



Australian Government

Department of the Environment and Energy

DEPARTMENT OF THE ENVIRONMENT AND ENERGY

SUBMISSION TO THE PRODUCTIVITY COMMISSION INQUIRY

INTO DATA AVAILABILITY AND USE

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SUBMISSION TO THE PRODUCTIVITY COMMISSION INQUIRY INTO DATA AVAILABILITY AND USE

Department of the Environment and Energy

Environmental data is important to government, industry and the community as critical information for natural resource dependent industries and markets, as an enabler of effective regulation, to inform environmental policies and programs, and to improve community understanding and sense of place. The Department of the Environment and Energy welcomes the opportunity to make this submission to the Productivity Commission. The submission primarily concerns environmental information and does not include matters relating to the transfer of responsibility for energy policy to the Department on 19 July 2017.

Key messages

- The Department of the Environment and Energy has extensive environmental data holdings. The Department has an open data policy, applies Creative Commons by Attribution licensing and makes its environmental datasets available through web services and applications:
 - The public utility and accessibility of our data could be improved through the modernisation of technological systems and methodologies, with the first steps underway.
 - New technologies and software tools, including advances in remote sensing, offer enormous promise to address data gaps in a cost-effective manner and enable more comprehensive real time environmental monitoring, but require further development and (in some cases) significant up-front investment.
 - Modernising data systems and investing in analytical capacity and expertise offer substantial opportunities to progress key policy and program questions and stimulate innovation.
 - Greater value from environmental information for Government lies in its integration both across the landscape/seascape, and with economic, social, infrastructure and climate data, to better inform economic agents in their decision-making and to develop and evaluate policy and investment approaches, including private sector solutions.
 - In this context, spatial data is the critical factor for integrating data and should form the “third spine” as an identifier for data (in addition to household and business identifiers).
- Three areas will be essential to realise the potential economic and other benefits of environmental data, and government effort can support this:
 - Effective, low cost, data sharing between levels of government.
 - This is becoming more achievable with data increasingly being published as a service, and as open data policies continue to be implemented by governments.
 - State and territory governments create and hold much environmental data, and have varying positions on open data access. While there has been significant progress towards more openness in recent years, further improvements can be made.
 - Sharing between Australian Government agencies and research bodies can still require substantial negotiation effort.
 - Consideration should be given to the design and stability of institutional arrangements so that open data is entrenched as part of normal business.

- Continuing public investment in the research sector as an important platform for environmental data collection and release and for enabling data analysis and use, including the National Collaborative Research Infrastructure System.
 - Ongoing investment in facilities such as the Atlas of Living Australia, the Terrestrial Ecosystem Research Network, the Integrated Marine Observing System, and the National Computational infrastructure, is critical.
 - Government data custodians and biological collections institutions, for example herbaria, museums, and the Australian Biological Resources Study, curate the fundamental data and information that underpins research and data platforms, portals and tools. Adequate investment is needed for continued curation and delivery of these national environmental data resources.
- Practical mechanisms to better integrate data across environment domains (climate and atmosphere, water resources, biodiversity, landscapes, oceans etc) and across economic and social data.
 - Institutional arrangements and initiatives that promote this integration and enable deeper analytical effort will bring a wide range of economic and other benefits, and will be essential to address forthcoming environmental challenges.
 - Such action will also set up important conversations between the collectors and users of data, including business and community. A more informed data value chain will help to prioritise effort on data and analysis and drive innovation.

Introduction

Environmental data improves the evidence base for best practice decision-making by a wide range of agents in the economy, in particular those natural resource and climate dependent industries and markets such as extractive industries, agriculture, tourism and infrastructure. Accessible, usable environmental data also increases understanding of the environment by the community. It offers the opportunity for more effective investment and more robust evaluation of the success of interventions. Reducing uncertainty in environmental information enables a tighter targeting of government intervention and policy to achieve environmental outcomes.

The Department of the Environment and Energy collects, collates and analyses environmental data to support policy and program design and to inform regulatory decisions. Our environmental data includes that which we create concerning matters of national environmental significance, national greenhouse accounts and related projections, regulatory interventions, and program investment. We also compile data from a range of sources including state and territory agencies to present a national picture of the state of the environment.

Environmental data is critical information for industry, including for the extractive industries, agriculture, energy, telecommunications, and water and transport providers and users. In 2012 the Department adopted an open access model for data and publishes its major datasets through:

- data.gov.au
- spatially through National Map and the Australian Renewable Energy Mapping Infrastructure (AREMI)
- 'Find Environmental Data' on our website
- publicly accessible web GIS applications
- web applications and services curated by the Australian Biological Resources Study, Centre for Australian National Biodiversity Research and the Australian National Botanic Gardens
- an interactive National Greenhouse Accounts database.

Our data is accessed by a variety of users including researchers, environmental consultancies, telecommunications companies, resource and energy companies, and other state, territory and Commonwealth government agencies.

Our extensive spatial datasets are listed under [Find Environmental Data](#), with the most accessed categories of data being for protected areas (the Collaborative Protected Areas Database and others), species and ecological communities, vegetation, heritage listings of all types, wetlands, and marine biological and ecological information. The 23 GIS web services which facilitate access to the data have received over 25,000 hits a week since 1 January 2016. Between June 2014 and June 2016, there were approximately 7,300 downloads of our environmental spatial datasets.

Climate change projections for Australia are hosted on the [Climate Change in Australia](#) website. These projects, which are funded by the Department, CSIRO and the Bureau of Meteorology, are presented in regional 'clusters' designed to align with natural resource management boundaries. Feedback on the value of the website indicates broad use by a variety of research users and decision makers. Between January 2015 and February 2016, the website received over 120,000 unique site visits and attracted over 800 registered users. An independent evaluation found that the delivery of climate change information outputs and engagement activities, along with the Climate Change in Australia website, has increased the capacity of Natural Resource Management planners across the country.

Open data is important to our international standing. In keeping with Australia's international treaty obligations, the Australian Antarctic Data Centre (AADC) curates and provides on-line access to over 7,600 data products associated with our scientific endeavours in Antarctica. These products include data from land- and sea-based research projects, meteorological readings from automatic weather stations, track and underway data from marine science voyages, spatial data, digital maps and aerial photographs, and a biodiversity database holding information on Antarctic and subantarctic flora and fauna.

During 2015/16 there were around 132,000 visits to AADC web pages, with approximately 10,700 data products downloaded. AADC data is additionally published into national and global data networks including the Atlas of Living Australia, data.gov.au, the Ocean Biogeographic Information System and the Global Biodiversity Information Facility. Usage of AADC data through these networks is in addition to the usage counts quantified here.

National, state and territory data custodians and collections institutions curate and deliver invaluable and irreplaceable collections of environmental data for open access and use. For example, the Australian Biological Resources Study (ABRS) leads the Australian taxonomy community in providing agreed, authoritative and standardised taxonomy, names, and profiles of the flora and fauna of Australia. Data from the ABRS's Australian Faunal Directory, which contains taxonomic and biological information for around 125,000 species, received more than 43.6 million web hits through its use in the Atlas of Living Australia in 2015/16.

Collaboration, value and cost

The Department considers that publicly funded information and data should be publicly available. It applies Creative Commons by Attribution licensing ([information licensing policy](#)) and requires that the outputs from the National Environmental Science Program are made publicly available unless robust grounds for exception exist ([NESP data and accessibility guidelines](#)).

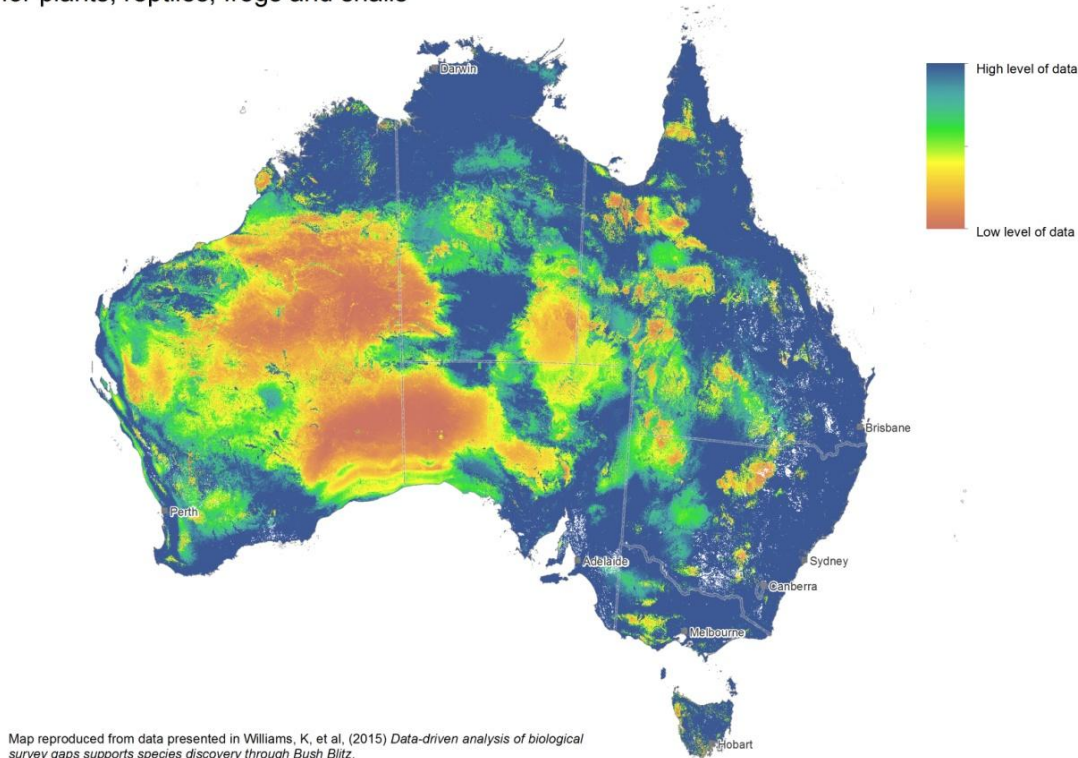
Quantification of the potential value to the broader economy of environmental information access is not readily available (with some exceptions such as the 2015 ACIL Allen report on the value of earth observations from space). Generally, the premise is that open data will realise efficiency gains, value and innovation, including in ways not anticipated by the data provider.

Location-based environmental data can require considerable collection effort. A great deal of biological data exists, but there remain significant gaps in coverage (Figure 1). Much environmental data is held by state and territory governments and other institutions, and substantial effort is entailed in bringing this data together in compatible formats, as is evidenced in the difficulty of developing a comprehensive national picture of the state of the environment. The Department has commenced a pilot program to test the utility of ‘essential environmental measures’ across environmental domains. The intent is to promote common standards for environmental measurements and data, or where that is infeasible at least translation, between jurisdictions. Such comparable data could inform any accounting based approach developed for environmental information.

The Department supports the efforts of the Australian Government Environmental Information Advisory Group (AG-EIAG). AG-EIAG was established by the Bureau of Meteorology under the National Plan for Environmental Information Initiative to promote a standards-based approach to environmental information. The [National Principles for Environmental Information](#) developed by the AG-EIAG provides guidance to Australian Government environmental information custodians on how to make their environmental information more discoverable, accessible and re-usable.

Figure 1

Completeness of ecological survey data
for plants, reptiles, frogs and snails



Environmental data has fewer privacy concerns than that concerning individuals. But it still includes sensitive information, such as the precise location of species which can be subject to illegal harvesting. The Department published its [Sensitive Ecological Data Access and Management policy](#) as a step to addressing what can be an impediment to data sharing between jurisdictions. Concerns about legal liability for decisions made in response to environmental information, including climate change impact scenarios, may also affect data sharing and publication

Sustained collaborations are necessary to bring together the available data and make it available for use and reuse. As an example, the Department is publishing its long-term ecological monitoring datasets for the national parks it manages through the Australian Ecological Knowledge and Observation System (AEKOS), a data repository and search portal run by the Terrestrial Ecosystem Research Network (TERN) Eco-Informatics Facility and funded through National Collaborative Research Infrastructure Strategy (NCRIS). Another example is the Atlas of Living Australia's collaboration with the Department in the development of the Monitoring Evaluation Reporting and Improvement Tool (MERIT), National Species List (taxonomy-as-a-service) and the eFlora platform for the creation and delivery of taxonomic profiles of Australian plants. MERIT is the Department's online reporting tool and is designed to collect and store planning, monitoring and reporting data associated with natural resource management grants projects funded by the Australian Government.

The sustainability and stability of NCRIS observatories, including the Atlas of Living Australia, the TERN, the Integrated Marine Observing System, the National Computational Infrastructure (NCI), and the ongoing sustainability of national environmental data custodians and collections institutions, is important for the environmental information landscape. NCRIS funding is subject to a current road mapping process led by Australia's Chief Scientist. These facilities are important current partners, and offer the potential for even greater gains as intermediaries who can significantly improve data availability and, in the case of the NCI, substantially augment our analytical capacity.

The value of environmental data is increased when we can bring it together across the landscape, with location as a key attribute. Spatial tools and applications are important integration tools for realising the value of the Department's data. Our external webGIS applications include a [Protected Matters Search Tool](#) (PMST) which helps determine whether matters of national environmental significance or other matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) are likely to occur in a particular area of interest. This is the most accessed of our external applications, with over 26,000 reports requested by external users in 2015. The biggest users of PMST were the telecommunications sector, environmental consultants, and engineering and energy companies.

A leading example of data compilation for both better regulation and improved community understanding of a highly contested industry is provided by the [Bioregional Assessment Program](#). The program is a collaboration between the Department, the Bureau of Meteorology, CSIRO and Geoscience Australia to understand the impact of coal seam gas and large coal mining developments on water resources and water-dependent assets. One of the principles of the program is the provision of transparent and open data.

The online Bioregional Assessment Information Platform was launched in April 2016. Background information, reports and registers have been published on the platform and users can access the methods, models, maps and 600 datasets used to develop the assessments. When all assessments are complete, more than 1,400 datasets will be available. This nationally significant step forward in the delivery of science has cost around 10% of the program budget, or around \$5 million. Some of this cost will result in greater efficiency in processes around data acquisition and publication in the future.

Environmental data is also contributing to an improved understanding of opportunities for investment in renewable energy in Australia. The Australian Renewable Energy Agency (ARENA) is providing \$2.1 million of funding support for development of [the Australian Renewable Energy Mapping Infrastructure \(AREMI\) Project](#). AREMI is a freely accessible online mapping portal, which is a subsidiary project to the National Map, and is seeking to consolidate geospatial datasets pertaining to renewable energy resources, related infrastructure and other contextual information such as land tenure and environmental data. The combination of these datasets, presented in a readily

understandable visual format, is intended to improve decision-making and encourage investment by highlighting optimal combinations of energy resources and infrastructure.

ARENA is providing funding for mapping projects that provide data to the AREMI Project. Projects include the CSIRO Australian Wave Energy Atlas (\$1.3 million in ARENA funding), the Australian Biomass for Bioenergy Assessment (\$3 million in funding) and the Mapping Network Opportunities for Renewable Energy and Demand Management Project (\$453,000 in funding). These projects all provide data that fill identified gaps about renewable energy resources and opportunities for investment. In the renewable energy sector data on new and emerging technologies has been collected mostly through subsidy schemes. For example, the Solar Renewable Energy Certificate scheme ensures some visibility over the rooftop solar industry. Some new and emerging technologies, such as battery storage, have no attached scheme that enables government data collection although such data could potentially have major implications for the efficient and transparent operation of the energy market.

The implementation of the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) provides an example where the Government has played an essential role in the development of public datasets collected from the private sector/sources for broader community benefit. Under the NGER Act the Australian Government has set standards for greenhouse emissions estimation and reporting by companies through NGER legislative instruments. These provide mechanisms for efficient and cost effective reporting of data and for its broader dissemination by the Clean Energy Regulator.

The approach to the sharing and public release of these datasets collected by government from private sources has evolved under NGER. Public dissemination of such data has spill over benefits and is sought after by, for example, financial institutions attempting to assess the risk from the carbon exposure of their investments. Against these potential broader benefits from information sharing, the providers of the data have argued that public dissemination of such information generates unacceptable competitive risks to their operations.

Initially, the NGER scheme provided total protection of the private suppliers' data in all instances. Facility level data was unable to be publicly disseminated and punitive sanctions apply to officials for breaches of the protection of that data. Subsequently, the balance has shifted. The Clean Energy Regulator now publicly disseminates facility-level emissions data for electricity generators, while retaining the initial policy of the protection of facility-level emissions data for all other entities. Increased publication of facility-level data is also required under the National Greenhouse and Energy (Safeguard Mechanism) Rule 2015, which commenced on 1 July 2016. The balance that authorities have struck between these competing interests varies from country to country. In the United States, for example, a different judgement has been reached whereby the US Environment Protection Agency publishes facility-level emissions data for all industries for which it collects data.

Impediments and opportunities

There has been a significant shift in the culture around both data access and data holdings as a strategic asset. Environmental/geophysical data holders have been moderately progressive in this regard. There is growing momentum (and technical capacity) to house critical datasets and analytic tools online. For example, online platforms can facilitate understanding and communication of climate and disaster risks through a GIS capability that operates at multiple geographic scales (local, regional, and national), provides simultaneous user access, and real-time hazard and scenario information to improve both preparedness and long-term planning decisions.

Where historic underinvestment in environmental information systems exists remediation is costly. The Department is commencing improvements to major environmental databases to reduce regulatory uncertainty and improve integration. Resourcing of data analytics is generally also not well resourced with skilled analysts, IT infrastructure and computational power underdone. The Department is investigating opportunities to leverage cross-government initiatives and new technologies to increase capacity cost-effectively, and avoid duplication of effort. For example, the Department of Agriculture and Water Resources is partnering with the Department and the Atlas of Living Australia to reuse the linked open data platform that drives the National Species List in a taxonomy-as-a-service deployment for biosecurity management

For the Department, the value of environmental data in program and policy design is substantially enhanced when it is able to be brought together with economic and social data, and opportunities for shared value are realised. The Department is working across government to increase these opportunities including with the Department of Agriculture and Water Resources and the Australian Bureau of Statistics. There may be opportunities to work with the private sector - in particular the insurance and finance sectors - to drive climate-resilient development through improved access and sharing of hazard and exposure data. Improving the transparency and consistency of climate hazard and risk disclosure information can promote better management, allocation and pricing of risk across government, community and business.

Opportunities are being explored to increase the openness of biodiversity survey data required of industry by the Department for regulatory purposes, with the possibility of reduced costs to industry if it is made more accessible through public data portals such the NCRIS facilities. This would reduce the anecdotally reported instance of duplication, and place such environmental information into the precompetitive space.

Access to data is a feature of the 2016 State of the Environment report, in a way not previously envisaged. This five yearly, independently authored report will for the first time be released in an interactive digital format, with access to the data on which the authors relied for their assessments. While the first version of this platform is targeted at an iterative presentation of the 2016 State of the Environment and its underpinning data, it will provide a basis for ongoing environmental data release in a more timely, accessible and interactive manner.

Recent audience research conducted for the State of the Environment report indicated that digital release was taken as a given; a reflection that governments are merely catching up with expectations. The identification and consistent use (from assessment to assessment) of quality data sets that allow for trend analysis and reporting based on empirical evidence was reported in the audience research as addressing the greatest perceived limitations of the state of the environment process.

The expectation of communities for detailed locally relevant environmental information poses an ongoing challenge for a national agency. Exploration of applications and interpreted information products (beyond that currently available including the [MyEnvironment app](#)) continues as an important element of government transparency. As well as information availability, ensuring information is in accessible and useful forms for the broader community is an important challenge. This may involve publishing environmental data in applications delivered by industry bodies or the private sector.

Across government, broader adoption of Creative Commons by Attribution licensing would assist in reducing the significant resourcing required to publish major datasets. For example, accessing underlying data for release through the State of the Environment platform has been a resource intensive and onerous task, despite most datasets becoming ultimately available.

Institutional arrangements for the longevity of public data can also be insecure. Large data projects and portals do not always have enduring and stable arrangements for updating and ongoing support, despite the significant up-front public investment in their creation, and their value to industry and the community. Government agencies and programs can be transitory and if they are dissolved or scaled back all of that data collection and development can be lost, or significant collection and collation efforts remain as one-off 'snap shots'.

Emerging opportunities in remote sensing and new sensor capabilities offer the opportunity for more comprehensive and timely data collection, greater automation, and major impacts on departmental business and community engagement. Improved coordination and deep collaboration are required to fully realise the potential of new technologies. Many of these opportunities, such as the [Australian Geoscience Data Cube](#), require significant up-front investment. However the outcome in being able to track environmental change of time at management scales is potentially transformative.

Overall, the emphasis in the public data debate has largely been focussed on individual and business information. Environmental data is a third stream of value to government and the broader economy, given the value of natural capital to economic activity across Australia. Spatial data is the critical factor for integrating data and should form the "third spine" as an identifier for data. Environmental information is a domain with transformative potential.