

PAPUA NEW GUINEA

**UNITED NATIONS CONVENTION ON
COMBATING DESERTIFICATION**

NATIONAL REPORT



**FOR THE FIFTH SESSION OF THE COMMITTEE FOR
THE REVIEW OF THE IMPLEMENTATION OF THE
CONVENTION**

2006

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NATIONAL REPORT**

For the Fifth Session of the Committee for the Review of the Implementation of the
Convention

Prepared for the Government of Papua New Guinea

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Executive Summary

Introduction

Papua New Guinea (PNG) is a unique country. It is located on the eastern half of the island of New Guinea including the large islands of the Bismarck Archipelago including New Britain, New Ireland, and Bougainville further to the east. Its' population of 5.7 million people is scattered throughout the 464 000 km² of landmass including more than 600 small islands. PNG is a very rich country in terms of its natural resources which includes mineral, petroleum, gas, forestry, fisheries, land and agricultural resources. It is often described as an 'island of gold floating on a sea of oil'. Its' varied marine, volcanic, mountainous, swampy, freshwater, and forest environment is home to 6 percent of the world's total biodiversity. Nowhere else on this planet is its biological diversity equally matched by its cultural diversity than it is in PNG? Over 97 percent of land is owned by customary landowners including resources on, under and above land. The people speak over 800 different languages and belong to over ten thousand autonomous tribes with their unique social, cultural and political features.

UN Convention to Combat Desertification

It was in 1977 that the United Nations Conference on Desertification (UNCD) adopted a Plan of Action to Combat Desertification (PACD). However, this did not restrict the expanding nature of deserts across the globe. Coupled with drought, flood and changing climatic patterns, desertification became more pronounced at international forums in the last 3 decades. Real efforts to combat desertification came by way of the 'sustainable development' framework (Agenda 21) in Rio de Janeiro in 1992 which emphasized a new, integrated approach to the problem, emphasizing action to promote sustainable development at the community level.

In December 1992, the General Assembly agreed and adopted resolution 47/188 adopting the United Nations Convention on Combating Desertification (UNCCD). The UNCCD entered into force on 26 December 1996; hence PNG government ratified the UNCCD on the 6th of December, 2000.

The UNCCD acknowledges that the struggle to protect vulnerable and dry lands to natural and human-induced processes of land degradation and desertification will be a slow and long process. This is because the causes of land degradation and desertification are many and complex, ranging from international trade patterns to unsustainable land-use practices. Real and difficult changes will have to be made, both at the international, regional and national and the local levels within member states.

Drawing on past lessons, the UNCCD states that any regional and national programmes to combat land degradation must adopt a democratic, bottom-up approach. They should emphasize popular participation and the creation of an "enabling environment" designed to allow local people to help themselves to reverse land degradation. A sustainable land management (SLM) regime in PNG should embody this statement and put more pressure on state agencies to create action plans to implement in participation/consultation with stakeholders to achieve the objectives of the UNCCD.

In general, governments remain responsible for creating this ‘enabling environment.’ It must make politically sensitive changes, such as decentralizing authority, improving land tenure systems, and empowering women, subsistence farmers, and pastoralists. There is a need also to permit non-governmental organizations (NGOs) to play complementary roles in preparing and implementing the action programmes. In order to achieve lasting solutions, any action programmes should be fully integrated with other national policies for sustainable development. They should be flexible and modified as circumstances change over time.

The implementation of UNCCD objective in PNG aligns and compliments the programme of other ratified Multilateral Environmental Agreements (MEAs), such as the UN Framework Convention on Climate Change/Kyoto Protocol (UNFCCC), the Biodiversity Convention, the Montreal Protocol and others.

Land tenure and land degradation

About 97% of total land in PNG is customarily inherited and owned by 10,000 autonomous tribes. The government owns almost 50 percent of the remaining 3 percent total with rest going to Faith-based Organizations (FBOs) and others including privately-owned business entrepreneurs. Hence, where customary land is involved, the group owns and the individual uses land including its inherent resources.

Customary land management is a form of ‘*social contract*’ for customary land and this ‘social contract’ between the members and the land group sets the terms and conditions for land use within the land group. By the Land Group Incorporation Act 1974, the government has provided the first legal artefact to empower the land group to enter into the modernization process. Land registration and issuance of title to the Incorporated Land Group (ILG) has been the next essential step. This law empowers the group to deal with people and companies outside the group who wish to utilize their land. However, the ILG Act 1974 does not deal with land degradation.

Land degradation is not a new phenomenon in PNG. The country has experienced land degradation since humans practiced agriculture some 40 000 years ago. However, the paces of degradation and associated risks have increased in the last 3 decades given the country’s exposure to the forces of modernization, high rate of population growth, and high population mobility. The increase in demand for modern livelihood has forced people to access more land for economic production without having to fully comprehend the impact of their activities on the land.

Land transformation is most common in PNG. Transformation of land constitutes the first in a series of interrelated and complex processes leading to land degradation and desertification. Transformation involves changes to the physical appearance of an area but its productive quality remains intact. When transformed, land may lose the productive capacity following unsustainable use, and when production falls by between 10 – 25 percent, land is said to be degraded. Hence, transformation of forest into grassland may not necessarily constitute degradation because the soil fertility may not be lost following transformation.

Land desertification is relatively a new concept in PNG. Desertification is the extreme outcome of degradation where productive capacity of land and ability of species to inhabit a particular area are severely restricted. The productive capacity of land falls to over 50 percent and the risk to the expansion of desert land is higher on degraded land than is the case on transformed land. The specific objective of a SLM regime must be to restrict the ability of transformed land into becoming degraded land and from the latter turning into deserts.

In this context, SLM should be associated with the full understanding of the following:

- a. The nature of a particular land area including ownership,
- b. The various factors influencing land transformation and degradation,
- c. The social, economic, cultural and environmental factors influencing land-use,
- d. Practicalities of sustaining appropriate levels of production on land under different constraints, and
- e. Streamline and incorporate into policies at all levels.

From a PNGian perspective, SLM may be viewed as:

“a process of utilizing land to achieve optimal output under prevailing human and natural conditions without diminishing the productive capacity of a particular land area within a community or region.”

In many areas, pressure on land resulting from high population densities, migration patterns, economic development on agriculturally productive land are placing additional burdens on the productive capacity of land. Further, commentators argue that customary ownership practices are a hindrance to freeing up customary owned land for economic development purposes. For this and other reasons, there is an urgent need for sustainable land management practices in rural PNG.

National Land Development Policy

The government established the National Land Development Task Force (NLDTF) in December 2005 to explore ways to developing land in PNG. The principle mission of the Taskforce was to answer the question "How can we access land for development purposes?" In particular, what strategies can we adopt that will enable PNG to attain an economic growth rate of 5 percent as set out in the Medium Term Development Plan. The NLDTF sought to seek ways of improving land administration and to improve dispute resolution mechanisms as the first steps before working on developing mechanisms to develop land currently held under customary land tenure systems.

The current land administration practices were the major impediments to facilitating economic growth and development. Much of the 3 percent of alienated land remains under-utilized for various reasons. Development covenants have not been complied with nor are default provisions strictly applied. There is no physical planning and as a result large pockets of alienated state land in potentially high growth areas remain undeveloped.

This has led to squatting on most undeveloped state land, a truly uneconomical activity, and one that will create further problems for government. Many hard working and law abiding citizens are frustrated with a system that undermines progress and legal development activities.

The management and planning in the Department of Lands and Physical Planning (DLPP) has been poor in data management and inventory over last 2 decades. Record management systems require proper management because poor management results in land title transfers practically difficult. As a result many occupants of leases for houses, business and agricultural use, cannot mortgage their properties to do business. This has stifled the property market and as a result, has not contributed as much to economic activities. Improvements to land administration are a necessary precondition to enhancing full economic growth in PNG.

The activity of the NLDTF serves the governments' thinking and complements its MTDS. The purpose of the NLDTF is to seek ways of making 'land accessible' to developers with an aim to enhancing economic output from customary land. What is also critical and not part of the activities of the NLDTF is the absence of (a) environmental values including biodiversity conservation, and (b) how to facilitate sustainable land-use practices (SLM). The economic bias inherent in the terms of reference (TOR) for the NLDTF is unhealthy for PNG in terms of SLM in peripheral districts.

Constraints to sustainable land management

SLM must consider a compact between the key stakeholders; those who own traditional land, the government, private sectors, NGOs and the general public. Land is a scarce resource in PNG in terms of quality land. There is limited quality arable land for productive purposes. Only about 1 percent of total land, and with about 30 percent marginal land is available for quality agricultural use. Of this amount, not all is readily available all the time for agriculture as geographical, ownership, financial and infrastructure limitations restrict its productive usage. Currently, less than 10 percent of total land is being utilized.

Large-scale destruction of tropical forest resources is recognized as an on-going impediment to environmental and economic sustainability. There are serious trade-offs between the unrecognised and/or undervalued goods and services tropical forests and forest ecosystems provide to people. The forest goods and services sustain community livelihoods and when properly managed can secure timber, medical, and food security. Whatever it is, the simple fact is that the main repository of biodiversity is at risk of being destroyed. Of the causes, logging and land clearing for agriculture are among the most influential.

Cropping practices pose another threat to SLM. Serious changes in the pattern of crop production and cropping practices have occurred in the last few decades in most parts of PNG. There has been a growing shift towards production of cash crops at the expense of subsistence food crops. The cash cropping system have claimed mostly flat, fertile land, leaving the sloping hillsides for subsistence food production. Pushing food production and subsistence farming onto marginal land is most likely to exacerbate soil erosion problems. The traditional farming systems used in the country are exploitive in terms of soil fertility. With increasing population, quality arable land is becoming scarce and this has resulted in shortened fallow and constant use has led to reduced crop yields.

Soil erosion is an increasing problem in most parts of PNG. Steep sloping fertile land are easily overexploited and mismanaged, leading to accelerated soil erosion. Many soils, especially those under subsistence farming, are subjected to fertility depletion due to decline in soil organic matter, soil leaching and soil acidification. In PNG, lack of effective management techniques on customary land has transformed fertile marginal lands into degraded and/or potentially degradable land. The increasing rate of soil loss through erosion, degradation and other causes makes the formulation and implementation of national soil policies a matter of high importance. A national soils policy should allow and stimulate maximum utilization of the soil on a sustainable basis without decreasing productivity, and without causing direct or indirect damage to the environment.

Since 1976 to now, more than 25 mining and petroleum sites have been in operation. These includes the large ones such as Bougainville, Ok Tedi and Porgera which caused unprecedented damage to land fertility, pollution into river systems, high sedimentation load and subsequent impact on terrestrial and river systems. People have suffered both directly and indirectly. Land

rehabilitation is less forthcoming in these sites including smaller mines such as Lihir, Misima, and the Wau-Bulolo regions.

Enabling environment

The PNG environment policy accommodates principles of SLM. The SLM in the country is available through the current government's medium term plan or the Medium Term Development Strategy 2005-2010 (MTDS). In officially launching the MTDS 2005-2010, it demonstrated the governments' commitment to achieve 'economic growth and social progress'. The emphasis placed on export of primary products makes SLM inevitable for both the short and long term. Any effort to sustain agriculture commodities in PNG will emanate from SLM practices. SLM should therefore be integrated with other initiatives within key agencies such as DLPP, DEC, Agriculture and Livestock, Mining, Petroleum and Energy, and National Planning.

Indeed, the economic, social and environmental objectives set in Agenda 21 are about improving human and environmental conditions and the PNG MTDS is embarking on achieving these goals. SLM is one critical activity because land is the primary means through which economic, social and environmental resources can be sustainably developed and managed.

Apart from the MTDS, the Millennium Development Goals (MDG) which emerged from the Millennium Declaration in 2000 has 8 Goals that reflect global problems urgently requiring global attention, with local actions. It sets out its targets to be achieved by 2015 which can be measured through a series of 67 indicators altogether within a specific timeframes. The MDG seem to be the catalyst for the MTDS however, the controversies are not unlimited in the way the MTDS attempt to achieve development that is environmentally sustainable including managing land. Through its Seventh Goal (Environmental Sustainability), appropriate land use and management is key to ensuring that the quality of the environment is maintained in the face of economic development pressures.

Another component of an 'enabling environment' lies with the capacity of institutions to adequately fulfill the policy objectives of the government. The role and responsibilities of the Department of Lands and Physical Planning (DLPP) in dealing with land matters including is critical. The DLPP needs urgent human capacity with appropriate tools to deliver to all stakeholders in PNG. Despite the recent publication of the National Land Policy 2006, the human resource capacity of these lead agencies to deal with land matters for economic and social development remain challenging.

Institutional capacity also refers to law enforcement agencies. The ability of institutions to develop and implement sustainable land development programs in PNG rests on both internal and external factors. The former include institutional capacity (manpower, skills, and attitudes) and the institutional systems (planning, implementation, monitoring, training and management). External factors include allocation of funds, approved manpower ceilings, policy decisions, regulatory powers of institutions, etc. The DLPP has problems in both internal and external capacity.

Sustainable development in general and sustainable management of land in particular rests on aspects of good governance. PNG has a major problem in terms of good governance including poor land management, rule of law, accountability and transparency, and nepotism. Good governance entails commitment, dedication and responsibility in terms of driving the transparency and accountability message through the political and bureaucratic leadership.

The way forward on SLM/NAP

In terms of SLM, discussions are already underway to develop national action plans (NAP) to implement the UNCCD. It is anticipated that a NAP will involve key stakeholders including key government departments, institutions, the private sector, NGOs, landowners and the provincial and local-level governments. In line with *Article 9* and *10* of the UNCCD, the following remain key elements to a NAP:

1. A framework for sustainable land management will result from and include:
 - Policy orientation and convergence
 - Institutional arrangement
 - Fiscal support
 - Preventive/mitigative measures against land degradation
 - Science and technology to support SLM
 - Partnership building and resource mobilization
 - Review mechanisms for NAP implementation
 - Develop concrete projects for implementation/pilot projects
2. The nature of land management activities – either jointly or wholly performed by key stakeholder(s),
3. An outline of the roles and responsibilities of each stakeholder regarding the SLM,
4. The coordinating role of the National Focal Point and inter-agency collaboration,
5. Policy (SLM), streamlined integration with existing strategies such as the MTDS, MDG, sustainable development framework, and other policies, and
6. Other obligations as outlined for action at the national level under the UNCCD.

Foremost, governments' commitment to support sustainable development in general and SLM in particular is imperative. The ability of the political leadership to endorse sustainable land management requires realignment of resources towards SLM. Stability within the key departments advocating and managing the Multilateral Environment Agreements (MEAs), especially the UNCCD is paramount in ensuring continuity, policy coherence and securing resources for implementing the Convention.

Second and it is a cross-cutting issue, SLM does not recognize bureaucratic, administrative, cultural, legal or political boundaries. This does not imply that SLM lacks currency. The institutional framework through which SLM is designed and implemented should be made clear and transparent to all stakeholders. Core SLM functions including implementation, monitoring, evaluating, and coordination and reporting will transcend from decision centers to the action-fields. This requires developing and maintaining effective inter-agency linkages, partnership and collaboration.

Third, SLM policies need to be mainstreamed and implemented through effective legal and administrative structures. Enforcement capacity of law enforcing agencies and the administrative establishment should be complimentary. The administrative capacity of agencies responsible to enforce legal sanctions or to facilitate development should be properly resourced and be transparent for an effective implementation. International treaties on the environment and sustainable development can be achieved through properly instituted law enforcement agencies and administrative support units.

Fourth, at the level of implementing SLM are provincial and local-level governments. There is a lack of understanding about the concept of sustainable development at the provincial and local levels. The level of consultation regarding SLM has received relatively little government support

in terms of resources. Basic education and awareness about sustainable development and management including sustainable resource use is important to achieving the objectives of sustainable rural livelihoods. The provincial, local government systems and NGOs should be mainstreamed integrated and linked to the national system in order for SLM to be realized.

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List of Acronyms

AWC	Available water-holding capacity
CACC	Central Agencies Coordinating Committee
CILM	Commission of Inquiry into Land Matters
CRIC 5	Committee for the Review of the Implementation of the Convention - 5 th Session.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAL	Department of Agriculture and Livestock
DEC	Department of Environment and Conservation
DLPP	Department of Lands and Physical Planning
FBOs	Faith-based Organizations
FIMS	Forest Information Management System
GEF	Global Environment Facility
HDI	Human Development Index
ICZ	Intertropical Convergence Zone
INCD	Intergovernmental Negotiating Committee on Desertification
ILG	Incorporated Land Group
MDG	Millennium Development Goals
MEAs	Multilateral Environment Agreements
MTDS	Medium Term Development Strategy
NADP	National Agriculture Development Plan
NAP	National Action Plan/Programme
NAPs	National Action Plans/Programmes
NARI	National Agriculture Research Institute
NCSA	National Capacity Self Assessment
NEC	National Executive Council
NLDTF	National Land Development Task Force
NSDS	National Sustainable Development Strategy
OLPLLG	Organic Law and Provincial and Local-Level Government
PNG	Papua New Guinea
PNGLIS	PNG Land Information Systems
PNGians	Papua New Guinean (PNGn)
PNGRIS	PNG Resource Information System
STRM	Shuttle Radar Topography Mission
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNCOD	United Nations Conference on Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
3NR	Third PNG National Report

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Foreword

The PNG Third UNCCD National Report is produced by the PNG Government to be presented to the Fifth Session of the Committee for the Review of the Implementation of the Convention (CRIC 5). This National Report is the result of a series of Workshops convened since 2002 by the PNG UNCCD National Task Force team and the Technical Working Group in consultation with all stakeholders in the country. This Report is endorsed by the PNG Government.

Since ratifying the UNCCD in December 2000, the PNG Government, through its National Focal Point, the DEC and with the generous support from UNDP have convened the Workshops to begin the process of developing a National Action Plan/Programme (NAP) to implement the UNCCD as required under *Article 9* and *10* of the UNCCD for countries affected by land degradation and land desertification.

The Third PNG National Report (3NR) provides the background information on land, the environment, economic, social and cultural features of PNG. This is to provide stakeholders the background information to develop a SLM and/or NAP. The Report analyses the national development context and the national development priorities including the MTDS and MDGs. A distinction is made between land transformation, degradation and desertification and outlines what SLM and a NAP should contain. The finally part of the Report highlights some constraints to effective SLM including the various implications of implementing the UNCCD to PNG. The Report suggests a Way Forward to support a national framework for sustainable land management and development.

CHAPTER 1

Background to Papua New Guinea

1.1 Introduction

Papua New Guinea (PNG) is by far the largest country in the South Pacific except Australia in terms of natural wealth, landmass and population base. Located on the eastern half of the sub-continental island of New Guinea, plus the great islands of the Bismarck Archipelago and the northernmost Solomon group, as well as some 600 additional smaller islands, its population of some 5.7 million is largely subsistence based. Its landmass encompasses in excess of 464,000 km² (46.28 million hectares) with a marine jurisdictional zone in excess of 3 million km² (Figure 1). Over 97 percent of the total land area is owned by customary land areas.

The country is rich in natural resources. Besides petroleum, gold, nickel and copper, much of the land supports tree crops and other cash crops. Agriculture is still the mainstay of the economy with about 85 percent of the population at least partially or fully¹ reliant on subsistence agriculture. About three quarters of the country's land area is forested and much of this is inaccessible for both commercial and subsistence purposes at present. With 97 percent of total land in the ownership of traditional landowners the resources on land is owned by those who own land.

In the renewable sector the major commodities include coffee, tea, cocoa, oil palm, copra and rubber. Sweet potato, banana, taro, yams and a bountiful of vegetable species constitute the domestic food sector. The fisheries resource is a significant component but is untapped within its 200 mile exclusive economic zone (EEZ). The non-renewable resource sector is dominated by opportunities offered by developments in the mining, gas and petroleum sectors, but whose generated wealth are not effectively re-invested into promoting community-based rural sustainable development programs.

¹ Many rural communities depend on subsistence most of the time while those in urban centres are dependent on formal and semi-formal sources of income.

Figure 1: Papua New Guinea and its Provinces



1.2 People

The people have lived off the land for over 60,000 years. They are extremely diverse ethnically and are attached to well over 250 distinct cultural groups. The population of 5.7 million people with a current annual average growth rate of nearly 3 percent is the fastest growth rate in the region. This has implications for land-use in all parts of the country. Social indicators show a low quality of life for many in the rural areas and the unemployed of the towns. The 2003 Human Development Index (HDI) ranked PNG at 133rd out of 177 countries implying that there was no significant changes to PNG's human development record compared since 2002 (UNDP 2004).

Life expectancy is 54 years; infant mortality is 64 deaths per 1000 live births, and high maternal mortality at 300 deaths per 100,000 births; the adult literacy rate is 52 percent and despite relatively high public expenditure on education, the completion rate of primary school is only 59 percent. Law and order continues to be a serious socio-economic problem, particularly in urban areas and some rural communities. Only 10 percent of the population is employed in the formal wage sector. This is further complicated with the potential work force which is expanding with about 60,000 school-leavers annually, with only a small proportion of who can expect to find wage employment.

1.3 Economy

Significant economic events over the past ten year period have placed heavy demands on economic management. The steady but moderate growth in GNP of the mid 80's was followed in 1989 and 1990 by negative growth rates of -1.4 percent and -3.7 percent respectively (Saulei et al 2002). This downturn was due to a sharp fall in the terms of trade, exacerbated by the closure of the Bougainville copper mine, which alone contributed about 35 percent of export revenue. The economy bounced back with growth rates of 9.5 percent in 1991 and 9 percent in 1992 as new petroleum and mining ventures came under production.

The Progress Report for the PNG Millennium Development Goal (MDG) discussed the economic realities under its economic profile for the nation. There is general consensus that the 1990s was characterized by mixed economic performance even with the booming nonrenewable resource sectors in energy and mineral commodities which witnessed significant gains in the early 1990s (Nita 2006; UNDP 2004). The disappointing results reflected negatively on the governments' ability for prudent economic management characterized by a lack of diversified growth in the renewable resource sector.

There are however, positive indications in the economy despite the negative performances in the first few years of the Millennium. Consolidating the performance of the previous two years, the economy grew by 3 percent in 2005, given favorable external conditions, political stability and supportive fiscal, monetary, and trade policies.

Agriculture performed particularly well, especially coffee, copra, oil palm, and rubber. Construction recorded strong growth, as a result of low interest rates and solid demand for residential and commercial buildings. Mineral, natural gas and oil contracted by 4.5 percent, primarily on a 6 percent reduction in gold production due to a landslide at the Lihir Gold Mine in 2005. In total, the mining sector earned over 50 percent of total export earnings since Panguna Mine closed in 1989 (Post Courier July 13 2006).

GDP growth is currently at 3.5 percent from -0.1 percent in 2002 and 3 percent growth is projected for 2007 as industries including construction, manufacturing, and wholesale and retail trades are expected to grow at stronger rates than previous years. Interest rates have fallen from 13.3 percent in 2002 to 6.5 percent in 2006. Public debt was dangerously high – rising from K1.950 billion in 1992 to K8.80 billion in 2002 but has fallen significantly since. However, law and order problems, governance issues, land tenure arrangements, limited infrastructure, and basic service delivery are long standing issues that continue to impinge upon growth and higher living standards (Nita 2006).

1.4 Women on land

Almost 50 percent of the total population in PNG is women. Over 90 percent of this total deals directly with land resources for their survival. The participation of women in the use of land requires special attention and is provided for in the national constitution. Women, who have traditionally tended gardens, and continue to do so, account for only 5 percent of wage employment compared to 15 percent for men (UNDP 2004). Equal opportunity for education is a priority for females under the Education Plan 2003-2010 but still female literacy and school enrolment rates lag significantly behind those for males. For most women, the positive features of development, such as potential for cash cropping and access to education for their children, have added to their traditional work roles. Women are very active in the semi-formal and subsistence sectors, particularly in selling produce, merchandised goods; their access to credit facilities is more restricted than that for men. (Nita 2006).

SLM is associated with women whose livelihoods depend on sustainable use of land and other resources. The attachment of women with subsistence lifestyle and cash crop production is significant for food security and for the local economy. The participation of women in the informal sector with appropriate facilities and conditions/policy is more beneficial to sustainable development in terms of recognizing the potential of women as partners in utilizing land. Over 90 percent of women in PNG deal directly with the environment and natural resources therefore making their participation in both sustainable land management and development paramount.

1.5 Environment

PNG's forest estate covers over 70 percent of the country's total land area. PNG forest ecosystem and genetic biodiversity is one of the richest in the world. There are over

9,000 species of higher plants, including as many as 1,500 species of forest trees. PNG is home to over 700 species of birds including the world's smallest and some of the world's largest parrots, the largest pigeons, all of the world's three species of cassowaries, and more than two thirds of the known birds of paradise. PNG is also home to the world's largest butterfly,² and almost two hundred species of mammals, including two of the world's three monotremes and all of the world's tree kangaroos (Sekhran and Miller 1994).

The vascular plants include some 15,000 to 20,000 species of ferns and flowering plants. A list of genera was produced in the early 1990s, but modern species-level treatments exist for only a small portion of the flora. The overall status of knowledge of plants was reviewed by consecutive biologists and taxonomists in the 1990s. Of particular significance are orchids. They are particularly diverse, with well over 3,000 species (Sekhran and Miller 1994). In many ways, international organizations value forests more for their biodiversity than for their logging potential. However, the unresolved issue is how this biodiversity can be protected in ways that are acceptable to landowners and provide them with alternative sources of income. There is an urgent need to raise awareness amongst landowners of the non-timber values of their forest and the desirability of protecting this resource while ensuring that they do not miss out on development opportunities.

1.5.1 Biodiversity

Together with the above, PNG is described as one the world's few remaining wonders of biodiversity. It is estimated that some 6 percent of total biodiversity occur only in PNG (Nita 2006). While the attention on biodiversity is focused on a selected number of physically observable terrestrial and aquatic species, many other species including viruses, bacteria, algae, fungi and protozoa remain yet to be discovered. The poor data available for unicellular organisms such as viruses and bacteria outside of those with direct economic importance make estimates difficult. It is estimated that 15,000 vascular plants yields and estimate of 90,000 fungal species remain to be identified and studied (Sekhran and Miller 1994).

Protozoa are almost entirely unstudied with the exception of marine foraminifera, which have been censured at Motupore Island (57 species) and Madang (182 species). In general the biodiversity status is unique in that there are some flagship species of socio-cultural, economic and spiritual significance to the country.

1.5.2 Landforms

PNG has been subdivided into five major landscape regions and their fourteen associated landforms. These are briefly summarized (Bleeker 1983).

The Southern Plains and Lowlands Region extends from the south coast to the foothills of the Central Ranges. In the far west, it is more than 400km wide and is drained by the Fly

² Bird wing butterflies include *Troides* (formerly *Ornithoptera*), and in particular, *T. alexandrae*

River, which is more than 800km in length and over 50km wide at its mouth. The region gradually narrows towards the east, where the foothills of the Central Mountain Ranges divide it into several embayments. South of the Fly River this surface is mostly flat to very slightly undulating and generally less than 30m above sea level. Extensive low lying areas of this plain are inundated during the wet season. North of the Fly River is another plain, which is intricately dissected in relief by narrow ridges and valleys and ranges from 10m in the south to over 60m in the north. The remainder of the region is dominated by very poorly drained or swampy alluvial plains (Figure 2).

The Central Ranges Region extends throughout the mainland island of New Guinea, the highest peak in PNG being Mount Wilhelm (4,509m). This region occupies nearly half of the island and forms a complex system of narrow ridges, V-shaped upland valleys and volcanoes. It varies in width from approximately 50km near the Irian Jaya border and in eastern PNG, to almost 20 km in its centre. The principal units of this major region are the Star Mountains in the west, through the Hindenburg, Muller, Kubor, Schrader, Bismarck and Owen Stanley Ranges, in the east. Each of these units reaches altitudes exceeding 3,000m. The highest peaks, around 4,000m, were covered by glaciers during the Pleistocene. The region as a whole has a high relief, and on some of its margins, where there is an abrupt break with the flanking lowlands, this relief may be over 300m.

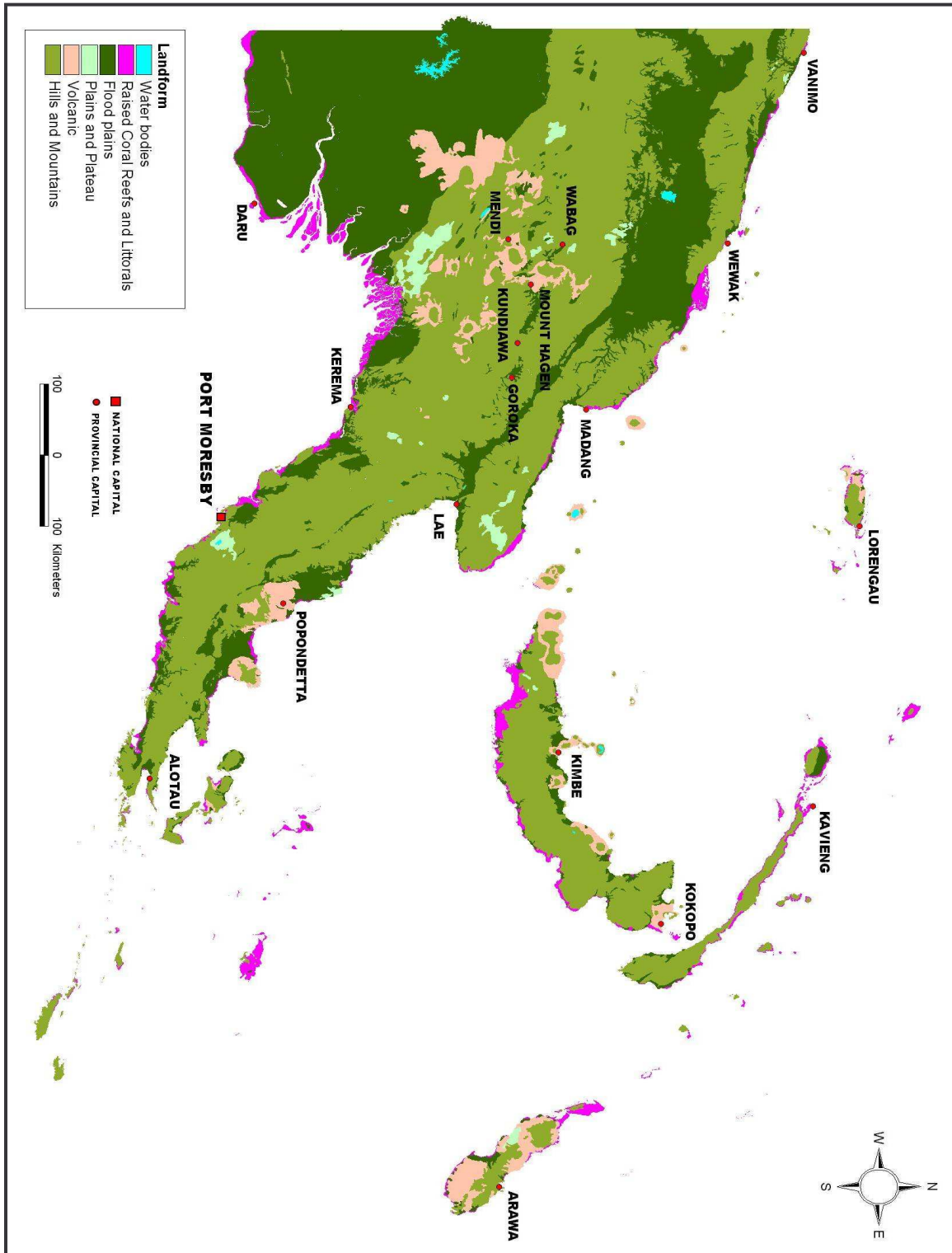
The Intermontane Trough Region is a huge structural depression extending across New Guinea. The depression is made up of plains, lowlands and swamps, in most parts flanked by steep mountains. The Sepik plains, the most extensive in PNG, are dominantly swamps, meandering flood plains and fans bordering the northern flanks of the trough. The Markham-Ramu Valley also has large swampy areas, but is characterized by moderately to steeply sloping fans made up of coarse material derived from the backing, steeply sloping mountains.

The Islands Region is subdivided into four major groups of islands. The Southern Bismarck Island Arc is a belt of active volcanoes running along the coast north of the mainland into New Britain. Numerous active volcanoes are to be found along the north coast of New Britain, large areas having been covered by ash deposits. The central and southern parts of New Britain are dominated by rugged mountains formed on sedimentary rocks, particularly limestones which have prominent karst features. The Northern Bismarck Island Arc includes Bougainville, Buka Island, New Ireland, New Hannover and the Admiralty Islands. Bougainville, the largest island of the Solomons Group, has a massive central mountain chain dominated by three large, active volcanoes surrounded by volcano-alluvial foot slopes and fans.

1.5.3 Geology

Although complex in nature, the geology of PNG is now relatively well documented as a result of an active exploration program undertaken during the last three decades. The mountain chains running through the centre of the mainland and the Islands to the south-east are dominated by metamorphic and intrusive igneous rocks. The central chain is

Figure 2: PNG's major landforms



subdivided into three units namely, the Central Highlands, the Owen Stanley Ranges and a line of islands stretching from Goodenough Island to Rossel Island.

Apart from a few areas of Mesozoic marine volcanics in New Britain, and the metamorphic islands of the south-east Papuan coast, the major PNG Islands are dominantly composed of Tertiary rocks. Bougainville and the north coast of New Britain, however, have extensive areas covered by Quaternary deposits from active volcanoes. The structural history of PNG is explained as being caused by the interaction between and collision of the Australian Continental Plate and the Pacific Plate.

The landmass started to take shape during the Miocene period, but it was not until the Pliocene that it became firmly established when large vertical movements along major fault lines created most of the present day landforms. This uplift is continuing in the Northern Ranges. Widespread volcanic activity occurring in the highlands as a result of the movements formed large volcanoes such as Mount Hagen and Mount Giluwe. While large scale volcanic activity ceased in the highlands about 200,000 years BP, some deposition of ash took place until about 50,000 years ago. While on the mountain ranges above 3,600m glacial erosion took place, extensive denudation occurred at lower altitudes resulting in a strongly dissected landscape. Elsewhere, in limestone areas, typical karst features developed. Changes in the coastline, particularly in the south, were brought about by glaciation in the northern hemisphere, causing lowering of the sea level by approximately 130m. The PNG landscape is still subject to rapid changes due to volcanism, landslides induced by seismic activity and various active denudation processes.

1.5.4 Climate

Being located in the tropics, PNG is often assumed to have a climate characterized by constant high temperatures, a high rainfall and a high degree of humidity. Although this applies to most of the country which, there are nevertheless areas with open savanna (Aw), or mild temperate, rainy climates with or without distinct dry seasons (Cw and Cf), which both occur in highland areas above 1,500m.

Although the local climate is strongly related to topography, the major climatic controls are influenced by seasonal latitudinal movements of two air masses separated by a low pressure belt, the *Intertropical Convergence Zone* (ICZ). North-west winds prevail from late December through to mid April when the ICZ is situated over, or to the south of the country. Because the heaviest and most frequent rainfalls are associated with these winds they are frequently called monsoons. Between May and October, when the ICZ lies to the north of PNG it causes dominantly south-easterly winds also known as trade winds, which blow with great regularity over the Coral Sea.

Except in areas affected by strong orographical influences, these trade winds do not produce frequent, heavy rainfalls. The short transitional periods between the two 'seasons' are characterized by flukey winds called 'doldrums'. These periods occur during late

October and November and again during late April and May. In highland areas, the seasonality in rainfall is still present, particularly in the east, but is much less marked due to local variations mainly related to topography.

The mean annual rainfall distribution indicates that the areas having an annual rainfall of less than 2,000mm are restricted to parts of the Markham Valley, the Bulolo Valley, the Maprik-Angoram area, the Eastern Highlands, and the coastal areas near Cape Vogel, Port Moresby and Daru. Large areas receive over 4,000mm a year, particularly the northern and southern flanks of the highlands and the south coast of New Britain. A few small centres in the Star Mountains, at the Irian Jaya border, and to the north-east of Kikori have an annual rainfall in excess of 8,000mm, while more than 10,000mm has been recorded in the Ok Tedi area of the Star Mountains.

The lowland areas are characterized by constantly high temperatures with only slight variations throughout the year (1-4°C for the mean daily temperature). Mean maximum readings of 28-34°C and mean minimum readings of 20-25°C are usual with a daily fluctuation of about 7°C. Generally, with every 100m increase in altitude the lapse rate is about 0.5°C, resulting in overall mean maximum temperatures of 20-29°C and mean minimum temperatures of 10-18°C in most of the highland valleys. In these areas, the annual temperature ranges are about 11-13°C.

Climate has a profound effect on soil and on land which consequently has implications for land-use. One of the most important factors in agriculture is the effect that rainfall has on the soil and land. Precipitation, evaporation, surface runoff, seepage or subsurface flow all have a direct bearing on the capacity of the soil to store moisture, which in turn depends on the available water holding capacity (AWC) of the soil. The AWC will vary from one soil to another, depending on such factors as soil depth, soil texture, organic matter content and clay mineralogy. Excess water can result in flooding and poorly drained conditions, while water shortage may cause drought, depending on the length of time and the available water holding capacity of the soil.

1.5.5 Vegetation

PNG has a richly diverse flora, with extensive areas still being covered with primary forest. This diversity is largely attributable to the altitude range (sea level to over 4,500m) and to its geographical position. The country is considered to be the interchange of the Indo-Melanesian and Australian zones of flora.

The major vegetation types discussed by Bleeker (1983) are summarized below. *Lowland Forest* is predominant and extends to approximately 1,400m in areas where rainfall exceeds 1,800mm per annum. It is structurally and floristically the richest forest type and typically contains numerous palms, vines and climbers. Lowland forest develops best on relatively well drained alluvial plains, where its canopy height is 35 to 40m. Impeded drainage will cause the canopy to be more open and irregular in height. In very poorly drained to swampy conditions, sago and pandanus are found in the understorey.

Around 3,000m, under increasingly cold conditions, there is a quite abrupt change to *Upper Montane Forest*. This is characterized by stunted, often gnarled trees, approximately 10-15m in height, belonging to the conifer, myrtle, heath and rose families. Mosses and epiphytes are very common. Open *Grassland* is common at altitudes from sea level to more than 4,000m. Tussock grasses, alpine herbs and mosses are found only above 4,000m. Because of the cold climate and frequent frosts, these include many southern temperate species. The tussock grasses *Danthonia* and *Poa* are dominant, together with ferns, lichens and mosses, the latter two being found in conjunction with bare rock exposures at the highest altitudes.

Between 2,500 and 4,000m the grasslands are dominated by *Danthonia* together with *Deschampsia* which may grow up to 1m in height and width. These grasses are mainly found on relatively well drained slopes, often in association with tree ferns. There is intensive sweet potato cultivation at lower altitudes (1,500 and 2,500m) and many disused garden sites have been overgrown by dense, pure stands of up to 5m tall sword grass (*Miscanthus floridulus*).

Savannas are grasslands with scattered trees of variable density which are found in areas having highly seasonal rainfall generally less than 1,800mm. They are restricted to a few areas, but occur mainly in the Port Moresby region where the dominant trees are eucalypts, and in the southern part of the Western Province where *Melaleuca*, *Tristania* and *Acacia* are the major trees. Kunai and kangaroo grass are the dominant grassland species. Savanna, like grassland vegetation, is considered to have developed largely because of clearing and burning.

Herbaceous freshwater swamps and *wooded freshwater swamps* are commonly developed along the floodplains of major rivers. Usually the vegetation type is strongly related to the depth and seasonality of flooding. In areas subject to very deep flooding 'floating' swamp grasses are extensive, while in less deeply flooded situations tall cane grasses, such as *Saccharum robustum* and *Phragmites karka* are most common.

Mangroves are found extensively along the south coast in relatively sheltered positions on tidal flats in the estuaries of the main rivers. They tolerate constant flooding and saline conditions, and are commonly zoned according to species composition with *Avicennia*, *Sonneratia* and *Rhizophora* occurring on the seaward side, and *Bruguiera* and *Rhizophora* forming tall forest inland. Nipa palms occur in the transition zone between the saltwater and freshwater environments. Areas of *Gardens and grassland* are found between sea level and 2,700m, but dominate in the highlands.

1.6 Water

Water is significant factor in land suitability for crop production and livestock grazing. Water is available for use through rainfall, water supply schemes, irrigation, dams, wells, stream and rivers. The average rainfall varies from one location to another and water availability, distribution and accessibility varies. On the mainland, the mean annual

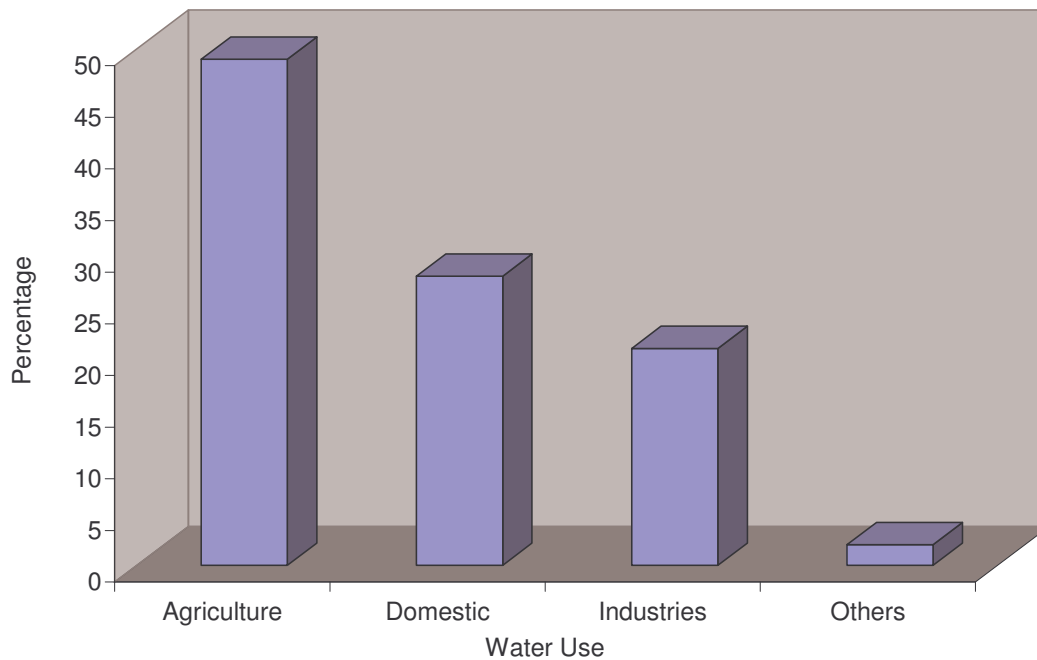
rainfall ranges from less than 2,000mm along the coast to more than 8,000mm in some highland regions. The island groups to the north and the northeast receive an average rainfall between 3,000 and 7,000 mm/year while areas lying south-west of the Fly River, west-ward of Lae in the Markham Valley receive less than 2,000mm of rain per year. The Port Moresby coastal areas receive relatively least rain with less than 1,000 mm/year (DEC 2006).

The 9 hydrological drainage divisions (basins) in the country make PNG seem a water-rich country. The largest river basins of the country are the Sepik, Fly, Purari and Markham. Even though the Sepik has the lowest annual discharge, it has the largest catchment area with 78,000 km², followed by the Fly River with 61,000 km², the Purari with 33,670 km², and Markham with 12,000 km². The other catchments are less than 5,000 km² in area and are very steep (DEC 2006). However, accessibility to both quantity and quality water for domestic, agricultural, and industry is highly costly.

The internal renewable water resources are estimated at 801.0 km³/year. As the country has an abundance of surface water resources and as there are few large-scale consumers, groundwater resources have not been developed much. However, there is evidence that groundwater is being used increasingly as a source of reliable high quality water. In 1974, 34 percent of the villages surveyed relied on groundwater from boreholes, dug-wells or springs. In the 1970s and 1980s, groundwater was developed for urban water supply schemes in seven major towns. The bacteriological and chemical quality of most of the groundwater in PNG is safe. Groundwater resources have not been assessed but it is assumed that most groundwater returns to the river systems and is therefore included in the surface water resources (DEC 2006).

There are around 5,383 freshwater lakes in the country. The lakes are mostly small, and only 22 have a surface area exceeding 1,000 ha. Lake Murray is the largest with a surface area of 64,700 ha. In 1986, there were three dams in the country over 15m high. The gross theoretical hydropower potential for PNG is 175,000 GWh/year. In 1990, the total installed capacity was 163 MW and the annual generation was 438 GWh/year. The total water withdrawals for 1987 are shown in Figure 3. Total water withdrawal for that year was relatively insignificant in global terms and amounted to only 0.1 km³. The main consumer was the agriculture sector with 48 percent, followed by the domestic (28 percent) and industrial sectors (22 percent) and 2 percent for others (Figure 3). In 1990, 94 percent of the urban population and only 6 percent of the rural population had access to water supply.

Figure 3: Percentage of water use



Source: DEC 2006

1.7 Agriculture

Subsistence agriculture is still the largest single economic activity undertaken in PNG. It remains the backbone of the nation's economy with the involvement of over 80 percent of the population. Increasingly, subsistence farmers are entering the cash economy through the sale of surplus produce, and by combining subsistence food production with cash cropping. This is achieved using the same piece of land, for example by planting bananas temporary shade for coffee or peanuts as nitrogen fixing legume for coffee in their plots as is the case in the Highlands region.

In general, agriculture is and will continue to be the mainstay of the PNG economy. It accounts for approximately 25 percent of GDP and 13 percent of total export earnings (Nita 2006). Over 80 percent of the population resides in rural areas where a vast majority of these people are at least wholly or partially reliant on subsistence agriculture for their livelihood. Intensification of agricultural activities, primarily through the informal sector, holds the greatest potential for absorbing the majority of new entrants to the labor force numbering to some 60,000 annually. Rural sustainable development and rural food security are paramount in an analysis of sustainable land development and rural livelihood programme.

Traditional agriculture in PNG is based on a rotational bush-fallow system which is highly productive and sustainable provided that population pressure does not force the use of too short a rotation period. However, the intensification and commercialization of agriculture coupled with increasing population pressure in some parts of PNG are threats to land and long term sustainability of the PNG agricultural production systems (Hanson et al 2001).

With increasing population pressure, the traditional agricultural production system poses significant threat to the quality of land. The main cause of deforestation and land degradation in PNG is shifting cultivation. It has been estimated that the area of forest cleared for this purpose is between 150,000 and 200,000 hectares annually and, in total, some 6 million hectares are used in the rotational gardening cycle. The land which is most at risk of degradation is that which is cleared and subsequently utilized continuously or where the period of fallow is inadequate for the recovery of its previous condition.

Soil erosion is common in these situations due to the clearing of vegetation, particularly the loss of well developed tree root systems. Examples are widespread in the Highlands. This scenario is evident where human interference lead to land transformation and in the absence of suitable land management intervention, this has eventually led to degradation. The invasion into degraded land by exotic grass species has biological and agricultural limitations.

1.8 Mining and petroleum

The non-renewable resource sector is housed on land and has significant on land. It is characterized by mining, petroleum and gas resources. It remains the single most significant sector in terms of national income thus representing approximately 30 percent of the total annual national income between 1998 and 2004. Currently, it represents over 60 percent of PNG's total exports. Economic considerations concerning both income and expenditure by the national government have largely focused on the development and profitability of this sector, reflecting a government policy of GNP-led growth. In 2004, the projected nominal K1, 074.7 million GDP generated by the mining and petroleum/gas sectors compares with a projected nominal K4,008.8 million for the non-mining sector (i.e. 21 percent of GDP). In 1993 oil, gold and copper accounted for 72.4 percent of total exports.

While the potential for further mineral and petroleum resource discovery and development is relatively high, it cannot be denied that the attractiveness of the country to foreign investors has deteriorated in recent years. Concerns about unforeseen equity requirements of the PNG Government and the increasing problems concerning law and order, and mounting landowner demands cast substantial shadows over future interest by mining companies to commit to long-term investments. This concern has already been reflected in a 50 percent drop in exploration funds expended over the last 3 years. The recent wrangle over equity arrangements for the PNG Gas Project and the outcome of the

Mt Kare episode concerning disputation of resource ownership and disregard for the law, are current foci of this concern.

Moreover, the revenue stream from this sector cannot be sustained as the remaining life spans of each operation are between one to two decades. Therefore, careful planning and investment of current revenues from the sector is paramount. At present, the fate of government income from mining and petroleum are difficult to identify, particularly as government revenues are largely channeled directly or indirectly into central government landowner coffers. They appear, however, to be largely directed towards foreign debt repayment and maintenance of the public service. Other returns to the national Government, paid as dividends to the government's Mineral Resources Development Corporation (MRDC) as equity holder, are virtually completely disbursed in the repayment of loans drawn to finance the equity holding.

This procedure results in revenue generated from royalties being the only clearly distributable component of revenue generated by the sector. With 20 percent of the annual royalties going direct to landowners, this leaves with 80 percent for the provincial governments. Total royalty revenues from mining over the period 1990-2003 totaled approximately K890 million.

In PNG, the economic benefits of this sector overshadow the actual and potential risks that this sector poses to land. Operation of mining involves the clearance of pristine natural environmental and removal of millions of tones of earth. The displaced materials including hard rock and sedimentation are either dumped directly in adjacent land fill sites or into river systems which affect the quality of the environment, river systems and the value of land. Land rehabilitation programmes in mining regions have been introduced but the mine's impact on land seem to be long term. The Bougainville, Porgera and Ok Tedi mines confirm this to be the case.

1.9 Energy and gas resources

PNG has sufficient sources of energy resources including hydrocarbons, petroleum and rivers for constructing hydro dams. PNG started producing crude oil from reservoirs found in the Southern Highlands Province including Kutubu, Gobe and Moran, which started flowing in 1992 and 1998, respectively. The oil is currently processed and exported through the Kutubu pipeline system. The government approved the construction of the Napa Napa oil refinery outside Port Moresby in an effort to realize the country's downstream processing of oil for local consumption which came into operation in 2004.

PNG also has significant reservoir of natural gas. The Government has given approval to Exxon Mobile to develop the PNG Gas Project whose project life is estimated to be 30 years. Large reserves of gas found in the gas fields of the Southern Highlands are developed to supply the Queensland market through the proposed PNG Gas Pipeline, a pipeline stretching from gas sources in PNG through the Corral Sea to Northern Territory in Australia.

The PNG Gas Project being developed through Joint Venture between Esso Highlands Limited and its affiliates (as Operator) and Esso's co-ventures Oil Search Limited and its co-affiliates, Nippon Oil Exploration Limited through its subsidiary Merlin Petroleum Company Limited, and subsidiaries of Mineral Resource Development Company Limited (MRDC) is currently the largest new project in PNG. The gas project capital investment in PNG will be approximately US\$2.5 billion over the nominal project life with approximately the same again estimated for recurrent expenditures over the nominal project life. The gas project is expected to produce 225 petajoules of natural gas every year and actual production is expected to begin by 2009 (Exxon Mobile 2005).

Solar generated energy sources are now becoming available to those communities seeking to utilize this for of electricity, especially for lighting, cooking and other household applications. Wood is the principal cooking fuel for the low-income households in both rural and urban areas of the provinces. With population growth and high population densities this is having significant environmental problems. Development of the charcoal industry was promising in 1981, but now has limited application in the rural areas. Kerosene consumption grew sharply in the 1970s and is still an important energy source for cooking and lighting, especially in the rural areas (Tameo 2004).

PNG has many renewable energy sources occurring on land. In hydropower, the potential hydroelectric resources are capable of generating some 15,000 megawatts of electricity. Less than one percent (1 percent) of this 15,000 MW capacity is utilized. The new geothermal power plants in Lihir show another example of renewable energy use where the total installed capacity will reach 56 megawatts. We also need to plan and use wind energy, solar energy, biomass energy and marine energy as these resources are plentiful and PNG can develop and efficiently utilize these energy sources. However, despite this, 90 percent of the country's population is without any access to electricity.

The goal of the National Energy Policy (Draft) 2006 is to 'ensure that ownership of energy resources is vested with the resource owners and that their development must be accessible, reliable, affordable, efficient and environmentally friendly for the benefit to communities, industries and trade, and other development activities'. This goal will be achieved through a social, economic and environmentally driven strategic objectives including ownership of energy resources vested in the energy resource owners, increase commercialization of energy resources with local participation, and introduce best practice mechanisms to ensure environmental quality. If adapted, the National Energy Policy 2006, and the recommendations of the Energy Sector Assessment Report under the MDG 7 Initiatives, will promote sustainable energy development and use by introducing a partnership framework between the state, energy resource owners and the private sector.

1.10 Land and sustainable land management

Many attempts have been made to define land. The traditional definition of land in PNG

‘encompasses all constituent parts of the total environment’ – land, trees, plants, animals, rivers, mountains, swamps and landforms. Simply, land is not separated from other resources. The modern definition is more restrictive, confined to soil and its productive capacity. The following two modern definitions are adopted to shed light to this Report.

According to Dent and Young (1981), land is defined as:

“...as comprising all elements of the physical environment to the extent that these influence potential for land use”. Land does not only refer to soil but also includes the relevant features of geology, landforms, climate and hydrology, the plant cover and fauna, including insects and micro fauna associated with diseases.

The United Nations Food and Agriculture Organisation (FAO) adopted a rather longer and broader definition of land. The FAO (1976) defined land as:

“...an area of the earth's surface, the characteristics of which embrace all reasonably stable, on predictable cyclic, attributes of the biosphere vertically above and below this area including those of the atmosphere, the soil and underlying geology, the hydrology, the plant and animal populations and the result of the past and present human activity to the extent that these attributes exert a significant influence on present and future use of land by man”.

By definition, land in PNG is not as a separate entity apart from resources, the people, and their social and cultural modes of operation. Traditionally, land constitutes “the” fundamental resource in PNG. When someone says, “that is my land”, he/she is not segregating the land/soil from all other constituent elements on, under or above that land. One’s definition of land, and in this case, incorporates all living and non living, renewable and non renewable things in that particular area.

Land and its resources are owned by communities in which access rights and resource extraction are governed by complex rules, some readily applied and others deeply embedded within cultures. Traditional land management practices have long been established and successfully applied in many parts of the country. However, given high rate of population growth in all provinces and the demand placed on the population by the modern economy, the pressure on land for cultivation for subsistence and cash agriculture is mounting. Given the relatively low percentage of agriculturally productive land; it makes it absolutely necessary for stakeholders to adapt sustainable land management practices.

In this context, sustainable land management (SLM) should be associated with the understanding of:

- a. The nature of land,
- b. The various factors influencing land transformation and degradation,

- c. The social, economic, cultural and environmental factors influencing land-use, and
- d. Practicalities of sustaining appropriate levels of production on land under the different constraints.

Therefore, from a PNGian perspective, SLM may be viewed as:

“a process of utilizing land to achieve optimal output under prevailing human and natural conditions without diminishing the productive capacity of a particular land area within a community or region.”

The underlying principle of SLM is to maintain the productive capacity of land in PNG by adapting and/or innovating land-use practices that are consistent with prevailing environmental conditions, ie water, moisture, temperature, climate, porosity etc. While in a few parts of the country, environmental conditions may sustain production indefinitely, production in rest of PNG will depend on appropriate land management practices. A SLM strategy requires a response package in view of certain limitations posed by environmental conditions as well as other socio-economic factors.

1.11 UN convention to combat desertification

In 1977, the United Nations Conference on Desertification (UNCOD) adopted a Plan of Action to Combat Desertification (PACD). However, the United Nations Environment Programme (UNEP) concluded in 1991 that the problem of land degradation in arid, semi-arid and dry sub-humid areas had intensified. A year latter, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, a new, integrated approach to the problem, emphasizing action to promote sustainable development at the community level was adopted. It also called on the United Nations General Assembly to establish an Intergovernmental Negotiating Committee (INCD) to prepare, by June 1994, a Convention to Combat Desertification, particularly in Africa. In December 1992, the General Assembly agreed and adopted resolution 47/188. The UNCCD entered into force on 26 December, 1996.

Working to a tight schedule, the Committee completed its negotiations in five sessions. The UN Convention to Combat Desertification (UNCCD) was adopted in Paris on 17 June -1994 and opened for signature there on 14-15 October 1994. It entered into force on 26 December 1996, 90 days after the fiftieth ratification was received. Over 179 countries were Parties as at March 2002. The Conference of the Parties (COP), which is the Convention's supreme governing body, held its first session in October 1997 in Rome, Italy; the second in December 1998 in Dakar, Senegal; the third in November 1999 in Recife, Brazil; the fourth in December 2000 in Bonn, Germany; and the fifth in October 2001 in Geneva, Switzerland. As of 2001, COP sessions were being held on a biennial basis.

Combating desertification is essential to ensuring the long-term productivity of inhabited dry lands. Unfortunately, past efforts have too often failed, and around the world the problem of land degradation continues to worsen. In recognizing the need for to fight desertification the UNCCD was adapted. The principle aim of the UNCCD is to promote effective action through innovative local programmes and supportive international partnerships and cooperation.

The UNCCD acknowledges that the struggle to protect vulnerable and dry lands to natural and human-induced processes of land degradation and desertification will be a slow and long process. This is because the causes of land degradation and desertification are many and complex, ranging from international trade patterns to unsustainable land management practices. Real and difficult changes will have to be made, both at the international, regional and national and the local levels within member states.

Countries affected by desertification are implementing the UNCCD by developing and carrying out national, sub-regional, and regional action programmes. Criteria for preparing these programmes are detailed in the UNCCD's four "regional implementation annexes": Africa (considered a priority because that is where desertification is most severe), Asia, Latin America and the Caribbean, and the Northern Mediterranean. The Oceania (Pacific Islands) region is not specifically targeted in the above category however, population and economic pressures coupled with vulnerabilities associated with climate change make the issue a significant one. Land transformation and degradation are being experienced in the region, especially in PNG.

Drawing on past lessons, the UNCCD states that any regional and national programmes to combat land degradation must adopt a democratic, bottom-up approach. They should emphasize popular participation and the creation of an "enabling environment" designed to allow local people to help themselves to reverse land degradation. PNG's land ownership regimes put more pressure on state agencies to create policies which state agencies will implement in consultation with and participation by customary landowners to achieve the objectives of the UNCCD.

In general, governments remain responsible for creating this enabling environment. They must make politically sensitive changes, such as decentralizing authority, improving land tenure systems, and empowering women, subsistence farmers, and pastoralists. There is a need also to permit non-governmental organizations (NGOs) to play a strong role in preparing and implementing the action programmes. In order to achieve lasting solutions, any action programmes should be fully integrated into other national policies for sustainable development. They should be flexible and modified as circumstances change over time.

The PNG government, having acknowledged the socio-economic and environmental benefits of protecting the land and as a means to combat desertification and land degradation and to mitigate against the effects of drought ratified the UNCCD on the 6th of December 2000. And in accordance with *Article 26* of UNCCD and the relevant COP decisions, particularly decision 11/COP 1, and subsequent COP decisions regarding the

reporting of measures taken to implement UNCCD, this Report is intended for the UNCCD in preparation for the Fifth Session of the Committee for the Review of the Implementation of the Convention (CRIC 5).

CHAPTER 2

Land Degradation and Desertification

2.1 Land in PNG

Land in PNG is 97 percent customary owned. Of the total land area, about 75 percent is naturally forested thus containing some 6 percent of the world's total biodiversity and provides the basis for over 80 percent of the population who live in the rural areas. About 58 percent of the land is subjected to erosion; another 18 percent is inundated or constantly flooded while only 1 percent of the total land is quality agricultural land with limited restrictions. PNG's arable land per capita is 0.15 hectare per capita and is much lower than the world average of 0.25 (DEC 2006). Taking into account marginal land, up to 30 percent of the total land is suitable for agriculture, with only less than 10 percent of this currently being utilized.

Following Independence in 1975, systematic investigations of the geology and landscape, as well as land evaluation investigations were carried out by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The methodology for land-evaluation investigations was based on the land systems survey. A total of 15 land systems were surveyed covering about 50 per cent of the total land area of the country. Land use was divided into three broad categories, subsistence cultivation, cash cropping (indigenous), and plantation. Most people in each land system were involved in subsistence cultivation. Cash cropping of mainly tree crops, such as coconuts, cocoa, coffee, and some rice, was practiced by the indigenous population in both lowland and highland areas, although in the latter some pyrethrum, passion fruit, tea, and some livestock were introduced.

Land-system surveys undertaken before 1975 estimated that 20 per cent of PNG land was under shifting cultivation. Some estimates of areas were given for different categories of land use in lowland and highland areas. For instance, area under subsistence cultivation per capita was estimated to be between 0.08 and 0.24 ha, with an average of 0.12 ha (DEC 2006). The total land area brought into commercial production (i.e. plantations) by non-indigenous people ranged from 6,400 ha in East Sepik for coconut and cocoa to over 148,000 ha for coffee and pastures in the highlands.

Over the last two decades, land use has changed considerably in PNG as more land is cleared for agriculture, logging, infrastructure and mining. As population and economic pressure increase, the demand for land for economic survival has forced the people to use as much as possible from whatever arable land that is available for cash crops while subsistence farming is pushed onto marginal arable land. Major mining and logging activities are other activities that have records of serious environmental damage to the natural environment. Due to the complexity of land tenure, most urban centres have limited land to expand in spite of the increasing urban population which is causing illegal settlements in almost all urban centres.

2.2 Land transformation and degradation

Human activities including deforestation, shifting cultivation, commercial agriculture, population growth and climatic conditions act synergistically to impact land. Land desertification represents the extreme unsustainable form of land degradation. The process towards desertification is indeed complex and the causes are many. For the purpose of this discussion, a simple explanation is offered. Land transformation is the first in a series of interrelated and complex process involving more than a single agent of land desertification.

Land transformation occurs when the physical appearance of a particular area is altered to meet the needs of the transformers. Humans are the principle agents of change in which nature plays an enhancing role in the transformation process. A principle characteristic of transformed land is that it does not affect the quality of land for productive purposes. In other words, the fertility of transformed land is intact (Figure 4). Despite the retention of its quality, transformed land is most at risk to becoming degraded land if unsuitable management practices are introduced and practiced for long periods without altering such practices.

Figure 4: Transformed land in the Eastern Highlands

Desertification is the degradation of land in arid, semi-arid, and dry sub-humid areas to the extent that quality of land for productive purposes and habitation by species is relatively nonexistent. It is caused primarily by unsustainable human land-use practices and climatic variations.

This implies the particular scenario that:

Net D = (ndp + ulp) – (nrc + slm). Net D means net degradation.



If natural degradation process (ndp) and unsustainable human land-use practices (ulp) exceeds the natural restorative capacity (nrc) and sustainable land management practices (slm), then degradation occurs. Hence, if $(ndp + ulp) > (nrc + slm)$, then degradation is said to occur. In other words, if $(ndp + ulp) < (nrc + slm)$ then degradation is not said to have occurred.

Transformation of forest land into agricultural land does not necessarily constitute land degradation because its quality is often intact. If this land undergoes further changes,

looses its quality and becomes grassland, or barren as experienced in many parts of PNG, these signals a new phase where it is no longer suitable for productive purposes. The land has indeed, been degraded.

Under the previous matrix (**Net D = (ndp + ulp) – (nrc + slm)**), any effort to target and minimize land degradation in PNG must first be aimed at breaking the cycle leading towards land degradation at the point of transformation. It entails site-specific sustainable land management strategies (SLM) including selection of the type of plant cultivars, livestock breed, methods of cultivation and pastoralism, artificial land fertility management scheme, selection of particular use to which a land is made, and a mixture of an array of both traditional and modern sustainable land management methodologies. A combination of these practices will go a long way towards helping reduce the risk of land degradation and hence desertification.

2.3 Land desertification

Land desertification or the concept of deserts is relatively foreign to PNG. PNG's experience in terms of desertification is one that is not related to the underlying definition or interpretation of land desertification. In PNG, land degradation is more pronounced than land desertification and is closely related to land-use practices associated with logging, subsistence and commercial agriculture, infrastructure development, and urbanization. The impact on land is one of transformation with a high risk of degradation. There is as yet no incidence of desertification but that is not to conclude that degraded land cannot lead to desertification given certain factors. As stated elsewhere, land desertification represents the extreme and unsustainable form of land degradation. Desertification is the degradation of land in arid, semi-arid, and dry sub-humid areas to the extent that quality of land for productive purposes and habitation by species is relatively nonexistent.

Generally, it is argued that 'desertification does not refer to the expansion of existing deserts'. It occurs because dry land ecosystems, which cover over one third of the world's land area, are extremely vulnerable to over-exploitation and inappropriate land use. Poverty, political instability, deforestation, overgrazing, and land irrigation practices can all undermine the land's productivity. Over 250 million people are directly affected by desertification world-wide. In addition, some one thousand million (or one billion) people in over one hundred countries are at risk. These people include many of the world's poorest, most marginalized, and politically weak citizens. The environmental, social, economic and political effects of desertification can equally apply to PNG.

According to the United Nations Environment Programme (UNEP) about 35 percent of the Earth's land surface is classified as arid or semi arid deserts. This is home to over a billion people. The world's deserts are spreading at an alarming rate in drier parts of every continent from a combination of both human induced and natural processes. The conversion productive rangeland (uncultivated land used for grazing), rain-fed cropland,

or irrigated cropland into desert-like land with a drop in agricultural productivity of 10 percent or more is identified as desertification (Table 1).

Table 1: Levels of desertification and its impact

Level of desertification	Impact on Agriculture Output	Stages of Mitigation
Minimal	<10 % drop in agriculture output	Transformation stage
Moderate	10-15% drop in agriculture output	Require effective restorative management practices
Severe	16-25% drop in agriculture output	Degradation stage set
Very Severe	26-50% drop in agriculture output	Process of degradation and desertification underway
Extremely severe	>50% drop in agriculture output	Desertification established

Source: DEC 2006

Table 1 show the different levels of impact in areas where land is heading towards desertification. Instead of advancing on a broad front, desertification often begins with small patches and then spreads outwards like a bush fire. Eventually, the land can completely lose its ability to support vegetation, water, animal species as its top soil is either washed away or blown away and the sun bakes the subsoil rock-hard. In PNG, the described features of desertification are difficult to identify. However, features of degradation, as a preliminary stage towards desertification are indeed widespread.

2.4 Climates and land degradation

Apart from unsustainable human interference on land, climate is the other principle agent directly responsible for land degradation and desertification. Climate is a synthetic state of the earth's environment, which results from the various interactive processes between the atmosphere, hydrosphere and also the Earth's surface. These interactive processes have created a quasi-equilibrium state that has been sustained, although the climate exhibits large variations around its quasi-equilibrium state spatially and temporally.

In PNG, the key physical determinants of its weather and climate are the landmasses and oceans that surround it. There are also key factors that influence the climate and they include:

- Excess heating due to incoming solar radiation at the equator where the ocean and atmosphere interactions provide the favourable moisture source for abundant

- precipitation typical of tropical environments.
- Annual variability of the tropical east-west walker circulation that at times create El Nino patterns.
 - Despite PNG's tropical location, the south coasts of the mainland are actually dry over the period corresponding to the southern hemisphere winter.
 - Topography including the orientation of major ranges. While the mainland lies in the west/east direction, most ranges are aligned in the NW/SE direction. Periodical shifts in the wind direction therefore have real potential to alter rainfall patterns of any given location.

The above influencing factors on climatic conditions in PNG have significant influence on crop diversity and agricultural activity. The climate therefore, is humid and rainy with wet-dry seasons annually which have different implications for land depending on the land use of particular regions. Temperatures are not extreme for tropical climates and most areas, apart from the high altitudes, have a daily mean temperature of 27°C with little variation.

Humidity in the lowland areas varies around 80 percent. Varied topography and location determine localized climates in the country. There are two principal wind directions, which strongly influence the rainfall patterns of the country. They are: southeast - from May to October, northwest - from December to March while April and November are transition months.

However, high mountain barriers across the path of these winds induce heavy orographic and also convective precipitations on the northern and southern slopes in the highlands themselves while the Western and Sepik lowlands are characterised by huge thermal convective precipitation.

The prevailing southeast trade winds occur during the months June to October and acts as a medium for dry air movement responsible for dry conditions over this period. The influence of these southeast trade winds gradually fades towards the equator where deep tropical weather dominates. Over the remaining months from December to April, which corresponds to the southern summer, the major influences are the northwest monsoons originating in Asia. This airflow transports moist humid air and provides abundant moisture over the whole country hence the enhanced precipitation over that period.

In PNG, the single most significant mechanism of climate and sea level variability is related to the ENSO phenomenon. Effects of the southern oscillation show a definite correlation between the SOI and the rainfall patterns of the southern coasts of the mainland but gradually fade towards the equator. The impacts of ENSO on relative sea level changes are significant ranging from 20-30 mm per year.

With the effect of ENSO phenomenon, the rate at which land transformation is taking place has significantly affected the land-use patterns for various regions within the country. In the case of the inhabitants of smaller islands and atolls, much of their productive lands have been inundated with seawater due to sea level rise. As a result,

many of them to change their methods of cultivation, cropping practices or increase use of the available hillside or slope areas. While in most interior parts of the mainland New Guinea, with the unusual changes in the precipitation patterns, a lot of the people have moved from their normal subsistence way of cultivation into a more complex merchandised form of agricultural practises. These practices have had a lot of impact on the rate of erosion and also the fertility of the soil.

2.5 Land potential

PNG is an agricultural country and it is likely that its' increasing population will continue to rely heavily on agriculture in the New Millennium. More land will be brought into production and it is in the densely populated areas where population pressure is becoming a problem that land problem will be more chronic. Despite critical shortages of land that have been reported in the Highlands, no systematic treatment has been undertaken to classify land-use related to population density. However, recent data from the Agricultural Land Use Survey for PNG suggest that several areas could face similar problems of land-use. Therefore, a greater research effort is required to assess and evaluate land-use change and to relate it to population growth in PNG. Such a research programme will ascertain the long-term sustainability of the current agricultural systems in the country.

The land potential refers to potential for crop growth and the major environmental constraints to crop production. Examples of the latter include steep slopes, poor soils, high rainfall, long dry seasons, low temperatures, frequent flooding and excessive cloud cover. Land potential is significant in order to utilize information about the land management practices used in gardens to overcome such constraints. People living in low potential environments often struggle to produce food for consumption and have even more difficulty growing cash crops. A summary of existing land-use practice, risks associated with certain practices, and agriculture potential in the provinces is provided in **Annex 1**.

There is both agricultural pressure and agriculture potential. High intensity agriculture practiced in low potential environments often leads to agricultural pressure on land, resulting in land degradation, reduced crop yields and food shortages. It also limits the ability of people to increase food production in the future. Alternatively, where there is low intensity or no agriculture in high potential environments, the areas are under-utilized. Depending on market access and transport infrastructure, such areas may be suitable for agricultural development. Improved road access, transport or extension services could stimulate rapid agricultural development in high potential areas.

2.6 Food security

Food security is generally good in PNG. This is because a high proportion of the population is engaged in food production at the subsistence level, most people have

access to land and they rely on a diverse range of subsistence food sources. Also, most people have access to some cash income with which they can buy food when subsistence supplies are inadequate. While the availability of food is good, there are some major problems with its quality. People generally have an inadequate intake of protein and concentrated energy sources such as oils and fats.

The major urban areas of PNG depend heavily on imported food such as rice, tinned fish and meat, and increasingly flour and dairy products. Vigorous domestic fresh food markets exist in many places, but they do not satisfy overall demand and prices are high relative to imported rice. There is strong political pressure for the development of a domestic rice industry to replace imports. However, even if a domestic rice industry overcame severe environmental and pest constraints, it could not produce at or below world market prices. Significant increases in the price of such an important food would have serious political and nutritional consequences.

Food security is sometimes threatened by climate extremes, including excessive rainfall, drought and frost. Global climate change and the emerging AIDS epidemic may have a negative impact on food security in the future, but the effects cannot be accurately assessed at this time. AIDS will have a major impact on the labor force as the highest death rates will be in the 15 to 40 age group for women and the 20 to 50 age group for men.

CHAPTER 3

Land Tenure and Land Development

3.1 *Nature of land tenure*

About 97 percent of total land in PNG is customarily owned and is inherited by 10,000 autonomous tribes (Nita 2006). The government owns almost 50 percent of the remaining 3 percent total with rest going to Faith-based Organizations (FBOs) and others including privately-owned business entrepreneurs. Hence, where customary land is involved, the group owns and the individual uses including its inherent resources.

Customary land management is a form of ‘*social contract*’ for customary land and this ‘social contract’ between the members and the land group sets the terms and conditions for land use within the land group. By the Land Group Incorporation Act 1974 the government has provided the first legal artefact to empower the land group to enter the modernization process. Land registration and issuance of title to the Incorporated Land Group (ILG) is the next essential step. These laws will empower the group to deal with people and companies outside the group.

The customary-oriented ‘social contract’ remains intact after registration. Hence, ownership remains intact. What has changed, though is that the ‘issuance of land title to an ILG has empowered the group to convert its’ previously locked up and commercially valueless asset (land) to a valuable property able to be shaped and employed to the group’s advantage, at least in theory. These two legal artefacts, the *title* and the *registration certificate* have added great value to the previously unproductive asset. Conversion of land to ‘commodity’ enables the respective ILG to now access and harness the surplus value of the asset to accumulate capital either alone or in conjunction with other ILGs who have undergone the same transition. This remains the basis for capitalism in a modernizing PNG.

ILGs cannot make use of the surplus value of their assets unless those assets are mobilized as property in modern commercial transactions. The Commission of Inquiry into Land Matters (CILM) in 1973, after a exhaustive consultation throughout the country, recommended legislation to register group lands (Recommendation 4...), register groups (Recommendation 12 ...), and to settle disputes by mediation based on custom (Recommendation 67 ...). In response to the CILM Report, the founding fathers in the Legislative Assembly passed the ILG Act 1974 and the Land Dispute Settlement Act a year latter (1975). Apart from the Constitution, these two Acts are the most important land-related pieces of legislation ever enacted in PNG.

There is a great deal of misunderstanding about customary land tenures. One of the most common mistakes is to believe that customary tenure involves both the communal ownership and the communal use of land. In its extreme form, this view leads critics to

see communal ownership as something like communism, whose fate it should share. On the contrary, communal ownership in countries like PNG should be seen as a form of private property rights, albeit that the rights are owned by a group rather than by individuals. A further aspect of this misunderstanding is the failure to distinguish between land tenure and land-use. It is dangerous to generalise about customary tenures, especially in a country like PNG with fully understanding its hundreds of different ethnic groups and associated cultures.

3.2 *Misunderstandings of land tenure*

In Melanesian society under which the tenure to land is group based, individuals have rights to land as a result of their membership by birth into a group, or of some other relationship to the group (for example, marriage to a member, or adoption into the group). Land use, on the other hand, is largely in the hands of individuals - members of the group, their spouses, siblings, children or other close kin. Land tenure and land-use can be seen as a balance between group and individual rights and obligations. It is a traditional balance, but one which can, when necessary be shifted in the direction of strengthening the rights of individual group members and relaxing group controls, to allow for the new demands of modernization including modern livelihoods.

Another major misunderstanding is the belief that customary tenures are static, non-adaptive, uncertain, backward-looking, in short, an obstacle to development. 'Communal land ownership' means low productivity and small incomes'. This sweeping statement is contradicted by the facts. The rapid expansion of village cocoa and coffee production in the 1970s and 1980s and into the modern era, and of vanilla today, all took place on communally-owned land. Indeed, it is the coffee and cocoa plantation lands under formal titles where production has declined the most, while village production of these crops has increased, in the absence of secure land titles (DEC 2006).

In many aspects, customary land tenure patterns championed land, resource and environment conservation in PNG. Many parts of PNG's rural communities still practice century-old customary conservation practices based on ownership tribal/communal patterns. People clearly understood their environments and its constituent resources in which cultivation, harvest and hunting practices complimented seasonal variations in their local environments. Their methodologies were simple, environmentally friendly and in general forms of land degradation now described were nonexistent in PNG.

Despite the role land tenure played in resource and environmental conservation, the pressures encountered in the face of population growth, economic pressures, government instability, issues pertaining to good governance, unemployment and threat posed by HIV-AIDS, the need for an integrative land management system and practice is necessary. Despite the fact that 30 percent of land in PNG is arable or potentially arable, the above factors are increasingly putting communities under enormous pressure. As a consequence, the risks for land transformation leading to land degradation are significantly high. Customary land tenure is no longer seen as a champion of

conservation without first having to institute policies and regulatory framework necessary to acknowledge the role traditional practices can contribute in SLM.

3.3 Land tenure and agriculture

PNG's history has always been associated with its land tenure and agriculture systems. Over 250 food-plant species have been recorded and 43 of these have been always cultivated, 51 are cultivated and harvested as wild resources, and 157 are gathered from forests, savannas, and grasslands while today more indigenous and imported plants are experimented. Subsistence agriculturalists grow mainly tuber crops and planting some fruit and nut trees. The period of cultivation ranges from 3 to 5 years in the lowlands to continuous cycle of cultivation in most Highlands' areas. The fallow period ranges from limited fallow to about 25 year fallow periods, although in some areas the fallow period is up to 50 years and is dependent on cycle of tree crops such as pandanus. These are all undertaken in traditionally own land.

The majority of PNG agriculture systems are present fallow systems, or systems which have evolved from forest fallow systems. Fallow systems involve clearing and cutting forest, some burning of felled vegetation, cultivation of crops, and abandonment of the site to natural processes of regeneration.

Despite many reports to the contrary (mainly from South-East Asia), tropical forest fallow systems can be stable. Fallow systems are environmentally friendly because a tree cover over often erodible and naturally poor soils is maintained. Stable shifting agriculture systems do not destroy rainforest by cutting and burning trees; they cycle through secondary forest as observed in many of PNG's lowland regions. Shifting cultivators avoid using previously uncultivated forests, if possible, because of the difficulties and dangers of felling the trees, and because generally secondary forest contains more useful plants and animals and are easier to work than primary rainforest.

Latitudinal differences in solar energy, temperature, rainfall, and soil nutrients are some of the ecological constraints on agricultural systems. Often a farmer is unable to directly control the constraints of solar radiation, temperature, and rainfall but is able to adapt to changes brought about by these constraints. PNG agriculturalists have been able to adapt to changes brought about by climate change and the socio-economic conditions so that agriculture has remained the mainstay of rural societies for thousands of years. Some of these responses and mitigating factors have resulted in the development of most elaborate farming techniques, such as mounding, terracing, mulching, ditching, draining, and irrigation systems which are now considered to have developed independently of the major agricultural civilization of the world. Some writers ascribe development of such techniques to the introduction of new crops, population growth, and increased demands for social production and a combination of all of these factors. This technological change/innovation was a result of agricultural intensification that is now evident in PNG.

Apart from the non-renewable resource sector, agriculture is the mainstay of the modern PNG economy, accounting for approximately 30 percent of GDP and about 13 percent of total export earnings. These are produced on arable land where land potential is relatively high (Table 2). Cash crops such as copra, coffee, cocoa, rubber and oil palm as well as subsistence agriculture based on root crops sustain about 85 percent of the total population. Surplus production is sold mainly in local and distant domestic markets. Large amounts of fruits and vegetables are produced in the Highlands but inadequate transport and marketing facilities limit their supply to urban areas. Subsistence agriculture accounts for about 45 percent of total agricultural outputs.

Table 2: Land suitability for tree crops, arable crops, pasture and irrigated rice.

Land Use	Very High Suitability (Km ²)	%	Very High to High land Suitability (Km ²)	%	Very High to Moderate Suitability (Km ²)	%
Tree Crops	7790	1.7	15460	3.3	66950	11.9
Arable	4960	1.1	21890	4.7	44220	9.4
Pasture	14710	3.1	29710	6.3	67290	14.3
Rice	11890	2.5	37980	8.1	61360	13.1

Source: DEC 2006

Subsistence farming occupies about 25 percent of rural land while the remaining 75 percent is unoccupied. Most occupied land in the Central Highlands has high population density compared to some parts of the country which has relatively low population density. However, the general trend as shown in the 2000 National Census remains that annual population growth rate across the country is increasing by between 2.5-3.5 percent.

With over 50 percent of rural population having very low income and having very limited sources of income, the intensity to use land and their immediate environment as a means of survival is indeed accelerating land, resource and environmental degradation. Pristine natural environments and forests such as that in Figure 5 are at risk.

In PNG, the most vulnerable to land degradation, economic shock and natural disasters remain the village-based population, which depend on subsistence farming for their livelihood and means of cash income for education, transport, health services and other socio-economic services. Those who depend on farming, forestry and fishing would see their livelihood degraded by degraded soils, forests and fishing grounds as well as changes in rainfall.

Figure 5: Pristine forest environment

They would be the ones who would find it more difficult to change over to new crops and farming practices including methods, acquire cultivable land for continued farming and adopt sound land management practices.



3.4 National land development policy

The government established the National Land Development Task Force (NLDTF) in December 2005 to explore ways to developing land in PNG. The principle mission of the Taskforce was to answer the question "How can we access land for Development Purposes?" In particular, what strategies can we adopt that will enable PNG to attain an economic growth rate of 5 percent as set out in the Medium Term Development Plan. The NLDTF sought to seek ways of improving land administration and to improve dispute resolution mechanisms as the first steps before working on developing mechanisms to develop land currently held under customary land tenure systems.

The current land administration practices were major impediments to facilitating economic growth and development. Much of the 3 percent of alienated land remains under-utilized for various reasons. Development covenants have not been complied with nor are default provisions strictly applied. There is no physical planning and as a result large pockets of alienated state land in potentially high growth areas remain undeveloped.

This has led to squatting on most undeveloped state land, a truly uneconomical activity, and one that will create further problems for government. Many hard working and law abiding citizens are frustrated with a system that undermines progress and legal development activities.

Efficiency and corruption in the Department of Lands and Physical Planning (DLPP) has been worse over the last 2 decades. Record management systems are absolutely poor which results in land title transfers difficult. As a result many occupants of leases for houses, business and agricultural use, cannot mortgage their properties to do business. This has stifled the property market and as a result, has not contributed as much to

economic activities. Improvements to land administration are a necessary precondition to enhancing economic performance in PNG.

There are a total of 16 recommendations and all of them refer to the operations of the DLPP and related activities in the provinces. The Taskforce argued that if all the recommendations made under Land Administration were implemented, there would be marked improvements on the economy leading to an economic growth rate of over 5 percent. This is underpinned by the fact that the 3 percent of alienated land in the country constitute 90 percent of the country's prime land.

In the area of 'land dispute resolutions', the Taskforce has recommended for the establishment of a single land court to deal with all disputes relating to land. There are many reasons as documented in the Committees report that captures the rationale for the establishment of the single court system. One of the principle benefits of a single land court system would be to deal efficiently with all outstanding land matters.

For instance, the number and frequency of land disputes indicates that the current arrangements are clearly inappropriate, especially the work of the Land Titles Commission, the National Lands Commission and the work of the District Land Courts. The Task Force was told of a back log of land mediation appeal cases numbering more than 200 for the Goroka District alone, awaiting hearing by the District Land Court. One can just imagine how many were there from the other Districts of Eastern Highlands, and how many from all the twenty provinces combined.

In the area of accessing customary land, the Committee worked on a very difficult guiding principle. The NLDTF was tasked to identify a mechanism that ensures that customary land will remain in the possession of the land owning group, yet can be comfortably leased and utilized freely in the modern business environment. The committee drew on the work of previous efforts and looked at existing mechanisms. The Model or framework proposed recommends the use of existing legislations with some modifications.

What is not considered in the list of recommendations are sustainable management of land by communities and developers, monitoring and mitigation of land degradation, and consideration of environmental and biodiversity factors in the face of development activities. The focus of the Task force is to facilitate land for economic development only, very much similar to the MTDS which favors economic growth ahead of other priorities. Despite the efforts of the NLDTF, there is much more yet to be done than the 16 recommendations made available.

CHAPTER 4

Impediments to Sustainable Land-use

4.1 *Limited quality arable land*

PNG has very limited quality arable land. Only 1 percent of the total land area is available with and with the use of marginal land, about 30 percent of the total land is suitable for sustainable subsistence agriculture. Of this amount, not all is readily available all the time for agriculture as geographical, ownership, financial and infrastructure limitations restrict its productive usage.

Currently, less than 10 percent of total land is being utilized. Nevertheless, these marginal land and its inhabitants are vulnerable to land degradation. The quality arable land mostly exists as small pockets of in provinces around the country. Moreover, most of this quality land are under agricultural production pressure and are mainly used for cash crop production. A large portion of land in PNG has moderate to very low land potential given a combination of limitations. The people of PNG must be cautious in how this land is used for agriculture or other purposes and must be aware of the nature of their land and environmental tradeoffs that are being sacrificed for cash and other social and economic benefits in the name of development.

The government must develop suitable incentives to encourage the sustainable use of arable and marginal land. This may be difficult due to the land tenure system where the government has no say over how communities of landowners use their land. The only way the government can influence sustainable land use management is when landowners form companies in various forms to develop economically viable projects. A series of steps are necessary to address contagious issues if the government is to encourage sustainable land use management for the limited arable land available and to protect marginal land.

4.2 *Deforestation*

Large-scale destruction of tropical forest resources is recognized as an on-going impediment to ecological and economic sustainability. There are serious trade offs between the unrecognised and/or undervalued goods and services tropical forests and forest ecosystems provide to people. The forest goods and services sustain community livelihoods and when properly managed can secure timber, medical, and food security. Whatever it is, the simple fact is that the main repository of biodiversity is in threat of being consumed unsustainably. Of the causes, many agree that logging and land clearing for agriculture are among the most influential.

As forests are logged for timber and/or transformed for agriculture, so are the many goods and services provided by forest and forest ecosystems. The contribution of deforestation to the greenhouse effect remains a globally sensitive issue. Without a doubt, deforestation in most areas is reducing or disturbing rainfall, exposing topsoil and making soil become susceptible to severe erosion thus preventing forest regeneration.

The absence in PNG of an effective enforcement capacity, both legal and administrative has only exacerbated the nature and forms of deforestation. The laws are rarely effective and therefore cannot be argued that they provide an effective insulation against deforestation. The media war between the proponents of logging both in the industry and in government and the defenders of forest resources led by local and international NGOs demonstrate the risks associated with the forest sector. While on one hand, proponents supported by government argue in favour of industrial logging irrespective of wholesale deforestation and unsustainable logging while the landowners are crying foul over their resources and their livelihoods. The continuation of this trend over a prolonged period of time is unhealthy for sustainable forest management and protection of their land.

4.3 Cropping practices

Serious changes in the pattern of crop production and cropping practices have occurred in the last few decades in most parts of PNG. There has been a growing shift towards production of cash crops at the expense of subsistence food crops. The cash cropping system have claimed mostly flat, fertile land, leaving the sloping hillsides for subsistence food production. Pushing food production and subsistence farming onto marginal land is most likely to acerbate soil erosion problems (Figure 6).

Figure 6: Intensive cultivation on marginal land

The current or traditional farming systems used in the country are very exploitive in terms of soil fertility. With increasing population quality arable land is becoming scarce and this has resulted in shortened fallow periods leading to reduced crop yields.



It is imperative for farmers to employ sustainable farming methods in both marginal and arable land in rural areas. Farming systems may include improved cultivation practices (e.g. contour ploughing on slopes), mixed cropping with leguminous crops and incorporation of leguminous tree species to improve and maintain soil quality to sustain productivity. Agriculture is required to satisfy two apparently contradictory needs; (a) to become more productive, and (b) be more sustainable. In other words, to supply the food needed without depleting renewable resources and conserving the environment. Breeding plants that produce higher yields and a better quality but which do not adversely affect the ecosystem can be achieved through an integrated approach using both conventional production methods and alternative biotechnological techniques.

4.4 Soil erosion

Soil erosion is an increasing problem in most parts of PNG. Steep sloping fertile land are easily overexploited and mismanaged, leading to accelerated soil erosion. Many soils, especially those under subsistence farming, are subjected to fertility depletion due to decline in soil organic matter, soil leaching and soil acidification. In PNG, lack of effective management techniques on customary land has transformed fertile marginal lands into degraded and/or potentially degradable land.

The increasing rate of soil loss through erosion, degradation and other causes makes the formulation and implementation of national soil policies a matter of high importance in relation to the promotion of sustainable land use in PNG. A national soils policy should allow and stimulate maximum utilization of the soil on a sustainable basis without decreasing productivity, and without causing direct or indirect damage to the environment.

There are continuously increasing demand placed on land to meet livelihood requirements (food, clothes, shelter) and provide energy for the growing populations. PNG should work towards using its soils on the basis of sound principles of resource management to enhance soil productivity without putting too much stress on the ability of the land to produce outputs at sustainable levels. It is also a complimentary requirement that control measures should be introduced, soil quality awareness, education and training be carried out at village level as well as information and technological dissemination at local level for maintaining an acceptable ecological balance within the soil system.

4.5 Mining and petroleum development

Like many least developed countries, PNG is dependent on commodity export. Since independence, the PNG government in its efforts to fund its development effort undertook a proactive development approach in the non-renewable resource sector, especially minerals and relatively latter petroleum, gas and nickel. The mining sub-sector was at some time the single foreign exchange earner for PNG. At the height of the Panguna Copper Mine in the mine 1970s and 1980s, it accounted for over 40 percent of

total national Gross Domestic Product (GDP). The unfortunate closure of that mine in 1989 was due to the high level of pollution occurring along the Jaba River. Further, the land was degraded along two fronts, (a) the mine itself at Panguna and surrounding areas, and (b) along the Jaba River system where sedimentation loadings continuously for nearly 2 decades caused extensive environmental damage.

The lessons from Panguna do not seem to have been acknowledged by decision-makers in Waigani. At the Ok Tedi Mine in the Western Province, similar damage is reported both by the proponents and adversaries alike. The dumping of almost 100,000 tonnes of waste rock and other toxins directly into the Ok Tedi River system over 20 years have produced results contrary to expected management predictions. In 2004, BHP as the major partner announced for the first time that indeed environmental damage experienced along the Fly River system have been caused by the Ok Tedi Mine.

Further, sedimentation build-up over the years has caused die-backs along the entire stretch of the river system and indeed its banks. The livelihood of people directly associated with the riverine environment and the land have been affected both directly and indirectly. Naturally, people responded to adaptive methods with little or minimal direct assistance from the Mine developers.

The Porgera Mine adds to the list of the history of mine consequences on land, the environment and the local people. Since its inception in 1989, the Porgera Mine disposed from 9,000 tonnes of waste rock and toxins a day to over 21,000 tonnes a day in 1994 when it entered into Stage 4b. Stage 4b focussed on the open cut component of mine development. The increase of sedimentation loading into the Porgera River system has environmental, social and economic impact on over 10,000 local communities living immediately downstream of the mine.

Land degradation and environmental damage around the mine is evident. Large boulders have blocked accessibility to land forever while sedimentation loadings have made accessibility to alluvial gold inaccessible. The developers continue to maintain that everything is OK but that seem to be the culture amongst all developers in the mining sector. It is imperative to note that economic benefits to the country cannot be used to effectively argue against people's livelihoods based on land which are currently being compromised. PNG is yet to experience the implementation of a sustainable mining policy that recognized the rights of people on community land.

Despite the availability of legislation regulating mining and environment protection, monitoring and enforcement is very weak/poor. The arguments that no longer can be tolerated are the 'manpower, financial, capacity, and political will' excuses which are as old as the State itself. There are inherent failures within the system itself that renders complete overhaul in the system if the country is to respond effectively to issues of national significance, let alone land degradation.

4.6 Use of chemicals and plant residues

Even though there have been little evidence of chemical pollution from the use and misuse of mining and agricultural chemicals, there are localized incidents that pop up every now and then of which are usually corrected. Still the threat remains and increases as mining and cash crop agriculture expand. With the poor application techniques and inefficient use, considerable portions of the chemicals on most cases do not reach their targets and the residue contaminates land, water and air. These chemicals can also be leached into drainage water causing pollution of surface and coastal waters. Mining activities have been known to cause serious physical and chemical pollution to land and water resources in some areas. The continued use of agricultural chemicals may lead to build up of pest and diseases resistance, which becomes a major problem in food production.

Safe uses of chemicals in the mining sector and many alternatives to pests and diseases control have been proposed. Information on integrated pests and disease management, including management and selection of chemicals used, use of biological control methods and development of genetic resistance such as those studied and developed by the National Agricultural Research Institution and other line agencies should be disseminated to rural populations in PNG. Further more, mining companies must account for every gram of toxic chemicals used in their operations and appropriate penalties, incentives and disincentives be devised to discourage unsafe wasteful practices and poor management of chemicals.

Also critical are plant residues from crop and trees often wasted in PNG. Their importance to the economy of PNG is scarcely realized. It is important to emphasize here that agriculture sustains not only food production but production of other renewable sources of energy. Today, there are several techniques available to use these residues efficiently. They include gasification, pyrolysis into liquid fuels, charcoal production, production of bio-gas and organic fertilizer. The growing interest in green biomass and the different valuable products that can be obtained from the same crop emphasizes a need to investigate all green plants for polyvalent uses, and to conserve the genetic pool of the green plants. Down stream processing in PNG needs to be emphasized to minimize food and energy losses. In PNG there is a need to encourage efficient use of plant residues to upgrade traditional food processing techniques, e.g. smoking and drying in the villages and hence protect valuable forest and other land resources.

4.7 Natural Disasters

Records show that natural disasters pose significant threat to land-use in PNG. Natural disasters such as droughts, mass land slides, volcano eruptions, floods have caused considerable environmental damage, loss of life, destroyed agriculture activities, and caused significant damage to the national economy (Table 3). The costs to human lives, economy and environment from disasters have increased dramatically in recent times.

It also had impact on social, economic, and agricultural infrastructure including water supply systems, clean air; marine ecosystems all put enormous strain on civic authorities to effectively deal the consequences. Insecurity to these infrastructures posed serious and recurring economic, health and environment risks. Many of these natural disasters are recurring, and are happening in the same regions thus placing enormous strain on the available government systems to respond effectively. The most common natural disasters include earthquakes, volcanic eruptions, mass landslides, floods and droughts. Despite the frequency of these natural disasters, efforts to minimize the consequences seem to be too distant.

Table 3: Major recorded natural disasters in PNG.

Year	Disaster	Location	People affected (Estimate)	Deaths
2003	Flood	East Sepik	13,000	None
2002	Volcanic Eruption	Pago, West New Britain	10,500	6
2002	Drought	Various	200, 000	25
2002	Earthquake	East Sepik	7,000	4
2002	Earthquake, landslide	Wantoat, Morobe	13,405	27
2000	Earthquake	New Guinea Islands	40,000	65
1999	Flood	North Fly, Western	10, 000	4
1998	Tsunami	Aitape, Sandaun	124,270	2,300
1998	Flood	East Sepik; Ramu & Mumeng, Morobe Province	30,000	34
1998	Cyclone & Gale	Milne Bay	50,000	None
1998	Storm	Milne Bay	6,000	--
1997	Drought/frost	Nationwide	3,159,000	?
1997	Cyclone	Central; Milne Bay	3,500	8
1996	Volcanic Eruption	Manam, Madang	3,000	44
1994	Cyclone	Milne Bay	1,200	--
1994	Volcanic Eruption	Rabual, East New Britain	50,000	3
1993	Cyclone	Northern Islands; Milne Bay	50,000	1
1993	Landslide	Kaiapit, Morobe Province	7,000	14
1992	Volcanic Eruption	Manam, Madang	2,000	15
1972	Drought	Highlands	19,000	23
1957	Volcanic Eruption	Manam, Madang	3,200	56
1951	Volcanic Eruption	Lamington, Oro	3,000	100
1937	Volcanic Eruption	Rabual, East New Britain	8,000	500

Source: DEC 2006

CHAPTER 5

Enabling Environment

5.1 Medium Term Development Strategy 2005-2010

When developed, a SLM framework will compliment with the government's medium term development plan. The current government launched the Medium Term Development Strategy 2005-2010 entitled 'Plan for Economic and Social Advancement' in September 2005. In officially launching the MTDS 2005-2010, it demonstrated the governments' commitment to fulfilling the 5 Goals and 8 Aims. It is also imperative that managing land as a critical resource on a sustainable basis requires successful policy integration. In essence, the MTDS represent the government's 'private sector-led economic growth' policy which is grounded in the Ten Principles of the MTDS which reads:

1. *Private Sector-led Economic Growth*
2. *Resource Mobilization and Alignment*
3. *Improvements in the Quality of Life*
4. *Natural Endowments*
5. *Competitive Advantage and the Global Market*
6. *Integrating the Three Tiers of Government*
7. *Partnership through Strategic Alliances*
8. *Least Developed Areas Intervention*
9. *Empowering Papua New Guineans and Improving Skills*
10. *'Sweat Equity' and Papua New Guinean Character*

The MTDS compliments the 27 Principles of Agenda 21 which represent the roadmap for translating Agenda 21 into nationally-owned action programmes. For example, the 3rd principle of the MTDS, "Improvements in the quality of life" is well grounded in several of the Principles of Agenda 21. Indeed, the economic, social and environmental objectives set in Agenda 21 are about improving human and environmental conditions and the MTDS is embarking on achieving these goals. Further, SLM is about improving and maintaining the conditions of land in PNG to enhance economic outputs leading to higher income levels and enhanced lifestyles.

5.2 MTDS and the Millennium Development Goals

The Millennium Development Goals (MDG) emerged from the Millennium Declaration in 2000. All 8 Goals of the MDG reflect global problems that urgently require global actions to reach certain targets within a set timeframe (Table 4). The MDG is unlike previous international goals which were endorsed without yardsticks (indicators) to measure and timeframes in which to realize specific targets. The MDG seem to be the

driver of the MTDS however, the controversies are not unlimited in the way the MTDS attempts to achieve development that is environmentally sustainable and managing land.

Table 4: Millennium Development Goals

Goals No	Goal
ONE	Eradicate Extreme Poverty and Hunger
TWO	Achieve Universal Primary Education
THREE	Promote Gender Equality
FOUR	Reduce Child Mortality
FIVE	Improve Maternal Health
SIX	Combat HIV-AIDS
SEVEN	Ensure Environmental Sustainability
EIGHT	Develop a Global Partnership for Development

Consequently, there is debate in terms of where the MTDS sits in relation to the MDG. It is argued that there is limited policy linkage between the MTDS and the MDG, especially when relating to environmental sustainability. The targets and performance indicators of the MDG are broad, have a longer time frame and are mainly concerned with social development issues. The important aspects of implementing the MDG such as preceding activities considered necessary to achieve the objectives have not been outlined in the MTDS. The MTDS is a policy framework designed to guide the governments' budget decisions while the MDG is a set of goals that United Nations member states including PNG, have pledged to meet. The UNCCD is one complimentary goal that PNG pledged to meet.

The current MTDS remains a strategic or a policy document, which serves as a guide to formulating other public sector plans and programs and strengthens its implementation, monitoring and evaluation. In general, launching the MTDS is in the right direction to promote development and support the current governments' emphasis on export-led economic growth policy. Sustainable land development should be part of any development strategy, and explicitly stated so, and not superficially employed to justify other objectives. An integrated SLM strategy for sustainable land development incorporating the 3 pillars of sustainability is paramount for PNG.

5.3 Institutional issues for SLM

The capacity of key institutions in PNG is important in getting all policies implemented. The role and responsibilities of the Department of Lands and Physical Planning (DLPP) in dealing with land matters and SLM is critical. The DLPP is currently one of the least performing government agencies in PNG. Despite the recent publication of the National Land Policy 2006, the capacity of the DLPP in dealing with land matters is relatively poor.

Institutional capacity is a major concern for all state agencies including law enforcement agencies. The ability of institutions to develop and implement suitable land development programs in PNG rests on both internal and external factors. The former include institutional capacity (manpower, skills, and attitudes) and the institutional systems (planning, implementation, monitoring, training and management). External factors include allocation of funds, approved manpower ceilings, policy decisions, regulatory powers of institutions, etc. The DLPP has problems in all these major areas of capacity.

The internal capacity of institutions in several key agencies including DLPP, DEC, DAL, Forestry, National Planning and others is clearly lacking and consequently institutional systems suffer. In PNG, capacity refers to the ability, robustness and dynamism of government agencies to fulfill their roles and responsibilities. The capacity constraints faced in PNG result from a combination of factors where it is practically impossible to deal with capacity constraints in a piece-meal way. It is imperative that the whole institutional structure and its arrangement mechanism will have to undergo some form of restructure. Bilateral agencies see the need for this critical exercise.

For example, the institutional capacity strengthening component suggested by some donors to improve the performance capacity of several key agencies such as the DLPP is a testimony of their understanding of the key role institutions can play in national development. Further, the capacity strengthening project in the DEC in the mid 1990s was also designed to build the capacity of that agency to effectively respond to its environmental responsibilities.

5.4 Good governance

Governance is a critical issue for sustainable development in general and management of land in particular. Good governance is about transparency and accountability in decision-making. Transparency and accountability leads to discipline in the workforce which reflected in positive results from development interventions. It is argued that good governance will sew the seeds for successfully implementing and achieve positive results. Good governance entails commitment, dedication and responsibility in terms of driving the transparency and accountability message through the political and bureaucratic leadership. Good governance is necessary to drive the international obligations including the UNCCD which PNG is party to on the home front. However, in PNG reports indicate that good governance is a major problem adding to the long list of capacity constrains (Nita 2006; Tameo 2004; Piest and Velasquez 2003).

Respect for the rule of law is fundamental to sustainable land management in PNG. The enactment of laws has a purpose in society, to ensure an orderly and peaceful society where transfer of land titles and land disputes are arbitrated in the court of law. Harmony and security which are the basis for development for growth can not exist in the face lawlessness. Further, the application and enforcement rather than the laws themselves are critical for social and economic sustainability. The widespread disrespect for the rule of law in PNG has proven to be a major deterrent to growth and development.

The notion and practice of ‘corruption’ has become a household concept given its systemic character in PNG. Corruption in PNG affects every sector and levels of government with crippling consequences on the institutional base of the country. The Department of Lands and Physical Planning is one of the many victims of corruption. Land titles are given at will with no proper records resulting in the State losing millions of kina. The ability of the government to both implement land policies and enforce land laws has become victim to systemic corruption at all levels. The lack of effective sanctions by the government on corruption in the DLPP is clearly undermining any effort to promote sustainable land management and development.

5.5 Enforcing legislation

Generally, land laws in PNG have relatively little significant impact. Enforcement of legislation had brought disrepute to the law and a lack of respect by the various industries including the private sector. Issues dealing with customary land ownership, titles transfer of leased land, development on land, and land compensation from potential developers are gray legal areas. Several examples exist to illustrate this point. For instance, no persons or organizations were prosecuted under the Environmental Contaminants Act 1978 and the Water Resources Act since 1982³ even when cases of land and environment pollution were recorded.

Further, even when landowners report unsustainable logging and human rights abuses caused by loggers, the National Forest Authority does relatively little to ensure sustainable logging practices are implemented and human rights abusers face the full force of the law. Enforcement is a major part of legal implementation and it is virtually weak throughout the system. It results in flagrant abuses of the law with the result that the law and the institutions which administer it are not respected or taken seriously.

There are valid reasons for this lack of enforcement. The lack of enforcement is largely due to administrative failures. One is that there is little capacity within departments to keep track of ‘recalcitrant users.’ Reciprocal behaviors and obligatory cultures within the state administrative institutions impinge upon enforcement capacity. Professional and personal security in the system is guaranteed by fulfilling obligations which in Western societies would result in severe penalties. When law dealing directly to peoples way of life are weak, it is unrealistic to expect the public service and those dealing with MEAs in general and the UNCCD in particular to have any lasting effect.

5.6 DLPP and DEC’s inter-agency linkage

The DLPP and the DEC are referenced given their central coordinating role in land and environmental and resource management issues coordinating the MEAs respectively.

³ These Acts are now amalgamated under the Environment Act 2000, which till now has not prosecuted any individuals or organizations.

Despite the wide potential role of both the DLPP and DEC, and the requirement that they both administer key pieces of land and environmental legislation respectively, the Departments' effectiveness have become limited to playing only a passive role inconsistent with the Lands Act 1996 and Environment Act 2000.

In case of the DEC, this is because activities that are supposed to be administered by the DEC under the Environment Act 2000 have been undertaken by other resource departments. The monitoring of logging projects, for example is effectively administered by the National Forest Authority. The DEC has officers responsible for over-seeing forest-related environment projects, but formal linkages with the NFA remain poorly developed.

In case of the DLPP, the Lands Act 1996 is restricted because of lack of effective coordination between other legislations administered in other Departments whose functional roles overlap. This has led to possible conflicts of interest and duplications of functions. These include the Mining Department and the Mining Act, the Gas Act 1998, Forestry Act (Amended) 1996, ILG Act 1974 and other legislations. Activities taking place on land tend to be the responsibilities of those sponsoring and monitoring those projects than that of the DLPP. The functions of the DLPP tend to be one of complying with land easements, land titles, and addressing land-related disputes on leased land. Land degradation and hence desertification are absent in the list of priorities in legislation and in the normal day to day functional responsibilities of the DLPP.

The inter-connectedness of the roles and responsibilities between different Departments dealing with natural resources requires effective inter-agency and/or inter-institutional linkages to effectively coordinate and execute their duties. Without effective linkages, the capacities of both the DLPP and DEC have severely been restricted. If inter-agency horizontal linkages remain undeveloped, the wider PNGn administrative structure can be expected to be yet less tolerant of the DLPP and DEC and their central coordinating role in land and environment monitoring.

What has been lacking in PNG is a 'systematic unified and coordinated' framework to address land issues under a sustainable development framework. A systematic and unified structure is essential to complement existing functions without duplicating the roles of, and over-burdening, single agencies in order to share and make efficient use of limited resources. The lack of integration between the DLPP and DEC and other the resource departments' (Mining, Petroleum and Gas, Forestry, Agriculture and Livestock, and Provincial Affairs) remains problematic.

An appropriate institutional system is reflected by the right mix of capacity (resources, personnel) and structure (delegation, linkages, co-ordination). Broadly, the DLPP and the DEC lacks the requisite resources to undertake their responsibilities and their implementation, monitoring and evaluation function is made yet more difficult by the fact that their management objectives appear to be seriously at odds with those of fellow Ministries. As observed elsewhere, the resource departments see their 'role as resource

developers, not as managers'. Under the current institutional arrangements it is practically difficult for any one agency to take on board both roles (Nita 2006).

5.7 Sustainable land management roadmap

This Review has emphasized the twin roles of the MTDS and the MDG in seeking a SLM and development roadmap for PNG. Sustainable land management is not an isolated issue. First, sustainable land management is embraced in the government's plan for economic recovery and social development through the medium term strategic document - MTDS. Second, while focusing on the social targets to empower people as the engine for sustainable development, the MDG outlines environmental sustainability as an 'equal' goal amongst the list of priorities under which SLM can effectively be accommodated.

Foremost, governments' commitment to support sustainable development in general and SLM in particular is imperative. The ability of the political leadership to endorse sustainable development requires realignment of resources and state agencies directly dealing with sustainable development and hence SLM. Stability within the key departments advocating and managing the MEA including the UNCCD is paramount in ensuring continuity, policy coherence and securing resources for implementing the Convention.

Second and as a cross-cutting issue, SLM does not recognize bureaucratic, administrative, cultural, legal or political boundaries. This does not imply that sustainable development in general and SLM lacks currency. The institutional framework through which sustainable development strategy, let alone SLM is designed and implemented should be made clear and transparent to all stakeholders including landowners. Core SLM 'functions including implementation, monitoring, evaluating, and coordination will transcend from decision centers to the action-fields away from the nation's capital' (Nita 2006). This requires developing and maintaining effective inter-agency linkages, partnership and collaboration.

Third, policies are implemented through effective legal and administrative structures. Enforcement capacity of law enforcing agencies and the administrative establishment should operate in complimentary ways. The administrative capacity of agencies responsible to enforce legal sanctions or to facilitate development should be properly resourced and transparent for an effective implementation. International treaties on the environment and sustainable development can be achieved through properly instituted law enforcement agencies and administrative support units.

Fourth, at the level of implementing SLM are provincial and local-level governments. There is a lack of understanding about the concept of sustainable land development at the provincial and local levels. The level of consultation regarding SLM has received relatively little government support in terms of resources. Basic education and awareness about sustainable land development and management including sustainable resource use is important to achieving the objectives SLM. The provincial and local government

systems should be integrated and linked to the national system in order for SLM to reach the masses.

CHAPTER 6

Combating Land Degradation Under UNCCD

6.1 Institutional mechanisms

Foremost, and given the significance of land in PNG, specific institutional arrangements including inter-agency networks and legal framework needs to be provided for by the government. Any framework will require specific duties, roles and responsibilities spelt out by legislation and supported by institutions and their networks to create a system responsive to land degradation in PNG. The government recognizes land as a critical resource for social, economic and environmental security. This recognition has to be translated into policies such as a SLM regime that eventually becomes institutionalized and implemented.

It is imperative for the government to support a SLM framework and a NAP that encourages land management process at all levels of human intervention. The Organic Law and Provincial and Local-Level Government (OLPLLG) provide the road through which land resources can appropriate be managed at the local level. Planning for, and management of land resources can in fact take place at district levels. Further, the passage of the District Authorities Act 2006 compliments the OLPLLG. Land is one social and economic input available to local people which if/when planned adequately, can enhance sustainable land-use. The government has the necessary mechanisms available to promote SLM and implement NAPs including all 3 major MEAs.

The MEAs remain to be effectively implemented. Lack of capacity to deliberate, strategies and implement policies relevant to meeting international agreements such as the UNCCD is one problem. Commitment problems also exist in the efforts to ensure key decision-makers enhance implementing the MEAs, let alone land degradation. It is noted that the prevailing complacent bureaucratic and political landscape is mitigated prior to dealing with SLM and NAPs. People view land degradation to be a non-issue because of the unqualified perception that there is enough land out there for everyone. Consequently, awareness about the actual and potential risks of land degradation in PNG is paramount. This is part and partial of the ‘capacity building’ objective under the UNCCD.

6.2 National programmes to combat land degradation

At the outset, the UNCCD website specially notes that states should:

“...emphasize popular participation and the creation of an “enabling environment” designed to allow local people to help themselves to reverse land degradation. ...governments must ...make politically sensitive changes,

such as decentralizing authority, improving land tenure systems, and empowering women, farmers, and pastoralists.” (UNCCD 2005).

PNG has an obligation to set into motion an action plan to fulfill some of the requirements of the UNCCD as part of its national action programme. The DEC and the UNDP are at the fore-front trying to develop country action programmes and to introduce SLM practices. A series of workshops were convened following the ratification of UNCCD in 2000 by DEC with the assistance of UNDP to seek ways of addressing land degradation in PNG. Each of the programmes is briefly described below.

6.2.1 Land databases

The risk and vulnerability of land in PNG is more apparent in the modern times than it has been in the past. The exact nature of land degradation and agents of change in given times and seasons in specific locations around PNG needs to be recorded. Information on the actual and potential land-use is either non-existent or is scattered among different government agencies and institutions, NGO’s and in the hands of some private sector interests. However, the relevant land-related databases available in PNG are the PNG Resource Information System (PNGRIS), Forest Information Management System (FIMS), and to be updated/developed PNG Land Information System (PNGLIS). Better decision-making about land can result from adequate land-based databases.

With the establishment of GIS facilities at the University of PNG, these databases can be updated and utilized by a wide range of stakeholders. Furthermore, qualified NGO’s and community-based organization are available for land-related field research. PNGRIS is currently being upgraded with funding from the European Union (EU). The soil layer of this GIS tool is being mapped into a more detail level using radar data produced by the Shuttle Radar Topography Mission (STRM) launched by NASA in the United States for this purpose in PNG.

6.2.2 National disaster initiative

For drought mitigation and preparedness the National Disaster Office, with funding from AusAid, has taken the initiative and is currently in the forefront of designing strategies and coordinating activities at community level (See Section 4.8). There is a National Policy and Legislation addressing disaster risk management in PNG. The National Executive Council (NEC) has endorsed the National Mitigation Policy but the legislation is currently under review. The National Disaster Committee is the highest authority and the decision making body on any natural disaster and disaster policy matters. In relation to improvement of water security, over \$US750,000 was allocated as water mitigation for the drought prone communities soon after the 1997/98 long droughts under joint coordination by National Department of Health and the National Disaster Office. The mitigation effort ceased to continue for three main reasons:

- a. Absence of nationally-based rural water and sanitation coordinator;
- b. Shifting of mitigation focus from drought to tsunami disaster in 1998; and

- c. Lack of recurrent budget support for disaster mitigation and the National Disaster Office.

In relations to improvement of food security, the Department of Agriculture and Livestock (DAL) has established the Food Security Policy and the National Agriculture Plan to pro-actively deal with the overall food programmes and activities as part of PNG's compliance with the UN policies to combat hunger and poverty.

6.2.3 Agriculture and food security research

On agriculture and food security research, the National Agriculture Research Institute (NARI) has embarked on drought mitigation and has so far identified certain food crops for adoption by drought prone communities as tolerant crops for cultivation. A National Agricultural Development Plan (NADP) for 2007 – 2012 has been formulated by the DAL with consultation from various stakeholders and the wider community within the agriculture sector. This is a long overdue umbrella plan, which will direct agriculture development and food security in the medium term years.

One of the production strategies of this Plan is the promotion of environmentally friendly agricultural practices and technologies that increase production and that are economically viable and are sustainable at the local level. However, the main limitation is the inability of NARI and DAL in taking the results of the researches to the affected communities. To effectively transfer the techniques on how to cultivate the identified drought tolerant crops is another limitation. This is largely due to funding constraints and lack of coordination.

6.2.4 National action plans

At the national level and in response to the recommendation of UNCCD, PNG has initiated the process of preparing its NAPs or programmes to combat land degradation and mitigate the effects of drought. One initiative was to undertake awareness campaigns at appropriate levels to identify main stakeholders, build long-term commitment, mobilize support; create consensus for action, and clearly identify key responsibilities.

The NAP is awaiting the outcome of the National Capacity Self Assessment (NCSA) programme, especially the section on stocktaking, which should end in 2006. Information for UNCCD implementation is expected from the NCSA that will provide some concrete direction for the fight against land degradation in the country.

The government has already signed the MEAs that include UNCCD. The others are sister conventions - the United Nations Convention on Biological Diversity (UNCBD) and the United Nations Framework Convention on Climate Change (UNFCCC) both on 13th June 1992. While UNCCD specifically seeks to address the issue of sustainable land management, all three Conventions address different aspects of desertification as well as the threats posed by desertification. The NCSA project is expected to synergise the UNCCD in the context of the two other MEAs to effectively deal with land degradation

and desertification.

6.3 National UNCCD-related Workshops

The First Awareness Workshop was held in Port Moresby from the 23rd – 25th of January 2002. It was convened with generous funding in cash and in kind from the UNCCD Secretariat, Japanese Embassy and DEC in collaboration with UNDP. The 3-day Workshop was well attended by about 30 participants from key agencies including NGOs.

The Workshop provided an opportunity to identify key stakeholders in implementing UNCCD in PNG. It also allowed stakeholders to discuss issues related to land degradation and drought mitigation measures which led to suggested priority actions to address the concerns raised. In addition, the participants produced a National Action Plan Framework Guide to kick-start the process of formulating a NAP to combat land degradation and mitigate the effects of drought in PNG.

6.3.1 Workshop 1 Outcome 1

The outcome of the First Workshop focused on the ‘issues of concern for PNG’ that were identified during the 3-day proceedings. The key issues ranged from land vulnerability to government policies, awareness and land ownership. Some of these issues are highlighted by the bullet-points below.

- Increasing population against limited quality agricultural land,
- Insularity and public ignorance,
- Increasing socio-economic pressures on quality and marginal land,
- Vulnerability to natural disasters and economic shock,
- Inappropriate government policies and programmes to manage land,
- Lack of access to scientific and conventional technical knowledge,
- Lack of integration of traditional knowledge and practices, and
- The complexities of land tenure.

At the same Workshop, the following national priority areas were identified in order to combat land degradation and land desertification and to mitigate the effects of drought in PNG:

- Political commitment and bureaucratic support,
- Public awareness, participation, partnership and collaboration with NGOs and donor agencies,
- Resource mobilization and collaboration with government, NGOs, CBOs and private institutions,
- Institutional capacity building comprising across all executing agencies, and
- Research, monitoring and data management including dissemination.

There was general consensus amongst Workshop participants for the need to address all the priority issues all stakeholders and led by government in order to initiative a action programme and render political and bureaucratic support. It was also agreed that ‘land’ was too important for it to be taken as just another policy matter.

6.3.2 Workshop 1 Outcome 2

Outcome 2 of this initial Workshop set out to establish a ‘PNG guide to formulate a NAP’ to implement the UNCCD, in other words a ‘framework to guide the NAP to combat land degradation. Outcome 2 represented a broad list of activities, development priorities and listed every key institution in PNG as potential stakeholders. While the intention was positive however, it fell short of identifying which agency (ies) will perform which priority-action given the limited resource constraints. Further, Outcome 2 did not specify effective coordination mechanisms, let along who was driving the UNCCD at the national, provincial and local levels. Outcome 2 would have addressed these and other key questions including first, defining UNCCD in the PNGn context, and getting it established in government as a priority issue.

Also, as part of Outcome 2 is a NEC Policy Submission on UNCCD implementation. The objectives of the NEC submission were:

- DEC begin establishing the National Steering Committee (NSC) and the subsidiary National Technical Committee (NTC) to effectively coordinate the implementation of UNCCD – especially the NAP in PNG as required by the Convention, and
- To raise awareness at national political level and having the NEC endorse the NSC and NTC. The policy submission has been distributed to relevant government agencies and NGO for comments. The DEC is now finalizing the draft for submission to NEC.

It is anticipated that the NSC comprises senior representatives from key relevant government departments, institutions, donors, and NGO’s. The DEC would be the National Focal Point with the Secretary for DEC as the Chair. The NTC will consist of individuals with expertise from relevant government agencies, academic and research institutions, NGOs, and private sector organizations. Members will comprise mainly from learning and research institutions including from the private sector. Further, a PNG UNCCD operational structure that provided the roadmap into the roles and responsibilities of everyone in the proposed hierarchy was drafted.

6.3.3 Workshop 2

The Second UNCCD Workshop was convened also in Port Moresby from 31st January to 1st February 2005. In fact, Workshop 2 was identified as the ‘First NAP Formulation Workshop’. It was again funded by the UNCCD Secretariat with support from UNDP and

DEC. Many key stakeholders representing all sectors of society attended the 2-day Workshop although exact figures and home agencies are missing from the Draft Report. Further, the Report does not state which participants and/or organizations attended the initial Workshop 3 years earlier. No progress report was presented at this meeting. Despite these observations, Workshop 2 developed a general action plan for the formulation and completion of PNG's NAP by 2005. It is reported that however, 'due to the lateness of other related and relevant programmes that are to be developed, the NAP completion and formulization time had to be extended awaiting the completion of these programmes' (DEC 2006).

6.3.4 Workshop 2 Outcome 1

The main Workshop outcome represented 'PNG's UNCCD key focal areas for action'. It identified key sectors directly influencing land-use, the major issues in those respective sectors and suggested priority areas for action by the government. For instance, the agriculture sector was one key sector identified and described. This was followed by key issues in that sector including the issue of 'an increase in cultivation of marginal land' due to population and economic pressures. As a priority action, several suggestions were made including training and awareness. Other sectors were dealt in a similar manner and this list constituted the main outcome for Workshop 2.

6.3.5 Workshop 3

Workshop 3 was held in Port Moresby from the 16th – 18th March 2005. This was identified as the "Second NAP Formulation Workshop". The Workshop participation was described to be 'excellent' (DEC 2006).

The outcome of this workshop was an elaboration of the general action plan for the formulation of the NAP that was agreed upon in the previous NAP Formulation Workshop. Workshop 2 had identified who was to be responsible for the formulation of the different components of the NAP and set the time frame for completion. Another outcome of this workshop was basic planning for the implementation of UNCCD projects.

Due to situations beyond the control of the people driving the UNCCD in PNG, the timeframe for the NAP has again lapsed. It has further been extended to cater for other relevant programmes such as the development and completion of the NCSA and the NADP 2005 – 2010. The NAP would be formalized, making use of information from the stocktaking exercises from the NCSA and be integrate in the latest NADP, hopefully by the end of 2006 when these key related programmes are completed.

6.3.6 Workshop 3 Outcome 1

The main outcome of Workshop 3 (Outcome 1) was identifying the 'key elements of the NAP and the responsibility for formulating the plan itself'. The participants were guided by *Article 9 and 10* of UNCCD which outlined the key elements of developing NAPs. The structure and contents of NAPs are entirely in the discretion of national governments.

These were presented in their Draft Report (DEC 2006). Listed in one column were the 'Key NAP Items' which included major areas of intervention in implementing the UNCCD, and in the other were those identified as the 'Key NAP Points' or what would best be described as specific activities (**Annex 2**).

6.3.7 Workshop 3 Outcome 2

Outcome 2 of Workshop 3 sought to establish in-country criteria for selecting and prioritizing UNCCD projects. In general, the participants agreed that project participation should include some of the following:

1. Relevant local landowners & communities
2. Relevant national, provincial & local-level government agencies
3. Interested NGO's and private institutions.
4. UNCCD National Technical Committee
5. UNCCD National Steering Committee
6. Donor agencies and other development partners

The project selection criteria were to be based on the 2001 book by Hanson et al from the Australian National University entitled 'PNG Rural Development Handbook.' The Workshop participants followed the Book's 'most disadvantaged' index, but without first rigorously justifying why the 'Handbook' can be used as 'the selection criteria.' For instance, a 'disadvantaged area' might not necessarily be at risk of being affected by land degradation.

6.4 National Action Plan to implement UNCCD

The significance for PNGians to understand the implications of unsustainable land-use practice is well grounded in terms of their livelihoods. The 10 percent arable land currently under cultivation cannot possibly meet the needs of the almost 6 million people if land becomes degraded. In many areas, crop production has significantly been reduced including coffee in the Highlands region. When productive capacity of land declines, and so will the total output. This is a clear demonstration of the dwindling effects of unsustainable land management practices that would otherwise maintain the productive capacity of a particular land area.

The above scenarios had provided the impetus for the PNG Government to ratify the UNCCD in 2000. The UNCCD calls for national action programmes for countries affected by desertification to implement the Convention by developing and carrying out national, sub-regional and regional action programmes. Although Africa is targeted given the severity and risk of desertification, PNG has to take pre-emptive action programmes to combat land degradation.

The Workshops conducted in Port Moresby beginning in January 2002 exemplifies the commitment to developing NAPs for PNG. The Awareness Workshop put the issue of

land degradation and desertification into perspective in the PNG context in front of key stakeholders. The resultant ‘NAP framework’ to guide the development of a NAP to combat land degradation and combat the effects of drought in PNG was a positive first step. The creation/suggestion of a National Steering Committee and a National Technical Committee were to institutionalize the UNCCD implementation effort.

Throughout the series of Workshops, participants mainly elaborated on the general action plan to formulate the NAP followed by its implementation. Although the participants discussed the roles of agencies who should participate in the implementation of the UNCCD, there was no NAP already on the ground to be implemented. The elements of the NAP and responsibilities for formulation already outlined remained to be actioned. At present, the attempt to formulate a NAP is still continuing.

6.5 UNCCD project funding source

In seeking funding for UNCCD projects, DEC has worked with UNDP to secure the funds for the projects identified at the NAP formulation workshops. DEC and UNDP with other key stakeholders have just endorsed a request for US\$25,000 from GEF for the preparation of SLM and Medium Size Projects (US\$500,000) under the LDC-SIDS portfolio for sustainable land management. Currently, a credible local Consultant has been engaged to prepare the Medium Size Project proposal by mid September 2006. As a GEF requirement for counter funding, these capacity building and mainstreaming projects, a total of over 1 million kina is expected to be available for project implementation. With valuable assistance from UNDP, counterpart funding will be sourced from national and international sources identified at the 2nd NAP Formulation workshop.

CHAPTER 7

Implications for Implementing UNCCD

7.1 *Environmental*

There will be many advantages in environmental terms for PNG when the UNCCD projects (SLM and NAP) become funded and are implemented. The Fourth Goal of the Five National Goals calls for the wise use and management of the 'environment and the natural resources' to be collectively used for the benefit of PNGians. Hence:

WE declare our **Fourth Goal** to be for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit of us all and are replenished for the benefit of future generations (Constitution of PNG 1975).

The Fourth Goal reflected the *spirit* of 'sustainable development' 12 years before the publication of the Brundtland Report (1987) in which the definition of sustainable development was publicized for the global audience (Page 43). It is a powerful demonstration that sustainable development is not entirely new to PNG. What may perhaps be new is either the definition itself or the language through which it is being communicated. In this context, SLM may indeed be not entirely new to PNG either. It is imperative that SLM must be fully integrated with what is already available to the population at the rural level in order that the environment and the resources including land are managed sustainably.

7.2 *Economic*

PNG is country rich in natural resources with a complex system of land and resource tenure. The economy is largely dependent on exports and incomes from natural resources in mining, petroleum and gas, agriculture, forestry and fisheries. Despite the generated wealth, people still lag behind in terms of GDP ratings, health and education services, poverty, resource and environmental degradation, and issues of governance.

In terms of land, it has been transformed by a combination of natural and human factors - by erosion, natural disasters, shifting cultivation, commercial agriculture, infrastructure development, and livestock farming, all of which take place on enclaves of highly productive land in PNG. Large scale unsustainable logging and the introduction of mobile sawmills which can easily be shifted around the countryside pose severe risk to land degradation.

The PNG economy, which is highly dualistic in nature can benefit from the implementation of UNCCD programmes. On one hand, the relatively high per capita GDP is associated with export earnings generated from the renewable cash crop resource

sector. This is compliment with formal income generated by the 10 percent of the population engaged in the formal sector. On the other hand, the majority with no formal income live off their land. Unsustainable land-use practices will definitely degrade the quality of land and the economy will be affected through (a) too much stress put on the economy to support a growing, mobile, unemployed, and consumer-oriented population, and (b) economic output from degraded land will be relatively small for it to make an impact on the overall growth of the national economy. The principle objective of the UNCCD in-country programmes will be to ensure that productivity levels of land is high and sustained indefinitely.

7.3 Institutional

The fact that the UNCCD is signed by PNG, and is housed in the DEC as the institutional focal point for UNCCD is encouraging. The government committed its resources to supporting the 3 MEAs, especially the UNCCD when it signed the Convention. The institutional system, led by the DEC will drive the in-country UNCCD programmes and it is evident that the process has already begun. The series of UNCCD Workshops highlighted in this report is a testimony to the institutional support rendered by the government to achieve the purpose of the UNCCD.

Despite capacity constraints, the UNCCD programmes will have to be articulated and implemented. The capacity constraint argument should not be used to stall any UNCCD-sponsored projects. With the leadership provided by DEC and supported by other departments, NGOs and donor partners, the need for creating new parallel agencies is indeed unnecessary. In the longer term, UNCCD programmes will have to be integrated and streamlined with mainstream activities of line agencies. It is therefore imperative that the DEC introduce the UNCCD programmes without any further delay. Indeed, there are no extra financial implications for the government because existing institutional mechanisms are employed to implement components of the UNCCD.

7.4 Constitutional

There will be no negative constitutional implications. In fact, the UNCCD compliments the Constitution by its projected activities which will go along towards contributing to achieving some of the Goals of the Constitution. The Fourth Goal (7.1 above) is one example. Further, from the UNCCD Principles, *Article 3 (a)* covers the First and Second of the National Goals. Hence *Article 3 (a)* states:

“...the Parties should ensure that decisions on design and implementation of programmes to combat desertification and/or mitigate the effects of drought are taken with the participation of populations and local communities and that an enabling environment is created at higher levels to facilitate action at national and local levels.”

The First and Second Goal of the Constitution relate to ‘providing opportunities for every citizen to be dynamically involved in the development process, and in having an equal opportunity to participate in, and benefit from, the fruits of the development of our country’. The 5 Goals and *Article 3* of UNCCD are complimentary insofar as land is concerned in PNG. Every PNGian is a landowner and therefore a potential resource owner. If opportunities are provided to all citizens, and given the fact that they are great transformers and adapters, positive results will emerge in the long term. The UNCCD provides that opportunity to be dynamically involved in protecting the land and resources for sustainable rural livelihoods.

7.5 Sustainable development policy

There is no overarching long term framework for sustainable development in PNG. The absence of a sustainable development framework or a national sustainable development strategy (NSDS) renders it difficult to integrate all sectoral policies with a sustainability flavor into a single framework. In the presence of a NSDS, a SLM strategy could be linked into the long term framework for both the short, medium and long term. Despite this shortfall, the two medium term national strategic documents which incorporate elements of sustainability are the MTDS and the MDG.

While the MTDS drives the government’s social and economic agenda for the short term, the MDG targets certain aspects of sustainable development with indicators that measure progress towards certain targets in specified time periods, ie. 2015 and/or 2020. In terms of combating land degradation, the UNCCD and its programmes sit at the heart of both the MTDS and the MDG. Improving land degradation is about improving rural livelihoods in PNG and both these strategic policy documents are aimed at improving the overall lifestyle of ordinary PNGians. In this sense, the UNCCD and its projected action programmes are complimentary to the MTDS and the MDG.

CHAPTER 8

Conclusion

PNG is at the cross-roads of development in the 21st Century. The livelihoods of the majority of PNGians depend on agricultural practices that are sustainable in nature. The UNCCD provides a framework through which sustainable land management can be applied to sustain the output levels to meet human needs. This is practically achievable in PNG given the robustness, adoptability and dynamism of people in rural areas. Productive land is in fact limited and bringing under cultivation many hectares of marginal land poses both environmental and agricultural risks which have both direct and indirect impact on the economy. At this juncture, it is understandingly clear to advocate and implement SLM practices and a NAP to achieve it.

The UNCCD states that any regional and national programmes to combat land degradation must adopt a democratic, bottom-up approach. The SLM framework and NAP should emphasize popular participation and the creation of an "enabling environment" designed to allow local people to help themselves to reverse land degradation. PNG's land ownership regimes has put more pressure on state agencies to create policies which state agencies will eventually implement in consultation with, and participation of customary landowners.

The NLDTF completed its recommendations which are now before the NEC at the time of drafting this report. The NLDTF in its recommendations sought to free up customary land for economic development. The NLDTF was directed by narrow terms of reference which emphasized only on the need for economic development, very much like the government's own MTDS 2005-2010. The NLDTF did not deliberate on the overarching issue of land degradation and a SLM *process*. Further, the NLDTF failed to make recommendations to protect the environment when certain land becomes available for development. Further, the NLDTF failed to suggest how the grassroots will participate in the economic development of their land, apart from the implications that landowners will become mere rent collectors.

The PNG government, having acknowledged the socio-economic and environmental benefits of protecting land and as a means to combat desertification and land degradation and to mitigate against the effects of drought ratified the UNCCD. The ratification was indeed in the right direction towards protecting land - the only source of wealth for over 80 percent of PNGians. There is more to be done in PNG following the ratification of the UNCCD. Several important considerations are highlighted in order for PNG to achieve sound SLM in line with the spirit of the UNCCD.

First, an appropriate institutional network has to be created to perform the twin functions of (a) implementing aspects the UNCCD including coordination, evaluation, monitoring and reporting, and (b) undertake massive awareness campaign so that people including

politicians, bureaucrats, NGOs, students, women and youth, and the landowners are aware of the risks of land degradation and desertification.

Second, the Central Agencies Coordinating Committee (CACC)⁴ should play a central role in aligning support and resources amongst horizontal, line agencies and well and vertical, sub-national entities. The DLPP, DAL, Forestry, DEC and the National Planning should coordinate activities to combat land degradation by way of endorsing a SLM process and the NAP. The CACC should ensure that bottom-up management strategies are initiated through the national SLM/NAP initiative.

Third, the role of SLM through the UNCCD should first and foremost be the joint effort of all key stakeholders, but more so the landowners. And, so long as land remains under community/traditional ownership, every effort is required to give the responsibility for managing land sustainably to those who rightfully own land. The line agencies only coordinate, evaluate, encourage, facilitate and report on the SLM activities. That is what the UNCCD is all about, and the PNG context requires that landowners be engaged in all phases of any effort to introduce SLM practices.

⁴ The CACC is made up of all Heads of Departments and Agencies and is chaired by the Chief Secretary.

Annex 1: Land-use Potential and Limitations in Provinces

No	Province	Land Potential	Common Limitations	Agriculture potential	Land Status/ land management practice
1	Western	Low-moderate	<ul style="list-style-type: none"> • high/low rainfall • poor soil • frequent inundation • flooding/drought 	<ul style="list-style-type: none"> - fibre crops (Acacia) - subsistence staples⁵ - research required to determine crop potential 	<ul style="list-style-type: none"> - crop rotation, mulching, drainages, composting, fallow, crop selection - soil erosion, sedimentation
2	Gulf	Low –very low	<ul style="list-style-type: none"> • high/low rainfall • long dry seasons • poor soils • seasonal flooding 	<ul style="list-style-type: none"> - small cash crop - betel nut - subsistence crops 	<ul style="list-style-type: none"> - no rotation, mulching, nil drainages, no composting, fallow, crop selection for specific areas/seasons,
3	Central	Varies from very high (Sogeri) to very low (Port Moresby)	<ul style="list-style-type: none"> • poor soil , steep slopes • low rainfall • seasonal inundation • low temperatures/frost 	<ul style="list-style-type: none"> - fresh food/vegetables - betel nut - subsistence crops 	<ul style="list-style-type: none"> - mixed cropping, selective rotation, fallows - soil erosion, invasion by plants, weeds, grass
4	Milne Bay	Moderate-High	<ul style="list-style-type: none"> • generally, climate ideal for crop production • steep slopes/poor soil in some parts • long dry seasons/poor soils 	<ul style="list-style-type: none"> - oil palm, cocoa, copra - fresh foods - betel nut - subsistence crops 	<ul style="list-style-type: none"> - mixed cropping, selective rotation, fallows - soil erosion, invasion by plants, weeds, grass; varying temperatures
5	Oro	Very high-very low	<ul style="list-style-type: none"> • generally, volcanic ash good for crops • steep slope • high rainfall/flooding • excess cloud cover 	<ul style="list-style-type: none"> - oil palm, cocoa, fresh food - small holder cash crop - subsistence crops - betel nut 	<ul style="list-style-type: none"> - mixed cropping, selective rotation, fallows, - soil erosion, invasion by plants, weeds, grass, varying temperatures
6	Southern Highlands	Varies from very high -very low in some parts	<ul style="list-style-type: none"> • steep slopes/poor soil • high rainfall/flooding • low temperatures • frost/frequent cloud cover 	<ul style="list-style-type: none"> - coffee, small holder cash crop - subsistence crops/kaukau - research need to identify potential 	<ul style="list-style-type: none"> - frequent soil erosion, invasion by exotic plants/weeds - peanut/crop rotation, tillage, drainage, small mounds
7	Enga	Generally, moderate-low	<ul style="list-style-type: none"> • steep slopes, poor soils • low temperature • frost • frequent soil cover 	<ul style="list-style-type: none"> - coffee, pyrethrum - fresh produce/ and vegetables - subsistence produce 	<ul style="list-style-type: none"> - frequent soil erosion, degraded land, invasion by exotic plants/weed/grass -crop rotation, tillage, drainage, small mounds
8	Western Highlands	Moderate-very high	<ul style="list-style-type: none"> • generally moderate - nil • steep slopes • frosts/cloud cover 	<ul style="list-style-type: none"> - coffee, tea, fresh food, cash crops - has very high potential for other introduced cash crop - livestock – cattle, sheep, goat, piggery, others 	<ul style="list-style-type: none"> - frequent soil erosion, invasion by exotic plants/weeds, - peanut/crop rotation, tillage, drainage, small mounds
9	Simbu	High (Kerowagi) – very low in most other parts	<ul style="list-style-type: none"> • poor soil, high rainfalls, cloud covers • steep slopes, 	<ul style="list-style-type: none"> - coffee, cardamom - subsistence crops, small holder cash crop 	<ul style="list-style-type: none"> - extensive soil erosion , soil fertility decline, high population density - mounding, tillage, bedding

⁵ Subsistence staples = kaukau, taro, yam, cassava, corn, banana, sago and coconut in swampy and coastal regions respectively

Cont...

10	Eastern Highlands	Varies from moderate-very high	<ul style="list-style-type: none"> steep slopes, poor soil frequent cloud cover high rainfall, low temperatures long dry seasons 	<ul style="list-style-type: none"> coffee, fresh food, kaukau, subsistence, cash crops small holder commercial crops 	<ul style="list-style-type: none"> frequent soil erosion, land degradation, invasion by exotic plants/weeds peanut/crop rotation, tillage, drainage, small mounds
11	Morobe	Varies from moderate to low	<ul style="list-style-type: none"> long dry spells, drought steep slopes, poor/shallow soil inundation in flood plains low temperatures/cloud covers 	<ul style="list-style-type: none"> coffee, copra, cocoa fresh foods, rubber small holder cash crops subsistence crops livestock – cattle, poultry, piggery 	<ul style="list-style-type: none"> frequent erosion, degraded lands, invasion by exotic plant, grass, weed, excess water, temperatures vary crop rotation, add artificial fertilizer
12	Madang	Varies from high (Karkar) to very low	<ul style="list-style-type: none"> steep slopes high rainfall/seasonal flooding low temperatures long dry spells 	<ul style="list-style-type: none"> mixed staple gardens sugar, cocoa betel nut, subsistence crops (taro, yam, banana, kaukau, corn) 	<ul style="list-style-type: none"> frequent erosion, degraded lands, invasion by exotic plant, grass, weed, excess water, temperatures vary crop rotation, add artificial fertilizer
13	East Sepik	Varies from high-very low	<ul style="list-style-type: none"> steep slopes, poor soils flooding, seasonal inundation, high rainfall poor drainage 	<ul style="list-style-type: none"> subsistence crops (sago, banana, taro, yam, coconut) robusta coffee, coca, vanilla fresh produce 	<ul style="list-style-type: none"> soil retention barriers, drainage, mounding soil erosion, water logging, siltation
14	West Sepik	Varies from high-very low	<ul style="list-style-type: none"> steep slopes, frequent cloud cover high rainfall, poor soil frequent inundation 	<ul style="list-style-type: none"> subsistence staples, vanilla, small holder cocoa, betel nut fresh foods 	<ul style="list-style-type: none"> soil retention barriers, drainage, mounding, inter-cropping soil erosion, water logging,
15	Manus	Varies from high - low	<ul style="list-style-type: none"> high rainfalls poor soil, steep slopes 	<ul style="list-style-type: none"> subsistence and mixed staples limited fresh foods 	<ul style="list-style-type: none"> fertility decline, soil erosion, siltation, inter-cropping, crop rotation
16	New Ireland	High - moderate	<ul style="list-style-type: none"> steep slopes, poor soil frequent cloud cover high rainfall 	<ul style="list-style-type: none"> subsistence staples, small holder cash crops cocoa, copra, fresh foods 	<ul style="list-style-type: none"> high quality volcanic soil, with high potential capacity tillage, crop rotation, legume rotation
17	East New Britain	Very high-moderate	<ul style="list-style-type: none"> poor soil, high rainfall steep slopes, cloud cover 	<ul style="list-style-type: none"> cocoa, copra, rubber, oil palm mixed staple gardens 	<ul style="list-style-type: none"> high quality volcanic soil, with high potential capacity tillage, crop rotation, legume rotation
18	West New Britain	Very high-moderate	<ul style="list-style-type: none"> poor soil, high rainfall steep slopes, cloud cover 	<ul style="list-style-type: none"> cocoa, copra, rubber, oil palm mixed staple gardens 	<ul style="list-style-type: none"> high quality volcanic soil, with high potential capacity tillage, crop rotation, legume rotation
19	North Solomons	Very high-moderate	<ul style="list-style-type: none"> high rainfall, steep slopes, poor soil frequent cloud cover, frequent inundation 	<ul style="list-style-type: none"> cocoa, copra, fresh foods, small holder cash crops 	<ul style="list-style-type: none"> mulching, mounding, crop rotation face soil erosion, invasion by exotic weeds, plants, grass

Annex 2: Workshop 3 Outcome 1

No	Key NAP Items	Key NAP Points
1	Policy orientation and convergence	<ul style="list-style-type: none"> i. Assessment of past and present relevant laws, policy measures and programmes ii. Linkages of UNCCD with existing sector specific policies (national development strategies, forestry, biodiversity, climate change, poverty reduction strategy paper,)
2	2. Institutional Arrangement	<ul style="list-style-type: none"> i. UNCCD focal point status ii. National Coordinating Body iii. Inventory of Relevant Institutions, Government, NGO, and private sector. iv. Inter-agency collaboration and partnership
3	3. Fiscal support	<ul style="list-style-type: none"> i. Budgetary management and support ii. Environment Fund iii. Incentive/disincentive measures iv. Public-private partnership funding
4	4. Preventative, mitigating, and rehabilitating measures against desertification/land degradation and drought.	<ul style="list-style-type: none"> i. Monitoring and assessment on land degradation and land use ii. Sustainable agriculture and livestock land use and practices iii. Sustainable forestry practices iv. Sustainable mining practices v. Water resources and watershed management vi. Early warning systems vii. Capacity building
5	5. Scientific and technical cooperation	<ul style="list-style-type: none"> i. Academic and scientific networks ii. The network of research institutes iii. Technology, knowledge and know-how sharing iv. Linkages with UNCCD roster of experts and inventory of institutes
6	6. Partnership building and resource mobilization.	<ul style="list-style-type: none"> i. Public-private partnership building ii. NGO and CBOs network and involvement iii. Collaboration with donor countries/agencies
7	7. Reviewing mechanisms for the NAP implementation.	<ul style="list-style-type: none"> i. Review mechanism ii. Linkages with benchmarks and indicators iii. Timeframe iv. Follow-up actions
8	8. Indicative list of concrete field projects, programmes and pilot initiatives.	<ul style="list-style-type: none"> i. Title of proposed project ii. Objectives and outlines iii. Implementation mechanism iv. Cost plan and implementation timeframe

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