


# AUSTRALIAN NATIONAL DATA SERVICE NCRIS AND ARDC EIF

2009-2014  
FINAL REPORT

ANDS PROJECT PARTNERS





ANDS has been working with institutions to grow their data capability and to transform the value of research data, enabling researchers to discover, relocate and share their data and cite it as a genuine research output...

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DR RON SANDLAND AM FTSE CHAIR  
ANDS STEERING COMMITTEE

# Foreword

It has been a great privilege to act as the independent chair of the ANDS Steering Committee. As a committee, we have been deeply engaged in the evolution of ANDS and I'm sure we all take great pride in what has been achieved by ANDS' committed and passionate people and their partners and collaborators in research institutions around Australia and overseas.

The focus of ANDS has been working with institutions to grow their data capability and to transform the value of research data, enabling researchers to discover, relocate and share their data and cite it as a genuine research output. The projects ANDS has conducted have provided the wherewithal and the necessary culture change to enable all of this to occur.

Data has become the currency of research collaboration with the increasing availability of instruments able to collect very large data sets, often in complex forms such as video and image. Furthermore, international research collaboration has never been more important and the environment ANDS has created in the projects described in this report has positioned Australia's researchers and institutions to play a leading part in this research revolution.

This national capability has been recognised internationally; ANDS was called upon to play a leading part in the founding of the global Research Data Alliance. Much of this journey is described in this Final Report and on behalf of the Steering Committee I commend it to you. The importance of the journey ANDS has undertaken as a result of the enlightened national investments made in the EIF and NCRIS projects described here cannot be overstated. I'm delighted to say that it is a journey that continues apace under new national investments.

**DR RON SANDLAND AM FTSE CHAIR**  
ANDS STEERING COMMITTEE

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# Executive Summary

Data is crucial to most research, and, increasingly, research is data-intensive. New discoveries are being made by looking for data patterns from colliders and telescopes. A huge number of researchers have shared genetic data in an unprecedented way to map the human genome, leading to breakthroughs that are affecting all of our lives. The effective use, reuse, and sharing of research data is rapidly becoming the key to many fields of research, and Australia is now extremely well placed to reap the rewards of excellent research data and research data infrastructure.

These research data and data infrastructures are being put in place through the investments made by the Australian Government. As a result, Australian researchers increasingly have access to excellent research data, institutional infrastructure to help them manage that data, national infrastructure to help them publish, store, discover, and use this data, and an influence on international data standards through the Research Data Alliance.

This improved research data infrastructure provides benefits across the whole research system:

- Researchers have access to the best data and the best partners to conduct the best research
- Data creators and collectors can create more valuable data
- Research institutions more effectively leverage their research data assets
- Research funders enjoy a greater return on investment from well managed and reused data

As a result, **Australia has well organised data assets that enable its big challenges to be addressed more effectively.**

Over the last 5 years ANDS has worked across the whole sector in partnership with major research organisations and NCRIS facilities. Significant progress has been made in enabling improved data management, connectivity, discoverability, and usability by:

- Establishing the Australian Research Data Commons, a network of shared data resources
- Populating the Australian Research Data Commons with 100,000 research data collections
- Dramatically improving institutional research data management capacity
- Helping to establish institutional research data infrastructure
- Co-leading the establishment of the Research Data Alliance, improving international data exchange

This has meant that Australian researchers, research institutions and the nation are at the forefront of the opportunities inherent in global research data intensive activity.

Thanks to the work of the Australian National Data Service (ANDS), researchers are well equipped to respond positively to new funding application guidelines.

PROFESSOR IAN CHUBB AC  
CHIEF SCIENTIST



# Introduction

ANDS helps make data more valuable for Australian researchers, research institutions, and the nation. ANDS does this by improving data collection, management, connectivity, discoverability and reuse. It provides pan-sectoral infrastructure, services, harmonisation and partnerships that increase the efficiency and coherence of Australia's research data infrastructure.

Over the last 5 years ANDS has made significant progress in enabling improved data management, connectivity, discoverability, and usability. It has done this by:

- Establishing the Australian Research Data Commons (ARDC)
- Populating the ARDC with 100,000 research data collections
- Dramatically improving institutional research data management capacity
- Helping to establish institutional research data infrastructure
- Co-leading the establishment of the Research Data Alliance, improving international data exchange

Australia makes a very significant annual investment in the creation and capture of research data, estimated to be more than \$!B, and thus great returns on this investment are available if that data can be used more effectively and more often.

The benefits of enhancing Australia's research data are that:

- Researchers will have access to the best data and the best partners internationally to conduct the best research
- Data creators can work more efficiently by drawing on and contributing to improved data

management environments which support the use of data for wider and more significant problems

- Research institutions can more effectively leverage their research data assets to improve research partnerships and citations, leading to improved institutional reputation, rankings, and enrolments
- Research funders will enjoy a greater return on investment from well managed data, reducing data duplication, and increasing research reliability, as well as enabling the use of data for wider and more significant problems
- Government can enable more powerful analysis of the nation's most important problems, and deliver benefits beyond the research system to public policy, industry engagement and public participation

This report describes the situation leading to the establishment of ANDS, its history, the activities that ANDS undertook, the results of these activities and the consequent outcomes. Next, it reflects on future of research data in Australia. Finally it provides the appropriate financial and activity reporting.

# Project History

The amount of activity dealing with the importance of data to research has increased perceptibly over the last five years. This includes conferences specifically focused on research data issues (Research Data Alliance<sup>1</sup>, International Digital Curation Centre<sup>2</sup>, EUDAT<sup>3</sup>), data-focused tracks at discipline conferences (too many to cite), national reports (Riding the Wave<sup>4</sup>, A Surfboard for Riding the Wave<sup>5</sup>), funder requirements (NSF<sup>6</sup>, NIH<sup>7</sup>, Wellcome<sup>8</sup>, Horizon 2020<sup>9</sup>, Australian Research Commission<sup>10</sup>), special issues of journals (Nature<sup>11</sup>, Science<sup>12</sup>), and new journals altogether.

As the National Collaborative Research Infrastructure Strategy was being formulated, recognition of the importance of data, and the need for data infrastructure, was becoming clearer. The Australian National Data Service originated as part of the Platforms for Collaboration (PfC) capability in the context of the National Collaborative Research Infrastructure Strategy. In 2007, during

the course of the PfC facilitation process, a working group produced *Towards the Australian Data Commons: A proposal for an Australian National Data Service*<sup>1</sup>. In 2008 Monash as the lead agency worked with ANU and CSIRO on a project to establish the Australian National Data Service (ANDS). ANDS commenced officially in January 1 2009.

In the May 2009 budget, the Commonwealth government announced a series of initiatives collectively labelled as Super Science. The Australian Research Data Commons (ARDC) project was announced under the Super Science program and funded from the Education Investment Fund. The ANDS team created a project plan for the ARDC project that was complementary to the NCRIS-funded activities.

The ANDS Steering Committee decided in mid 2009 to recommend to the then Department of Innovation, Industry, Science and Research (DIISR) that ANDS manage the NCRIS-funded and EIF-funded

activities as an integrated project – this approach was approved and enacted. The ANDS Management team also decided to reshape the portfolio of ANDS programs to better reflect the implications of, and constraints on, the added funding. In the period July 2009 to March 2010. ANDS consulted widely on these changed plans, and after some fine-tuning to respond to consultation feedback, commenced executing against them.

ANDS has received subsequent funding, but this report concentrates on describing the outputs and outcomes of the NCRIS and EIF funding alone. Figure 1 shows the funding allocations by year and their allocations across ANDS' programs.

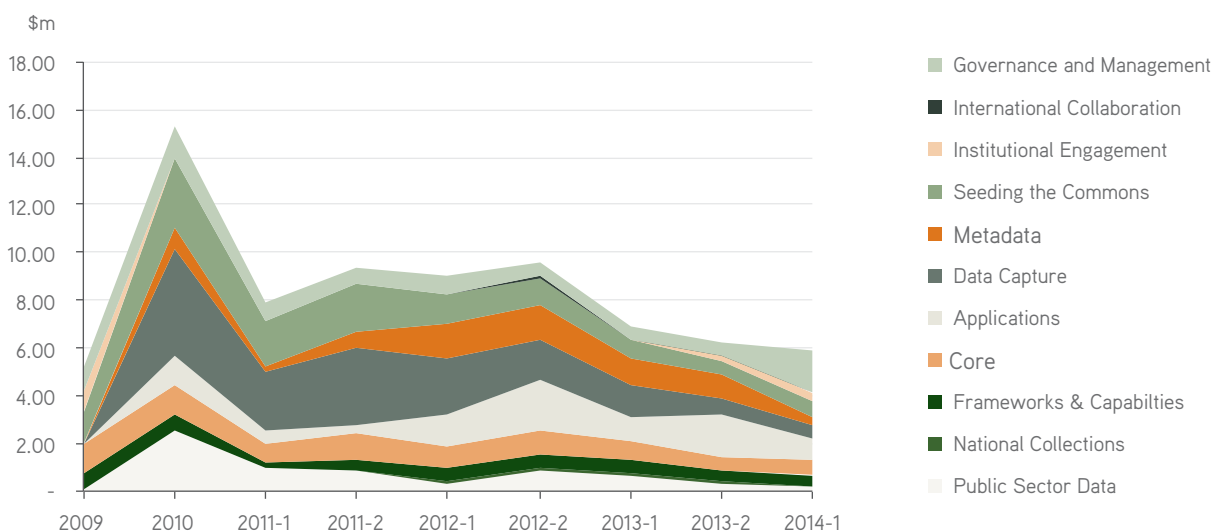


Figure 1: ANDS funding by year

1. <http://ands.org.au/towardstheaustraliandatacommons.pdf>

# National Research Data Infrastructure in 2009

By the time of the commencement of ANDS, the need for national research data infrastructure had been identified, but only limited elements of the technical components and some of the organisational components were in place. Any national research data infrastructure has to complement and enhance disciplinary and institutional research data infrastructure. However the availability of these components was patchy. Some disciplines had needed data infrastructure for some time. Astronomers understood that the very costly data capture devices – telescopes – were of more value if the data was treated uniformly. Time on the Hubble telescope required data to be deposited with the Space Science Telescope Institute, and this had already led to substantial reuse of that data. In other disciplines, there was a strong sense of personal ownership of data, often hard won, and carefully protected for individual reuse.

Research institutions largely saw research data as a researcher responsibility, rather than an institutional responsibility. The Australian Code for the Responsible Conduct of Research, developed by the National Health and Medical Research Council (NH&MRC), the Australian Research Council (ARC) and Universities Australia, and published in 2007, required appropriate data management, but this area of the code is more an aspirational statement than something routinely practiced.

The report “*Towards the Australian Data Commons: A proposal for an Australian National Data Service*”, not surprisingly envisaged a data commons that made it easy for researchers to share and reuse data. It was clear that along with technical infrastructure, there was a need to build institutional capacity to support institutional research data infrastructure, as well as provide data tools that supported researchers and research groups. It was agreed to be important that the data commons enabled many data collections to be findable and usable.

At the time of the submission of the 2009-10 Business Plan, ANDS had four programs of activity:

- *Developing Frameworks* – the frameworks that will enable research data producing institutions to capture, manage and share research data
- *Providing Utilities* – services that reduce the cost of capture and ease the task of discovery
- *Seeding the Commons* – improving local data capture and populating the data commons
- *Building Capabilities* – improving Australia’s capability to manage its research data

As a result of the ARDC project, the NCRIS ANDS project consolidated to two programs of activity:

- *Frameworks and Capabilities* – the frameworks that will enable research data producing institutions to capture, manage and share research data; and improving Australia’s capability to manage its research data
- *Seeding the Commons* – improving local data capture and populating the data commons

The associated EIF-funded ARDC project added five co-ordinated programs of activity:

1. *Data Capture* – an institutionally based program to automate the capture of data and metadata from instruments (broadly defined) in data intensive research
2. *Public Sector Data* – a program of making more public data collections visible and available through the ARDC
3. *Metadata Stores* – an institutionally based program that enables metadata to be stored coherently across an institution that supports data management, publishing, sharing and reuse
4. *ARDC Core Infrastructure* – an ANDS driven program that puts in place the national services that enable research data to be published and discovered (It is an expansion of the Providing Utilities program)
5. *ARDC Applications* – a program that develops tools and services to support demonstrations of the value of exploiting data in the ARDC



This just would not have happened without ANDS, not at all. It was \$75,000 that has probably had \$1,000,000 worth of impact on the University

BETH CRAWTER, COORDINATOR  
INFORMATION AND RESEARCH SERVICES  
SUNSHINE COAST UNIVERSITY

These programs were complemented and supported by the two NCRIS programs, *Seeding the Commons and Frameworks and Capabilities* as shown in Figure 1.

Taken together, the intent of the two investments was to:

- Create an "essential meeting place where the Australian path forward for research data management can evolve and where a vision can be achieved." – from *Towards the Australian Data Commons* (TADC)
- Enable the following capability: "Research data and research outputs from all sources can be discovered and reused across disciplines and over time through an integration of repositories and data centres supporting national and specialist discovery services." – TADC
- Create and populate the Australian Research Data Commons which "will support the discovery of, and access to, research data held in Australian universities, publicly funded research agencies and government organisations for the use of research." – ARDC Investment plan

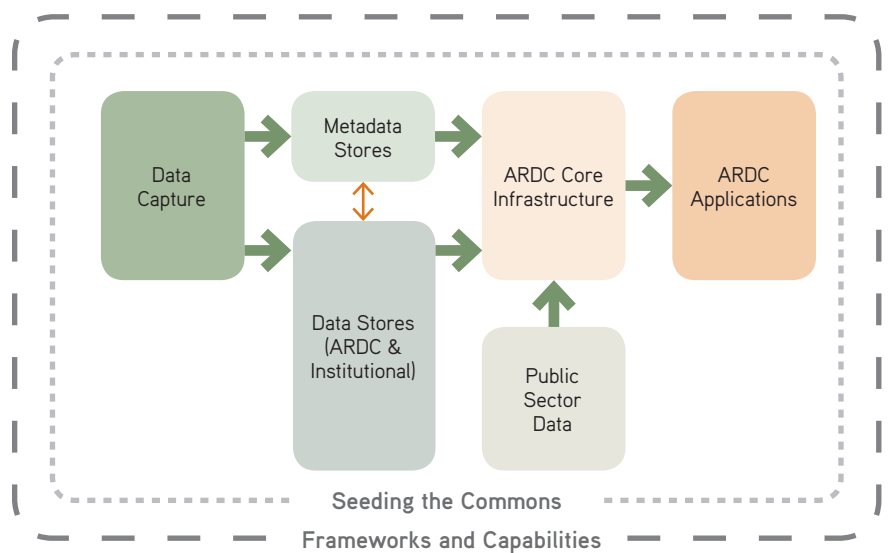


Figure 2: Australian Research Data Commons

# Transforming Australia's Research Data Infrastructure

By the end of the two projects, the aims of the projects had been achieved. The Australian Research Data Commons had been established.

The ARDC is a combination of the set of shareable Australian research collections, the descriptions of those collections, including the information required to support their reuse, the relationships between the various elements involved (the data, the researchers who produced it, the instruments that collected it and the institutions where they work), and the infrastructure needed to enable, populate and support the commons. ANDS does not hold the actual data, but points where the data can be accessed. The ARDC can be envisaged below, where ANDS investments contributed to the green pipes and boxes.

As a result of the NCRIS and EIF projects Australian researchers at all major research institutions in a wide range of disciplines across Australia's research institutions are now able to:

- Capture data, with rich metadata
- Automatically store it
- Simultaneously publish through a discipline portal and Research Data Australia
- Integrate that data with other data discovered through a portal
- Publish both the results and the data of their investigations in the ARDC

ANDS has established and operates some central infrastructure elements as a hub for the ARDC:

- A national data discovery infrastructure to provide a pan-sectoral overview of Australia's research data assets as well as a syndication point for global discovery
- A national data registration and identification service to provide global unambiguous tracking and interoperability of Australian research data
- A national data definitions catalog and register to facilitate data integration by promoting use of standard scientific concepts across the data commons

The ARDC is now well populated with a broad initial set of collections. At the conclusion of these projects, there were over 99,000 collections from all major research institutions, from major public sector suppliers of data used by researchers, including cultural institutions, and from data intensive NCRIS capabilities. The data collections cover all fields of research. The data collections are connected to over 25,000 researchers, groups and institutions.

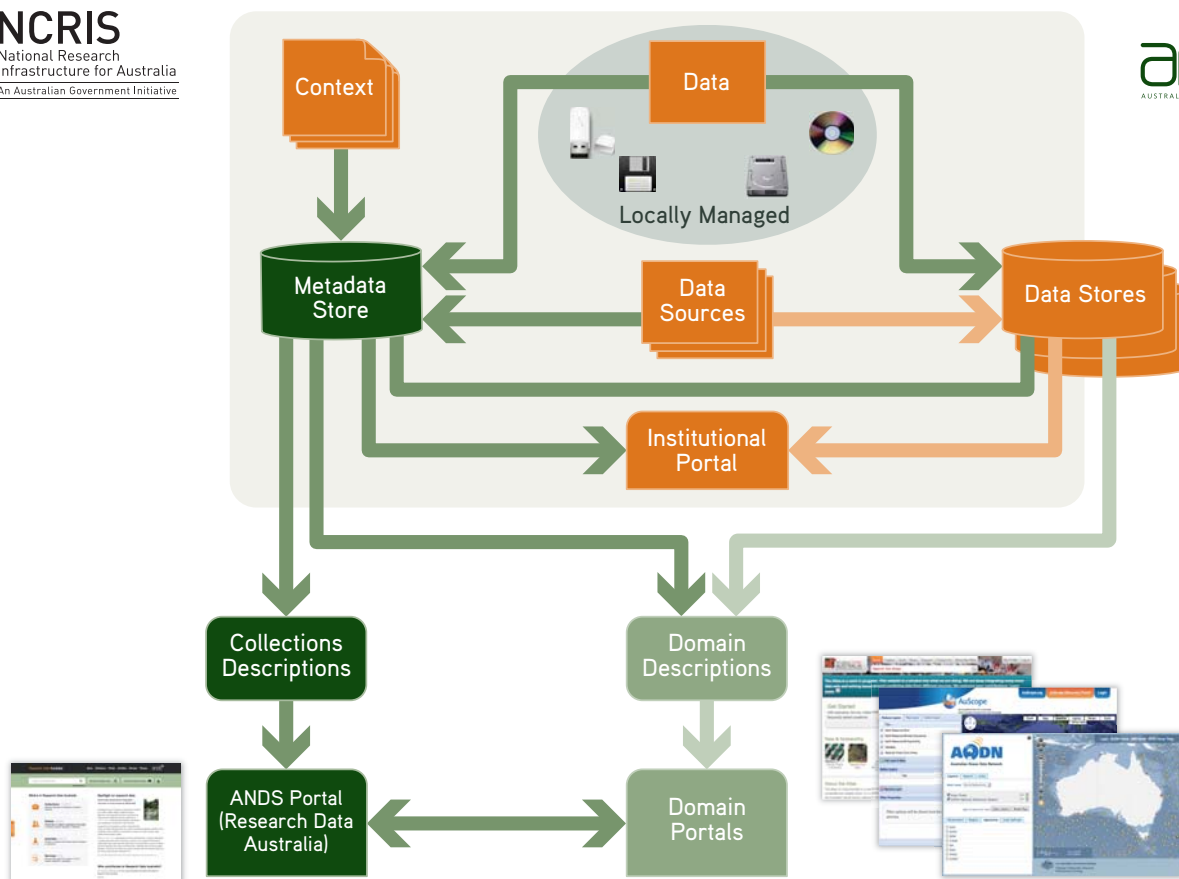


Figure 3: Australian Research Data Commons

However some other significant changes have also occurred.

- Australia is now internationally positioned as a leading partner in research data and research data infrastructure
- Australia’s research institutions have established substantial research data capability
- Australia’s research data policy has been strengthened in line with its international partners
- Australia’s researchers are able to publish, discover, reuse and be recognized for their research data with improved citation services
- Australia’s research data resources have been substantially improved

The transformation of the sector has led to Australia's researchers having a substantially improved ability to exploit Australia's research data assets for the benefit of the country. For example:

## CSIRO – Data archive charts the frontiers of space

Information gathered over many years using CSIRO's Parkes Radio Telescope—also now known as "the Dish"—is being used as a major resource in the international search for gravitational waves.

This is one of the more unexpected outcomes of the construction of the Parkes Observatory Pulsar Data Archive. This project fulfilled a CSIRO commitment to the world's astronomers—to make data from the Parkes telescope available publicly within 18 months of observation.

"The data archive, which is fully automated and was established with financial support from the Australian National Data Service (ANDS), ensures that important information is not lost," CSIRO pulsar researcher Dr George



Hobbs says. It also has freed CSIRO astronomers from the time consuming task of satisfying requests for the Parkes data from all over the world.

Those requests come flooding in because Parkes is where the bulk of all known pulsating neutron stars or pulsars have been discovered. As well as being interesting astronomical objects, these collapsed neutron stars are used as natural stopwatches for timing astronomical events.

Pulsars are highly magnetic and rotate rapidly emitting radio waves in specific directions which sweep through space like lighthouse beams. From Earth, therefore, they appear to pulse in an extremely regular manner. About two-thirds of all known pulsars have been detected by the Parkes telescope.

In late June 2012, a conference on the International Pulsar Timing Array project was held in Sydney. This project aims to show the existence, or otherwise, of the

gravitational waves proposed by Einstein as part of his theory of general relativity. The idea is that such waves passing through Earth should actually move it slightly, enough to be detected through tiny fluctuations in the pulsar timing.

In addition, astronomers from Peking University, who are using the Parkes data archive as a training tool for radio telescope data analysis, have published several papers which include descriptions of pulsars and other astronomical bodies they have newly discovered.

The archive project has been so successful that the CSIRO intends to use a similar infrastructure to capture and make publicly available the information gathered by its new marine research vessel, the RV Investigator.

The archive is accessible through both Research Data Australia (the national data portal) and CSIRO's Data Access Portal.

# AURIN – Planning liveable suburbs

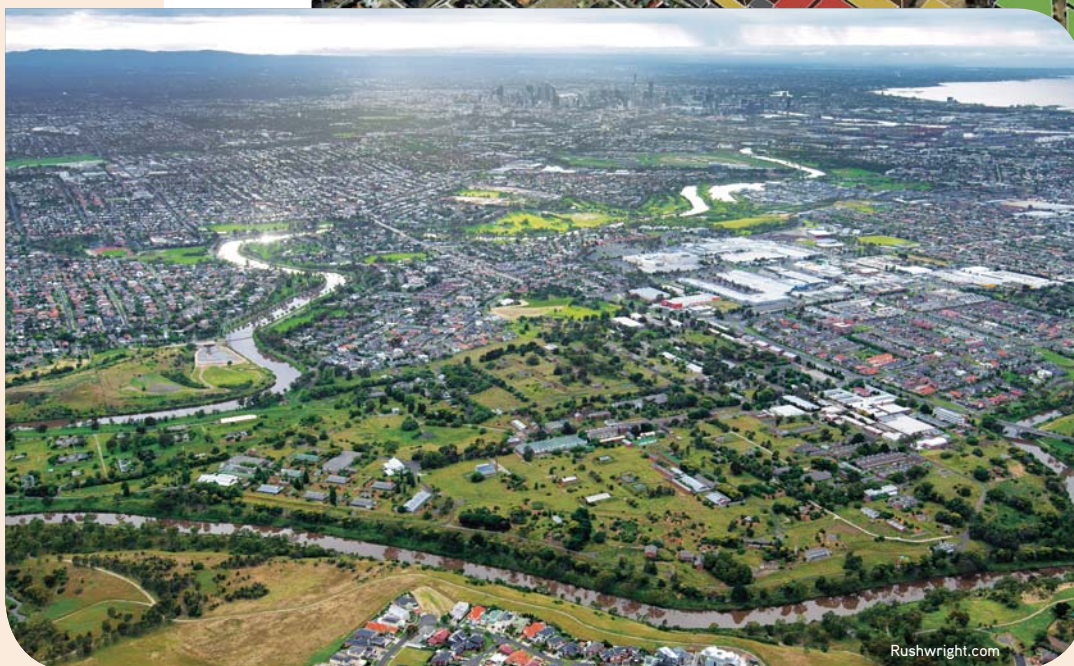
How do you develop suburbs that work for residents, developers and local government?

- Along the Maribyrnong River, 10 km from Melbourne’s CBD, 128 ha of government land is ripe for redevelopment
- It could accommodate 3000 dwellings and offices for 3000 people

- Planning a sustainable, liveable community integrated into its urban surrounds demands information on transport, health services, environment, housing prices, recreation facilities and more
- This information comes from Federal and State government agencies, local councils, utilities and private companies
- For Maribyrnong, data and 80 tools to manage it are being made

available through the Australian Urban Research Intelligence Network (AURIN) and the Australian National Data Service (ANDS)

- New tools—such as employment opportunities and walkability—are being added
- Similar projects can facilitate development across Australia’s cities and towns



MUtopia, The University of Melbourne

Rushwright.com

# TERN & ALA – Coming to grips with the environment from the ground up

Practical environmental science draws on a huge amount of information from many different sources and at several different levels.

For instance, if you want to know how and where a weed might spread, what the impact might be, and how to go about stopping it, you need a lot of data. You not only need to know about the characteristics of the plant itself, but also about the soils and nutrients it needs, the plant cover and light

conditions under which it thrives, and the climatic conditions under which it can survive. Then there is information on how it interacts with the plants and animals with which it comes into contact. And, if you want to determine its potential spread, you also need to know where it is likely to grow in the surrounding landscape and how it possibly could be transmitted there.

These different types of information typically are gathered in different forms by different people or bodies. In Australia, for instance, soil and plant cover data at the landscape level can come via remote sensing datasets made available through AusCover or via survey data through AusPlots, both of which are facilities of the Terrestrial Ecosystems Research Network (TERN). Information on biodiversity and individual plants and animals can be accessed via the Atlas of Living Australia (ALA).

But to generate a usable picture of the potential spread of the weed, that data

now has to be integrated to determine things like how vegetation cover and climate might interact in a case where plant seeds are transmitted by wind.

So the ALA, CSIRO and TERN's Eco-Informatics team at the University of Adelaide, supported by the Australian National Data Service have developed a software tool called Soils2Satellites, which can find, analyse, integrate and visualise ecological and related data from multiple sources, plots and/or locations.

The Soils2Satellites tool enables researchers to explore and display relationships between disconnected datasets in ways that were not previously possible. For example, researchers are now able to display layers of Australian environmental data such as elevation, temperature or soil type, then 'drill down' to compare vegetation and genomics data across those layers, and perform subsequent analyses across the combined datasets.



CSIRO



Suzanne Long

# Tropical Data Hub - Providing a platform on which to build a tropical future

Although northern Australia is home to only 5% of the population, more than half of Australian exports were shipped from northern ports in 2012-13, and the region was responsible for about 10% of the country's agricultural production. But the Australian Government clearly believes the north can do more.

In June, the Government demonstrated how keen it is to develop the nearly 40% of the country north of the Tropic of Capricorn by releasing a Green Paper to stimulate discussion. Early next year, it plans to deliver a White Paper to guide development policy for the region.

Access to information is pivotal to all of the policy directions discussed in the Green Paper—delivering economic infrastructure; improving land use and access; improving water access and management; promoting trade and investment, and strengthening the business environment; fostering education, research and innovation; and enhancing governance. And information is also central to the success of the proposed AgNorth Cooperative Research Centre, a collaboration between government, business and

academia to support the development of industries to help satisfy significant new markets for food and fibre opening up in the countries to the north.

A team at the eResearch Centre of James Cook University supported by the Australian National Data Service has been putting together a Tropical Data Hub (TDH) that will bring together information on anything to do with the tropics in Australia, from the Kimberley Ranges in the west to Cape York Peninsula in the east.

With campuses in Townsville and Cairns, JCU is one of only two tropical universities in Australia and of the few in developed nations. Yet the tropics is where two-thirds of the world's population lives, and faces distinctive issues of health, agriculture, the environment and managing resources.

So the TDH is reaching out and hoping to become an international repository of tropical information. Already it is supporting two initiatives of global importance—to do with the impact of global warming and the transmission of tropical disease—both important to development.

Edgar is a website that shows where bird species have been observed and uses this information to calculate and display the impact climate change will have on their distribution.

The Vector Ecology and Control Network (VECN), a global database on the transmission of malaria, is supported by the Bill and Melinda Gates Foundation and several other international organisations. It draws together, stores, organises and makes available a library of information on malaria as well as the habits and ecology of the hundreds of species of mosquitoes that transmit it. One major aim is to provide a test-bed for intervention. It provides software tools and predictive models that can be used to analyse data and point to the most efficient ways to control the disease.



# ANDS: Creating a national advantage

These major changes, and inspiring examples, are a direct result of the NCRIS and EIF investments, but also required adjustments to programs as circumstances changed.

A country wide consultation with the sector conducted jointly by the Department of Innovation, and ANDS came to the conclusion that research data management with associated infrastructure was needed institutionally, and not simply at the research group level. This was not the case in other international research data infrastructure approaches, but was the clear message from the consultation participants: data is a long term asset of both the institute and the research projects, and needs to be managed with institutional resources. Thus ANDS committed to invest in the institutional data, data infrastructure, data policy, data procedures, together with the people who would support this infrastructure. As a result, ***Australia's research institutions are amongst the best in the world in managing their research data assets.***

This has directly lead to an environment that has seen significant research data

policy advances, particularly from the ARC and the NH&MRC; these have been accepted as important by the research sector, and seen as important to ensure international compatibility. Ensuring that research data be as open as possible for all to use is a movement with international momentum, and Australia is very well placed to benefit from these changes.

Australia's researchers are now able to publish, discover, reuse and be recognized for their research data. They have tools and processes at their institutions that support them publishing their research data, with rich descriptions, and ANDS supports them with publishing services, including minting persistent identifiers (DOIs) that help researchers track their uses.

Finally data collections from research projects, from instruments, from Government agencies, and others are collected and available. ANDS has been guided by an important view that data have to be treated as assets that need to be made as valuable as possible. Thus, ANDS sees the transformations listed below as critical.

## ANDS is enabling the transformation of:





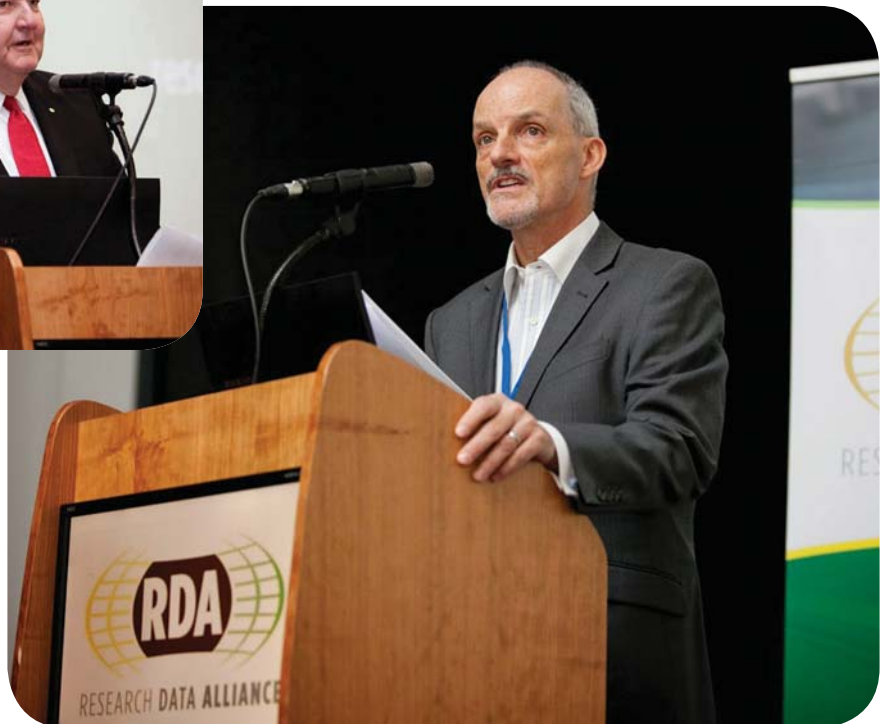
# Having an impact internationally

The Research Data Alliance was established jointly by the European Commission, through a specially funded project, the National Science Foundation of the U.S.A., through a newly funded project, and the Australia Department of Innovation, through ANDS. It was established to improve international research data sharing, and has been enormously successful in its first 2 years of operation. ANDS has had a pivotal role in that success, driving the establishment of the Alliance and providing guidance for its governance and support bodies.

Both Europe and the US have made significant investments in research infrastructure. ANDS, together with some of the data-intensive capabilities, has made a significant contribution in ensuring that Australian researchers and research institutions are engaged and leading in these global trends.



On 26 March, Australia's Chief Scientist, Professor Ian Chubb AC delivered the Keynote Address at the Research Data Alliance Third Plenary in Dublin, Ireland.



Dr Andrew Treloar, co-chair of Research Data Alliance 3rd Plenary in Dublin, Ireland, March 2014.

# Partnerships

## The basis of the Australian Research Data Commons

ANDS has delivered infrastructure that enables the transformation of research data from individual holdings to institutional and national assets that are managed, connected, discoverable, and usable for multiple purposes.

However data is generated by organisations, instruments, and research groups, and is managed within institutional environments. The policies governing research data are set by research funders, government and institutions. International research is conducted by partners by establishing specific agreements. Thus ANDS does not work directly, but through partnerships.

This partnership focus is evident through:

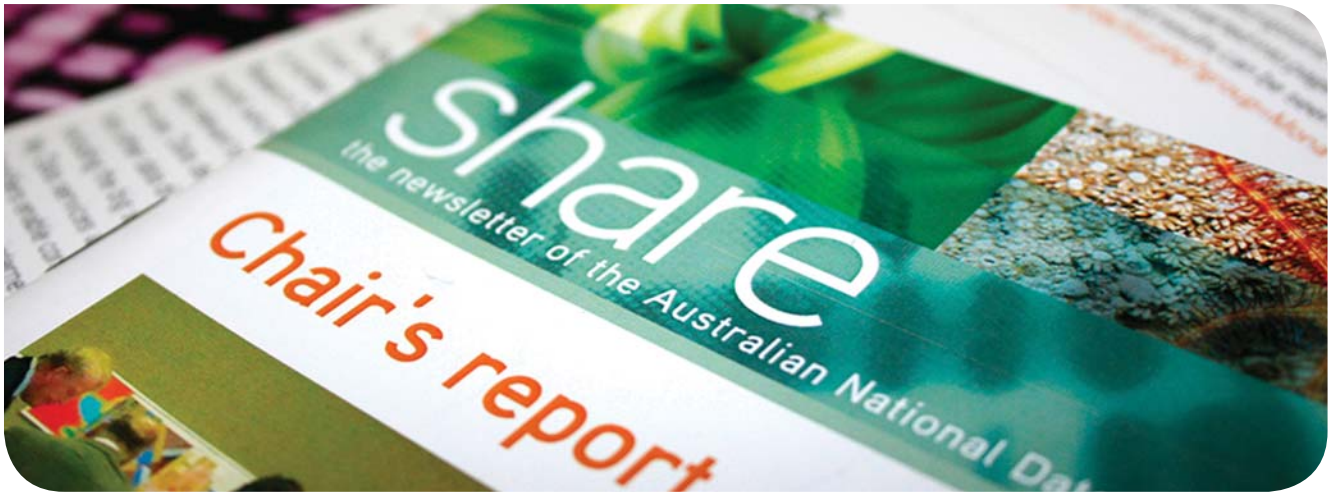
- Partnerships with 38 universities and 3 publicly funded research organisations, 13 NCRIS funded data generating organisations, 9 government data agencies, as well as the ARC and NH&MRC
- Establishing national data infrastructure that supports the needs of our partners
- 201 external projects (for details, please consult the Final Reports referenced at the end of this document) at 63 institutions to establish coherent data infrastructure, data capacity, and data policy to establish a world's best research data commons, consisting of:
  - 50 Seeding the Commons projects
  - 75 Data Capture project,
  - 31 Metadata Stores projects
  - 35 Applications projects
  - 10 National Collection projects

- Using this infrastructure to position Australia internationally as a foundation member (together with the EU and US) of the Research Data Alliance

This approach has meant that we have partnered with institutions so that they can provide direct services to their researchers and staff, rather than direct ANDS engagement with institutions.

Equally importantly, projects at the research institutions have been funded by ANDS, with co-investment not required, but often made. This was important at the time of the establishment of ANDS, as research institutions had not generally seen their research data as assets to be carefully managed, but more commonly as a risk in research. By making this investment, Australian research institutions developed world leading capacity in research data, enabling stronger ability to execute data intensive research strategies, and build stronger data intensive international partnerships.

To show how the emphasis on establishing institutional research data infrastructure was reflected financially, the next table shows the size and focus of the programs over the life of the projects.



TOTAL ALLOCATED FUNDS (NCRIS, EIF, AND OTHER) BY PROGRAM UNTIL JUNE 30, 2014

Programs	NCRIS (\$M)	EIF (\$M)	%	Focus
Public Sector Data	0.00	6.84	9.07%	ANDS
National Collections	0.51	0.00	0.68%	ANDS
Frameworks & Capabilities	4.58	0.00	6.07%	ANDS
Core	0.00	8.09	10.73%	ANDS
Applications	0.00	9.39	12.45%	Institutions
Data Capture	0.00	16.79	22.26%	Institutions
Metadata	0.00	7.29	9.67%	Institutions
Seeding the Commons	12.39	0.00	16.43%	Institutions
Institutional Engagement	0.00	1.57	2.09%	Institutions
International Collaboration	0.02	0.10	0.15%	ANDS
Governance and Management	5.77	2.09	10.41%	ANDS
Total Allocated Funds (\$M)	23.27	52.16	100.00%	

# Building Research Data Management Capacity

One of ANDS' distinctive approaches was to complement the roll-out of the Australian Research Data Commons with a commensurate development of human capability needed to use and engage with the new infrastructure. Better data and a coherent distributed infrastructure is not possible without developing well-engaged self-sustaining communities of practice.

ANDS staff work within an integrated, strategic and carefully targeted engagement activity matrix with research organisations and research service organisations, which is described in the following table. ANDS has developed and refined a 5 year agenda for capability building, providing resources to support institutions' aspirations, and creating the right environment for sharing amongst a community of practice.

Capability engagement strategy	Consistency between 2009-2014	Innovation and response: new strategies
Raising awareness Building knowledge	<ul style="list-style-type: none"> <li>• ANDS Guides</li> <li>• ANDS website encyclopaedic</li> <li>• Roadshows</li> </ul>	<ul style="list-style-type: none"> <li>• Webinars 2012</li> <li>• Youtube video recordings 2012</li> </ul>
Creating networked communities	<ul style="list-style-type: none"> <li>• Bootcamp intensives: 2010, 2012, 2014</li> <li>• Community Roundtables: discussing big and small issues in data management</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing inclusion of partners as presenters, resulting in ANDS now mainly holding a facilitator and coordination role</li> </ul>
Creating skilled data managers	<ul style="list-style-type: none"> <li>• Workshops, seminars –Australian and international case studies and speakers</li> </ul>	<ul style="list-style-type: none"> <li>• Self-paced online learning packages 2012</li> <li>• Individual and small group online tutorials 2013</li> </ul>
Sharing information, exemplars and case studies	<ul style="list-style-type: none"> <li>• <i>share</i></li> <li>• Googlegroups email lists</li> <li>• Conference presentations and workshops</li> <li>• Use of international and Australian best practice, policies</li> </ul>	<ul style="list-style-type: none"> <li>• Twitter 2013</li> <li>• andsUP e-newsletter 2013</li> <li>• Community Bulletin Board (CBB) 2009 replaced by special interest blogs 2014</li> <li>• Webinars 2012</li> </ul>



## Building communities of practice: a case study for Data Citation

Citation is a pivotal concern in the publication and reuse of data. A strategic, flexible and responsive approach to raising awareness has resulted in a vibrant and burgeoning Australian community now routinely applying DOIs to data.

**Community input** through 15 webinars, 3 roundtables, 8 workshops, 2 train-the-trainer sessions, 5 seminars, 8 andsdata YouTube recordings, and countless resource links:

- **National:** Australian Antarctic Division, Universities (Griffith, Queensland, ANU, Deakin, Melbourne, WA, Adelaide, Tasmania, NSW, James Cook, Edith Cowan, Curtin, Sydney) CSIRO, Australian Data Archive, TERN, Data.gov.au, IMAS, AIMS
- **International:** DataCite, Dryad Digital Repository USA, UK Data Archive, Thomson Reuters, Oakridge National Laboratories USA, ImpactStory USA, Public Library of Science, Wiley Journals, PREPARDE Project UK, ORCID

## Technical:

International contribution and input: DataCite, Research Data Alliance, Thomson Reuters Data Citation Index.

ANDS Cite My Data Service: Technical documentation is accompanied by plain-English information to help institutions effect cultural change.

### Materials:

- Online: ANDS Guides, PowerPoints, resources, infographics, explanations, examples, exemplars, FAQs <http://ands.org.au/cite-data/index.html>
- Resources: downloadable and use "as is" or repurpose: <http://www.ands.org.au/presentations/index.html#publications>
- Articles in share, andsUP
- 28 Australian University Library Guides on Data Management and citation

Australian research organisations have begun addressing the issues of data citation and data reuse. 26 institutions in Australia are minting DOIs (Digital Object Identifiers) through ANDS CiteMyData service and citation metrics are being harvested by data collecting agencies. The growing practice of data citation

is underpinned and driven forward by librarians who are knowledgeable and skilled in research data management and reuse, and by institutionally focused services and materials.

There is now a strong research data management capacity in Australia that uses a coherent approach to Australia's research data assets, and can support substantial change research data practice in the light of policy or technical changes.

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The Australian National Data Service (ANDS) project has raised awareness and fostered discussion advocating data management, discovery and re-use in the higher education and research sector.

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# Status of National Research Infrastructure in 2014



data management plans that have been developed under Seeding the Commons and Capability projects, with metadata lodged in an institutional Metadata Store

- More data connected, as a result of national infrastructure that enables persistent identification, vocabulary chosen from controlled vocabulary, connection to researchers with unique identifiers, and connected to published research projects, through a variety of National Services
- More data discoverable, through our National Services that support the publication of data descriptions through research Data Australia, and on to other discovery engines such as global internet search engines

Both research data and research data infrastructure are crucial to data intensive research, and both have been greatly strengthened by the NCRIS and EIF investments. As has previously been described research data is more or less valuable depending upon a number of factors:

- The extent to which it is collected and organised to form a body of data that enables questions to be asked not possible of individual observations. This is obvious when considering time series, such as river levels, but is equally important when asking systems questions that need different types of observations, such as physical and biological observations of the oceans
- Whether it is managed? Unless it is managed, it may be unclear who can use the data, under what circumstances, and under what licence conditions
- Whether it is connected? Is the data connected to the project, instrument, researcher, the publications using the data, and other information that could

provide vital context to understanding the data?

- Whether it is discoverable? Is the data published and visible in useful ways to potential research partners through web search engines, international discipline portals, institutional portals and Research Data Australia? If the data can't be found it cannot be used
- Whether it is reusable? Have relevant instrument settings and context of the data that is obvious to the observer at the time of creation, but not at a different time and place been captured. This information might be kept in a data publication, but might be kept as a description of research methods, or a laboratory notebook

As a result of the NCRIS and EIF investments, there is:

- More data collected, through projects to collect data including from Public Sector Data holders
- More data with rich metadata being captured at source as a result of the Data Capture projects
- More data managed under research

The result is data that is more usable, as a result of all of the previous activities as well as tools that make it easier to integrate, repurpose and analyse data through our ARDC Applications programs.

Thus the ARDC, pictured in Figure 2: Australian Research Data Commons has been established. More importantly, research data can be published and used in every discipline, across all domains and through infrastructure accessible through local research institutions.

# The value of the NCRIS and EIF Investments in ANDS

These investments were made in response to a rapidly evolving means of conducting research – as research became more data driven and data intensive in many fields.

If the investment had not been made, then undoubtedly over time Australian research institutions, data providers and funders would have responded to changes internationally. However, the investment not only sped up the response to data driven research, but also changed the nature of that response. If institutions had responded individually, it would have led to multiple responses to the changes – some would have been good, and others not so, but undoubtedly the collective response would have been much less efficient. More importantly, the response would have provided no coherence. This would have meant there were individual disciplinary responses, and individual institutional responses, but no system wide ability to assemble the data resources necessary to tackle nationally significant challenges.

Research is becoming increasingly data intensive and global data intensive research is increasingly collaborative. Australia's most impactful research, measured by citations, is done with international collaborators. A lack of international alignment and marginalisation of Australia in data intensive research would lead to lower impact of Australian research, making Australia's research system less effective.

By way of contrast, the investments in ANDS has led to a coherent system that supports data intensive research and positioned Australia at the forefront of data intensive research. *Data is essential infrastructure for research, as much as water is for farming, or roads are for transport.*

As well as data, the Australian research system has:

- A skilled workforce in data management around the country, and as good as any in the world
- Skilled data technicians able to provide infrastructure to support new data intensive challenges

- National data policy that supports Australian engagement internationally
- Processes at research institutions that treat data as an asset
- An ability to cooperate with European researchers who are responding to a 1.4B Euro scheme to support open data research
- Researchers able to create, store, manage, compute, analyse, and publish from rich data resources as well as anywhere in the world.

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This combination of infrastructure and resources [through eResearch investments, such as ANDS] provides Australian researchers with opportunities for improved collaboration – both nationally and internationally.

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PROFESSOR IAN CHUBB AC, CHIEF SCIENTIST

# Financial Reports

## 2009 to 2014

### (Consolidated view of NCRIS & EIF)

#### Expenditure by Program over the life of ANDS

Expenditure by Program (\$millions)	ACTUAL EXPENDITURE									
	2009	2010	2011-1	2011-2	2012-1	2012-2	2013-1	2013-2	2014-1	Total
Public Sector Data	0.04	2.52	0.93	0.91	0.34	0.87	0.67	0.36	0.22	6.84
National Collections	-	-	-	-	0.13	0.14	0.12	0.11	0.01	0.51
Frameworks & Capabilities	0.72	0.75	0.27	0.44	0.52	0.55	0.47	0.40	0.46	4.58
Core	1.23	1.20	0.77	1.04	0.88	0.97	0.81	0.58	0.62	8.09
Applications	-	1.18	0.61	0.42	1.40	2.12	1.00	1.73	0.93	9.39
Data Capture	0.01	4.46	2.44	3.23	2.28	1.72	1.34	0.76	0.55	16.79
Metadata	0.03	0.94	0.22	0.69	1.47	1.45	1.19	0.98	0.32	7.29
Seeding the Commons	1.33	2.94	1.87	2.00	1.20	1.15	0.70	0.54	0.67	12.39
Institutional Engagement	0.91	-	-	-	-	-	-	0.29	0.37	1.57
International Collaboration	-	-	-	-	-	0.11	0.04	(0.04)	-	0.11
Governance and Management	0.91	1.37	0.76	0.60	0.86	0.52	0.57	0.51	1.76	7.85
<b>Total Planned Expenditure</b>	<b>5.19</b>	<b>15.35</b>	<b>7.87</b>	<b>9.32</b>	<b>9.07</b>	<b>9.60</b>	<b>6.91</b>	<b>6.20</b>	<b>5.90</b>	<b>75.42</b>
Internal Total	3.42	5.11	2.65	3.13	3.44	3.39	3.37	2.46	3.67	30.65
External Total	1.77	10.24	5.22	6.19	5.63	6.21	3.54	3.75	2.23	44.77
<b>TOTAL</b>	<b>5.19</b>	<b>15.35</b>	<b>7.87</b>	<b>9.32</b>	<b>9.07</b>	<b>9.60</b>	<b>6.91</b>	<b>6.20</b>	<b>5.90</b>	<b>75.42</b>



## Expenditure by Program NCRIS and EIF

	PAST PERIOD ACTUALS JAN 09 - DEC 09 \$'000	PAST PERIOD ACTUALS JAN 10 - DEC 10 \$'000	PAST PERIOD ACTUALS JAN 11 - DEC 11 \$'000	PAST PERIOD ACTUALS JAN 12- DEC 12 \$'000	PAST PERIOD ACTUALS JAN 13 - DEC 13 \$'000	CURRENT PERIOD YEAR 2014-1 ACTUALS JAN 14 - JUN 14 \$'000	TOTAL \$'000
<b>SUMMARY OF CASH BALANCE</b>							
<b>Opening Cash Balance<sup>1</sup></b>	<b>678.96</b>	<b>41,033.53</b>	<b>39,478.53</b>	<b>34,554.56</b>	<b>18,564.23</b>	<b>5,864.09</b>	<b>678.96</b>
NCRIS Funding	11,000.00	-	10,500.00	-	-	-	21,500.00
EIF Funding	34,000.00	14,000.00	-	-	-	-	48,000.00
Interest Earned	575.31	1,216.70	1,929.56	1,122.37	349.67	58.58	5,252.19
Recovery General Revenue	(0.11)	-	-	-	-	-	(0.11)
Inc-Other < \$5000	(0.12)	-	-	-	-	-	(0.12)
Inc-Staff Contribution	-	-	-	-	-	0.19	0.19
<b>Total Income</b>	<b>46,254.04</b>	<b>56,250.23</b>	<b>51,908.09</b>	<b>35,676.93</b>	<b>18,913.90</b>	<b>5,922.86</b>	<b>75,431.12</b>
<b>Total Expenditure</b>	<b>5,220.51</b>	<b>16,771.70</b>	<b>17,353.53</b>	<b>17,112.70</b>	<b>13,049.81</b>	<b>5,922.86</b>	<b>75,431.12</b>
<b>Closing Cash Balance</b>	<b>41,033.53</b>	<b>39,478.53</b>	<b>34,554.56</b>	<b>18,564.23</b>	<b>5,864.09</b>	<b>-</b>	<b>-</b>
<b>EXPENDITURE</b>							
<b>Public Sector Data</b>	<b>1.62</b>	<b>2,008.13</b>	<b>1,314.19</b>	<b>663.80</b>	<b>120.00</b>	<b>23.66</b>	<b>4,131.40</b>
Salaries and On-Costs for technical staff	-	-	-	-	-	23.66	23.66
External Contracts	-	1,988.01	1,304.35	656.38	120.00	-	4,068.74
Operating Expenditure	1.62	20.12	9.84	7.42	-	-	39.01
<b>National Collections</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>135.28</b>	<b>152.36</b>	<b>8.95</b>	<b>296.58</b>
Salaries and On-Costs for technical staff	-	-	-	129.85	142.17	(1.41)	270.61
External Contracts	-	-	-	-	-	-	-
Operating Expenditure	-	-	-	5.42	10.19	10.36	25.97
<b>Frameworks &amp; Capabilities</b>	<b>715.23</b>	<b>91.20</b>	<b>4.38</b>	<b>119.26</b>	<b>65.11</b>	<b>40.33</b>	<b>1,035.52</b>
Salaries and On-Costs for technical staff	263.19	21.66	0.01	-	16.25	-	301.10
External Contracts	362.50	20.00	-	50.00	48.86	25.00	506.37
Operating Expenditure	89.54	49.55	4.37	69.26	-	15.33	228.05
<b>Core</b>	<b>-</b>	<b>212.17</b>	<b>279.74</b>	<b>124.38</b>	<b>20.95</b>	<b>23.66</b>	<b>660.90</b>
Salaries and On-Costs for technical staff	-	-	-	-	-	23.66	23.66
External Contracts	-	211.57	256.00	112.50	-	-	580.07
Operating Expenditure	-	0.60	23.74	11.88	20.95	-	57.17
<b>Applications</b>	<b>-</b>	<b>1,182.51</b>	<b>1,029.63</b>	<b>3,518.19</b>	<b>2,724.91</b>	<b>931.86</b>	<b>9,387.09</b>
Salaries and On-Costs for technical staff	-	-	353.08	580.95	454.48	134.85	1,523.36
External Contracts	-	1,181.05	594.21	2,860.47	2,258.83	795.50	7,690.06
Operating Expenditure	-	1.46	82.34	76.77	11.60	1.51	173.67
<b>Data Capture</b>	<b>14.40</b>	<b>4,461.75</b>	<b>5,856.85</b>	<b>3,998.29</b>	<b>2,058.96</b>	<b>545.19</b>	<b>16,935.45</b>
Salaries and On-Costs for technical staff	0.11	842.69	786.08	380.47	252.70	33.95	2,296.00
External Contracts	-	3,560.22	4,997.57	3,589.57	1,783.37	511.25	14,441.98
Operating Expenditure	14.29	58.84	73.20	28.25	22.89	-	197.47
<b>Metadata</b>	<b>33.39</b>	<b>936.14</b>	<b>727.73</b>	<b>2,925.88</b>	<b>2,162.62</b>	<b>320.26</b>	<b>7,106.02</b>

	PAST PERIOD ACTUALS JAN 09 - DEC 09 \$'000	PAST PERIOD ACTUALS JAN 10 - DEC 10 \$'000	PAST PERIOD ACTUALS JAN 11 - DEC 11 \$'000	PAST PERIOD ACTUALS JAN 12- DEC 12 \$'000	PAST PERIOD ACTUALS JAN 13 - DEC 13 \$'000	CURRENT PERIOD YEAR 2014-1 ACTUALS JAN 14 - JUN 14 \$'000	TOTAL \$'000
Salaries and On-Costs for technical staff	0.01	251.58	234.39	293.68	96.38	33.95	909.99
External Contracts	-	676.96	465.24	2,620.21	2,062.84	286.32	6,111.57
Operating Expenditure	33.37	7.60	28.10	11.99	3.41	-	84.46
<b>Seeding the Commons</b>	<b>1,292.33</b>	<b>2,813.62</b>	<b>3,869.80</b>	<b>2,344.06</b>	<b>1,240.72</b>	<b>593.29</b>	<b>12,153.81</b>
Salaries and On-Costs for technical staff	691.79	1,043.22	838.71	528.69	248.18	49.86	3,400.44
External Contracts	362.50	1,794.74	1,541.00	1,267.50	695.00	370.00	6,030.74
Outreach Contracts	-	-	1,368.00	463.50	280.58	172.61	2,284.69
Operating Expenditure	238.04	(24.34)	122.10	84.37	16.95	0.81	437.93
<b>Institutional Engagement</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>262.79</b>	<b>368.07</b>	<b>630.86</b>
Salaries and On-Costs for technical staff	-	-	-	-	255.28	358.48	613.77
External Contracts	-	-	-	-	-	-	-
Operating Expenditure	-	-	-	-	7.51	9.59	17.09
<b>International Collaboration</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>89.38</b>	<b>6.88</b>	<b>-</b>	<b>96.26</b>
Salaries and On-Costs for technical staff	-	-	-	64.81	0.00	-	64.81
External Contracts	-	-	-	-	-	-	-
Operating Expenditure	-	-	-	24.57	6.88	-	31.45
<b>Governance &amp; Management</b>	<b>3,163.55</b>	<b>5,066.17</b>	<b>4,271.21</b>	<b>3,194.20</b>	<b>4,234.51</b>	<b>3,067.59</b>	<b>22,997.22</b>
Salaries and On-Costs for technical staff	575.96	770.62	834.46	877.01	573.36	230.82	3,862.24
External Contracts	907.25	(0.00)	-	-	-	-	907.25
Operating Expenditure	340.36	580.37	520.25	505.66	502.31	218.67	2,667.63
ANU Support Costs	1,332.00	3,150.28	2,470.94	1,345.17	3,158.84	1,294.60	12,751.83
CSIRO Support Costs	-	549.73	445.55	466.36	-	1,323.51	2,785.15
Capital Expenditure - Other Equipment	7.97	15.17	-	-	-	-	23.14
<b>Total ANDS Expenditure</b>	<b>5,220.51</b>	<b>16,771.70</b>	<b>17,353.53</b>	<b>17,112.70</b>	<b>13,049.81</b>	<b>5,922.86</b>	<b>75,431.12</b>

## Expenditure by Funds

	PAST PERIOD ACTUALS JAN 09 - DEC 09 \$'000	PAST PERIOD ACTUALS JAN 10 - DEC 10 \$'000	PAST PERIOD ACTUALS JAN 11 - DEC 11 \$'000	PAST PERIOD ACTUALS JAN 12- DEC 12 \$'000	PAST PERIOD ACTUALS JAN 13 - DEC 13 \$'000	CURRENT PERIOD YEAR 2014-1 ACTUALS JAN 14 - JUN 14 \$'000	TOTAL \$'000
<b>SUMMARY OF CASH BALANCE</b>							
<b>Opening Cash Balance<sup>1</sup></b>	<b>678.96</b>	<b>41,033.53</b>	<b>39,478.53</b>	<b>34,554.56</b>	<b>18,564.23</b>	<b>5,864.09</b>	<b>678.96</b>
NCRIS Funding	11,000.00	-	10,500.00	-	-	-	21,500.00
EIF Funding	34,000.00	14,000.00	-	-	-	-	48,000.00
Interest Earned	575.31	1,216.70	1,929.56	1,122.37	349.67	58.58	5,252.19
Recovery General Revenue	(0.11)	-	-	-	-	-	(0.11)
Inc-Other < \$5000	(0.12)	-	-	-	-	-	(0.12)
Inc-Staff Contribution	-	-	-	-	-	0.19	0.19
<b>Total Income</b>	<b>46,254.04</b>	<b>56,250.23</b>	<b>51,908.09</b>	<b>35,676.93</b>	<b>18,913.90</b>	<b>5,922.86</b>	<b>75,431.12</b>
<b>Total Expenditure</b>	<b>5,220.51</b>	<b>16,771.70</b>	<b>17,353.53</b>	<b>17,112.70</b>	<b>13,049.81</b>	<b>5,922.86</b>	<b>75,431.12</b>
<b>Closing Cash Balance</b>	<b>41,033.53</b>	<b>39,478.53</b>	<b>34,554.56</b>	<b>18,564.23</b>	<b>5,864.09</b>	<b>-</b>	<b>-</b>
<b>EXPENDITURE BY FUNDS</b>							
NCRIS Expenditure	4,202.68	5,000.96	5,926.27	3,914.65	3,450.88	771.23	23,266.67
EIF Funding Expenditure	1,017.84	11,770.74	11,427.26	13,198.05	9,598.93	5,151.63	52,164.44
<b>Total Organisational Expenditure</b>	<b>5,220.51</b>	<b>16,771.70</b>	<b>17,353.53</b>	<b>17,112.70</b>	<b>13,049.81</b>	<b>5,922.86</b>	<b>75,431.12</b>

1. An additional \$3.0M was received at the ANDS establishment phase. The balance of funds after expenditure during that phase was rolled over at the beginning of 2009 (\$0.679M).

# Project Governance

Monash University was the lead agent for the NCRIS ANDS and the EIF ARDC projects. Monash University established a Collaboration agreement with the Australian National University and CSIRO as partners in the projects.

Monash hosted and operated one of the ANDS Offices, which was used to manage the Project. ANU hosted the other office that houses both ANU and CSIRO staff.

Monash appointed the independent Chair of the Steering Committee after consultation with the Department and the ANDS partners and formally includes the independent Chair in the performance management

arrangements of the Executive Director of ANDS. The Chair of ANDS was Dr Ron Sandland and the Executive Director of ANDS was Dr Ross Wilkinson.

As at March 2014 the current ANDS Steering Committee Members were:

- Independent Chair: Dr Ron Sandland
- Ms Cathrine Harboe-Ree (Monash University)
- Mr David Toll (CSIRO)
- Ms Roxanne Missingham (The Australian National University)
- Prof Mark Ragan (University of Queensland)
- Mr Paul Sherlock (University of South Australia)
- Dr Siu Ming Tam (Australian Bureau of Statistics)
- Prof Craig Johnson (University of Tasmania)
- Executive Director (ex-officio): Dr Ross Wilkinson (Australian National Data Service)

# Submitted Reports

Report Submitted to Commonwealth Government	Submitted Date
ANDS Establishment Project Interim Report 2008	29 February 2008
NCRIS Annual Report 1	30 September 2009
ARDC EIF Milestone Report 1	30 September 2009
ARDC EIF Milestone Report 2	31 December 2009
ARDC EIF Milestone Report 3	31 March 2010
ARDC EIF Milestone Report 4	30 June 2010
NCRIS Annual Report 2	30 September 2010
ARDC Annual Report 1 & Milestone Report 5	30 September 2010
ARDC EIF Milestone Report 6	31 December 2010
NCRIS Annual Report 3	30 September 2011
ARDC EIF Annual Report 2	30 September 2011
NCRIS Annual Report 4	30 September 2012
ARDC EIF Annual Report 3	27 September 2012
NCRIS Annual Report 5	29 November 2013
ARDC EIF Annual Report 4	29 November 2013
NCRIS Annual Report 6 & Final Report	Contained within this document
ARDC EIF Annual Report 5 & Final Report	Contained within this document

# Appendices

## Appendix A - NCRIS Final Report

NCRIS 2013-14 Annual Report 6 & Final Report

## Appendix B - EIF Final Report

ARDC EIF 2013-14 Annual Report 5 & Final Report

### Supporting Documents

The following documents provide very important context for ANDS.

- National Collaborative Research Infrastructure Strategy Strategic Roadmap 2006 ([http://docs.education.gov.au/system/files/doc/other/national\\_collaborative\\_research\\_infrastructure\\_strategic\\_roadmap\\_2006.docx](http://docs.education.gov.au/system/files/doc/other/national_collaborative_research_infrastructure_strategic_roadmap_2006.docx))
- Towards the Australian Data Commons ([ands.org.au/towardstheaustraliandatacommons.pdf](http://ands.org.au/towardstheaustraliandatacommons.pdf))
- Riding the wave - How Europe can gain from the rising tide of scientific data - Final report of the High Level Expert Group on Scientific Data - October 2010 ([http://ec.europa.eu/information\\_society/newsroom/cf/document.cfm?action=display&doc\\_id=707](http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=707))
- National Collaborative Research Infrastructure Strategy Strategic Roadmap 2011 (<http://docs.education.gov.au/node/34121>)

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