf wr_dt2 wr_ms wr_dk2 wr_wt21 ///
dw_own wr_wt22 ws_ru2 ws_ru en_lf en_cf en_el en_gs en_ke en_cw en_ot en_t dw_rent tr_bs tr_rl tr_bt ///
tr_ar tr_tx tr_ot tr_pt tr_t cm_tph1 cm_cph1 cm_tph2 cm_cph2 cm_pst cm_t ao_1 ao_2 ao_3 ao_4 ///
ao_5 ao_6 ao_7 ao_8 ao_9 ao_10 ao_11 ao_12 ao_13 ao_14 ao_15 ao_16 ao_17 ao_18 ao_19 ao_20 ao_21 ///
ao_22 ds_1t ds_1k ds_2t ds_2k ds_3t ds_3k ds_4t ds_4k ds_5t ds_5k ds_6t ds_6k ds_7t ds_7k ds_8t ds_8k
**********
**********
* Corrections/Adjustments
*1. Dwelling rent cannot be 0
recode dw_rent 0=.
drop wr_dt1 wr_dk1 /* Since different countries used different coding */
replace hh_age=. if hh_age<11 /* Unrealistically low age - few cases */
replace hh_age=. if hh_age>150 & hh_age!=. /* Unrealistically low age - few cases */
*2. Create access dummies
gen ac_el=(en_lf==1 | en_cf==1) if en_lf!=. | en_cf!=.
gen ac_wr=(wr_ms==1) if wr_ms!=.
gen ac_se=(dw_tf==1) if dw_tf!=.
gen ac_ph=(cm_tph1==1 | cm_cph1==1) if cm_tph1!=. | cm_cph1!=.
la var ac_el “Access to electricity”
la var ac_wr “Access to piped water”
la var ac_se “Access to sewerage”
la var ac_ph “Access to land OR cell phone”
la define acc 1 “Yes” 0 “No”
la values ac_el acc
la values ac_wr acc
la values ac_se acc
la values ac_ph acc
*correction for GABON
replace ac_ph=cm_tph1 if scount==”GAB”
replace cm_tph1=. if scount==”GAB”
egen ex_net=rsum(en_el wr_wt21 cm_tph2 cm_cph2)
recode ex_net 0=. if en_el==. & wr_wt21==. & cm_tph2==. & cm_cph2==.
la var ex_net “Network - sum of exp: elect, water, cell, phone”
egen ex_rut=rsum(ws_ru tr_t)
recode ex_rut 0=. if ws_ru==. & tr_t==.
la var ex_rut “Total transport + Rubbish”
egen ex_inf=rsum(ex_net ex_rut)
recode ex_inf 0=. if ex_net==. & ex_rut==.
la var ex_rut “Total infra: ex_net + ex_rut”
*3. Recode missing values to zeros for connected HH
* correct only for cases when positive values exist
forvalues x=1/30 {su ac_el if country==`x’
recode en_el (.=0) if ac_el==1 & r(mean)>0 & r(mean)!=. & country==`x’
su wr_wt21 if country==`x’
recode wr_wt21 (.=0) if ac_wr==1 & r(mean)>0 & r(mean)!=. & country==`x’
su cm_tph2 if country==`x’
recode cm_tph2 (.=0) if cm_tph1==1 & r(mean)>0 & r(mean)!=. & country==`x’
su cm_cph2 if country==`x’
recode cm_cph2 (.=0) if cm_cph1==1 & r(mean)>0 & r(mean)!=. & country==`x’}
```

```
*4. Hook-up vars: el, wr, se, tph, cph
egen hr_el=max(ac_el) if ac_el!=., by (coun psu)
recode hr_el 1=2 if ac_el==1
egen hr_wr=max(ac_wr) if ac_wr!=., by (coun psu)
recode hr_wr 1=2 if ac_wr==1
egen hr_se=max(ac_se) if ac_se!=., by (coun psu)
recode hr_se 1=2 if ac_se==1
egen hr_tph=max(cm_tph1) if cm_tph1!=., by (coun psu)
recode hr_tph 1=2 if cm_tph1==1
egen hr_cph=max(cm_cph1) if cm_cph1!=., by (coun psu)
recode hr_cph 1=2 if cm_cph1==1
la var hr_el “Hook-up: electricity”
la var hr_wr “Hook-up: piped water”
la var hr_se “Hook-up: sewerage”
la var hr_tph “Hook-up: telephone”
la var hr_cph “Hook-up: cellphone”
la define hr 0 “PSU not connected” 1 “PSU connected, HH not connected” 2 “HH connected”
la values hr_el hr
la values hr_wr hr
la values hr_se hr
la values hr_tph hr
la values hr_cph hr
replace hr_el=. if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26
replace hr_wr=. if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26
replace hr_se=. if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26
replace hr_tph=. if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26
replace hr_cph=. if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26
tab coun scoun if coun==2 | coun==6 | coun==27 | coun==29 | coun==30 | coun==22 | coun==20 | coun==26, nol
**********
**********
* Labels Section *
la var country “Country”
la var scountry “Country (string)”
la var month “Month of the interview”
la var year “Year of the interview”
la var reg1 “Country-specific region marker”
la var reg2 “Country-specific region marker (more detailed)”
la var ur “Urban/rural”
la define ur 1 “Urban” 0 “Rural”
la values ur ur
la var loc “Location”
la define loc 1 “Capital” 2 “Other Urban” 3 “Rural”
la values loc loc
la var hhsize “Household size”
la var aesize “Adult equivalent size”
la var weight “Household weight”
la var fd_exp “Monthly HH expenditure on food, local currency”
la var lc_exp “Monthly HH expenditure, local currency”
la var dec_e1 “Deciles based on per capita lc_exp”
la var qnt_e1 “Quintiles based on per capita lc_exp”
```

```
la var dec_e2 “Deciles based on household level lc_exp”
la var qnt_e2 “Quintiles based on household level lc_exp”
la var hh_sex “Sex of HH head”
la define hh_s 0 “Male” 1 “Female”
la values hh_sex hh_s
la var hh_rel “Religion of HH head”
la define hh_rel 1 “Christian” 2 “Muslim” 3 “Other”
la values hh_rel hh_rel
la var hh_ed “Education of HH head”
la define hh_ed 1 “No/Pre-school” 2 “Primary” 3 “Secondary” 4 “Vocational/specialized” ///
5 “Tertiary” 6 “Other (informal, home)”
la values hh_ed hh_ed
la var hh_agr1 “Dummy: 1 - agriculture is the main source of HH income”
la var hh_agr2 “Dummy: 1 - HH head employed in the agr sector”
la var dw_type “Dwelling type”
la define dw_type 1 “Room” 2 “Apartm” 3 “Sep struct” 4 “Single house” 5 “Other”
la values dw_type dw_type
la var dw_sh “Dummy: 1 - dwelling is shared with other HH”
la var dw_rm “Roof material”
la define dw_rm 1 “Sheets (iron, plastic)” 2 “Tiles (clay, asb)” 3 “Cement/concrete” ///
4 “Grass/straw/wood” 5 “Other”
la values dw_rm dw_rm
la var dw_wm “Outside wall material”
la define dw_wm 1 “Cement/concrete” 2 “Wood” 3 “Iron sheets” ///
4 “Bamboo/pole/dagga” 5 “Grass” 6 “Mud/earth” 7 “Mud/burnt brict, stone” 8 “Other”
la values dw_wm dw_wm
la var dw_fm “Roof material”
la define dw_fm 1 “Sand/earth/mud” 2 “Straw/smoothened mud” 3 “Cement/concrete” ///
4 “Wood/tile/plank” 5 “Other”
la values dw_fm dw_fm
la var dw_own “Dwelling ownership”
la define dw_own 1 “Owned” 2 “Rented” 3 “Free/squatting/subsidy” 4 “Other”
la values dw_own dw_own
la var dw_own_s “Dummy: 1 - subsidized housing”
la var dw_rent “Monthly rent”
la var dw_room “Number of rooms in the dwelling”
la var dw_tf “Tiolet facility”
la define dw_tf 1 “Flush” 2 “VIP latrine” 3 “Trad pit latrine” 4 “Bucket” 5 “Other” 6 “No/nature/bush”
la values dw_tf dw_tf
la var wr_ms “Main source of water”
la define wr_ms 1 “Piped water” 2 “Public/communal standpipe” ///
3 “Well/borehole” 4 “Surface water” 5 “Vendor/tanker” 6 “Other”
la values wr_ms wr_ms
*la var wr_dt1 “Distance to main source of water - orig (TIME, min)”
la var wr_dt2 “Distance to main source of water - standardized (TIME, min)”
la define wr_dt2 1 “In dwelling” 2 “0-30 min” 3 “31-60 min” 4 “>60 min”
la values wr_dt2 wr_dt2
*la var wr_dk1 “Distance to main source of water - orig (km)”
la var wr_dk2 “Distance to main source of water - standardized (km)”
la define wr_dk2 1 “In dwelling” 2 “< 1 km” 3 “1 km - < 2 km” 4 “> 2 km”
```

```
la values wr_dk2 wr_dk2
la var wr_wt21 “HH exp on water”
la var wr_wt22 “HH exp on water from vendor”
la var ws_ru “Rubbish disposal”
la define ws_ru 1 “Bin” 2 “Pit” 3 “Heap” 4 “Burned/buried/dumped” 5 “Other”
la values ws_ru ws_ru
la var ws_ru2 “HH exp on rubbish disposal”
la var en_lf “Main source of lighting”
la define en_lf 1 “Electricity” 2 “Gas” 3 “Kerosene/oil/para” 4 “Charcoal/wood” ///
5 “Crop residue/leaves” 6 “Other”
la values en_lf en_lf
la var en_cf “Main cooking fuel”
la define en_cf 1 “Electricity” 2 “Gas” 3 “Kerosene/oil/para” 4 “Charcoal/wood” ///
5 “Crop residue/leaves” 6 “Other”
la values en_cf en_cf
la var en_el “HH exp on electricity”
la var en_gs “HH exp on gas”
la var en_ke “HH exp on kerosene/oil/petrol/paraffin”
la var en_cw “HH exp on charcoal/wood”
la var en_ot “HH exp on crop residue/animal dung/leaves/etc.”
la var en_t “Total HH exp”
la var tr_bs “HH exp on bus”
la var tr_rl “HH exp on train”
la var tr_bt “HH exp on boat”
la var tr_ar “HH exp on aircraft”
la var tr_tx “HH exp on taxi”
la var tr_ot “HH exp on other transport”
la var tr_pt “HH exp on petrol/car fuel”
la var tr_t “Total HH exp on transport”
la var cm_tph1 “Dummy: 1 - HH has telephone”
la var cm_cph1 “Dummy: 1 - HH has cell phone”
la var cm_tph2 “HH exp on telephone”
la var cm_cph2 “HH exp on cell phone”
la var cm_pst “HH exp on post services, etc.”
la var cm_t “Total HH exp on communication”
la var ao_1 “Cattle/donkey/equine/sheep”
la var ao_2 “Chicken/poultry”
la var ao_3 “Plough/axe/sickle”
la var ao_4 “Radio/tape recorder”
la var ao_5 “TV set/VCR”
la var ao_6 “Refrigerator”
la var ao_7 “Air conditioner”
la var ao_8 “Generator”
la var ao_9 “Cooker/gas cooker”
la var ao_10 “Iron”
la var ao_11 “Electric fan”
la var ao_12 “Water heater”
la var ao_13 “Computer”
la var ao_14 “Sprayer”
la var ao_15 “Matress/bed”
```

```
la var ao_16 “Furniture/sofa”
la var ao_17 “House/non-residential building”
la var ao_18 “Land/plot”
la var ao_19 “Motorcycle/moped/scooter/bicycle”
la var ao_20 “Car/minibus/tractor”
la var ao_21 “Trailer for tractor”
la var ao_22 “Fishing boat/boat/canoe”
la define ao_1 0 “No” 1 “Yes”
forvalues x=1/22 {la values ao_`x’ ao_1}
la var ds_1t “Distance to primary school - TIME”
la var ds_2t “Distance to secondary school- TIME”
la var ds_3t “Distance to hospital/health center - TIME”
la var ds_4t “Distance to post office - TIME”
la var ds_5t “Distance to bank - TIME”
la var ds_6t “Distance to public transport - TIME”
la var ds_7t “Distance to market place - TIME”
la var ds_8t “Distance to farm of the household - TIME”
la define ds_t 1 “0-30 min” 2 “31-60 min” 3 “>60 min - TIME”
forvalues x=1/8 {la values ds_`x’t ds_t}
la var ds_1k “Distance to primary school - KM”
la var ds_2k “Distance to secondary school- KM”
la var ds_3k “Distance to hospital/health center - KM”
la var ds_4k “Distance to post office - KM”
la var ds_5k “Distance to bank - KM”
la var ds_6k “Distance to public transport - KM”
la var ds_7k “Distance to market place - KM”
la var ds_8k “Distance to farm of the household - KM”
la define ds_k 1 “< 1 km” 2 “1 km - < 2 km” 3 “> 2 km”
forvalues x=1/8 {la values ds_`x’k ds_k}
**********
**********
compress
*save master_lcu, replace
drop dw_roomocc dw_year dw_tar dw_lar region-hr_cph
save master_lcu_final, replace
```

Source: Own elaboration.

Note: DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey.

Annex A13.7 Variables in master dataset of AICD Expenditure Survey Database

Sector	Var name	Description
ID	hhid	Household id
	month	Month of the interview
	quarter	Quarter of the interview
	year	Year of the interview
	psu	Primary sampling unit
	reg1	The largest geographical breakdown – explain in label
	reg2	Smaller geographical breakdown (if available) – explain in label
	ur	1 – urban; 0 – rural
	loc	1 – capital; 2 other urban; 3 rural
	hhsize	HH size
	aesize	AE (adult equivalent) size
	weight	HH weight
	lc_exp	HH expenditure/consumption, local currency
	dec_e1	Deciles based on "lc_exp"/hhsize
	qnt_e1	Quintiles based on "lc_exp"/hhsize
HH Head	hh_sex	Sex
	hh_age	Age
	hh_rel	Religion
	hh_ed	Standardized education categories
	hh_agr1	1 – agriculture is the main source of income
	hh_agr2	1 – HH head employed in agr sector
Dwelling	dw_type	Dwelling type
	dw_sh	Dwelling is shared with other household
	dw_rm	Roof material – standardized
	dw_wm	Wall material – standardized
	dw_fm	Floor material – standardized
	dw_own	Dwelling ownership
	dw_own_s	Subsidized housing
	dw_rent	Monthly rent if rented
	dw_room	Number of rooms in the dwelling
	dw_roomocc	Number of rooms ind the dwelling occupied by the household
	dw_year	Construction year of the dwelling
	dw_tar	Total area of dwelling, sq. m.

Sector	Var name	Description
Dwelling	dw_lar	Living area of dwelling, sq. m.
	dw_tf	Toilet facility
	dw_tf2	**HH scp on sanitation/aewerage**
Water	wr_ms	Main source of water
	wr_dt1	Distance to main source of water – original (TIME, min)
	wr_dt2	Distance to main source of water – standardized
	wr_dk1	Distance to main source of water – original (KM)
	wr_dk2	Distance to main source of water – standardized
	wr_wt21	**HH exp on water**
	wr_wt22	**HH exp on water from private vendor**
Waste	ws_ru	Rubbish disposal
	ws_ru2	**HH exp on rubbish disposal**
Energy	en_lf	Main source of lighting
	en_cf	Main cooking fuel
	en_el	Total exp on Electricity
	en_gs	Total exp on Gas (Central/LPG)
	en_ke	Total exp on Kerosene/Oil/Petrol/Paraffin
	en_cw	Total exp on Charcoal/Wood
	en_ot	Total exp on crop residue/animal dung/ leaves/candles
	en_t	TOTAL HH exp on fuels
Transport & Communications	tr_bs	HH exp on bus (including city, intercity)
	tr_rl	HH exp on train
	tr_bt	HH exp on boat
	tr_ar	HH exp on aircraft
	tr_tx	HH exp on taxi
	tr_ot	HH exp on other transport
	tr_pt	HH exp on petrol/motor car fuel
	tr_t	TOTAL HH exp on transport
	cm_tph	HH has a telephone
	cm_cph	HH has a cell phone (at least 1 person)
	cm_tph2	HH exp on telephone
	cm_cph2	HH exp on cell phone

Sector	Var name	Description
Transport	cm_pst	HH exp on telegrams, post serives, etc.
	cm_t	TOTAL HH exp on communication
Asset ownership	ao_1	Cattle/donkeys/equine/sheep/goat
	ao_2	Chicken/poultry
	ao_3	Plough/Axe/Pick Axe/Hoe/Harrow/Sickle/ Reapers/Gejera/Mofer/Kember
	ao_4	Radio/tape recorder/complete music system/Hi-Fi Stereo
	ao_5	TV set/VCR/video/camera/dish antena/ decoder
	ao_6	Regrigerator
	ao_7	Air conditioner
	ao_8	Generator
	ao_9	Cooker/Gas cooker/Cooking pot, Cups/ Stove (electric/gas/kerosene/paraffin)/ Other stove or cooker
	ao_10	Iron (charcoal or electric)
	ao_11	Electric fan
	ao_12	Water heater/washing machine/sewing machine/milkingmachine/water pumping set
	ao_13	Computer
	ao_14	Sprayer/Hand sprayer/crop sprayer
	ao_15	Matresses and/or beds
	ao_16	Furniture/Sofa set/Upholstered chair/ chair/table/coffee table/cupboard, drawers, bureau/desk
	ao_17	House/residential house or building/non-residential building
	ao_18	Land/Plot
	ao_19	Motorcycle/Moped/Scooter/bicycle
	ao_20	Car/minibus/lorry/tractor/commercial or private motor vehicle
	ao_21	Trailer for tractor/cart/wheel barrow

Sector	Var name	Description
Distances to public services	**Dist: km (0 – less than 1 km**	
	ds_1t	Primary school (lower basic school)
	ds_1k	Primary school (lower basic school)
	ds_2t	Secondary school
	ds_2k	Secondary school
	ds_3t	Hospital/Health center
	ds_3k	Hospital/Health center
	ds_4t	Post office
	ds_4k	Post office
	ds_5t	Bank
	ds_5k	Bank
	ds_6t	Public transport
	ds_6k	Public transport
	ds_7t	Market place
	ds_7k	Market place
	ds_8t	Farm of the household
	ds_8k	Farm of the household

Source: Own elaboration.

Note: HH = household. [spelling of ownership in table]

Design, layout and production by Phoenix Design Aid A/S, Denmark. ISO 14001/ISO 9000 certified and approved CO2 neutral company – www.phoenixdesignaid.com.
Printed on environmentally friendly paper (without chlorine) with vegetable-based inks. The printed matter is recyclable.