

Improving Australian soil data and information governance

Peter Wilson
CSIRO Manager, National Soil Information
Coordinator, Australian Collaborative Land Evaluation Program

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EXECUTIVE SUMMARY

1.1 The needs

Environmental information is critical to the sustainable use and management of the world's resources. National and global issues of climate change and variability, food security, environmental degradation and resource scarcity require effective strategies for adaptation, mitigation and intervention, along with research and knowledge dissemination. This is dependent on environmental information systems and on processes which connect systems and improve data access and use. While this has long been the norm in financial and other fundamental systems, there are significant hurdles in achieving this with environmental information. Australian Government initiatives – including the National Collaborative Research Infrastructure Strategy, the 2011 Strategic Roadmap for Australian Research Infrastructure and the National Plan for Environmental Information highlight the need for comprehensive and connected information infrastructures – and are investing to progress them.

While there are technological aspects to meeting this need, the necessary underlying change has to be in processes, people and institutional settings – the governance arrangements for environmental information.

The world's soils are a fundamental part of the environmental information requirement. They underpin agricultural sustainability and food production, climate change and carbon sequestration, biodiversity conservation and the provision of ecosystem services, human health and infrastructure development (DAFF 2011). The System of Integrated Environmental and Economic Accounting (SEEA) includes soils as an essential component of the global standard for environmental accounting. Appropriate soil data and information are crucial to support evidence based policy, planning and resource management decisions.

1.2 Data governance

Within Australia, significant progress has been made with national governance arrangements to support useability of climate, geoscience, statistical and water information, but this remains a significant challenge and a constraint to the efficient use of soil data and information. Data governance improves the long-term management and use of strategic corporate data assets. A primary goal of data governance is to establish processes, people and technology to efficiently and effectively manage fundamental data so that it can be readily discovered, accessed and used. Governance defines who has rights and responsibilities and who makes decisions regarding content, access and use of data assets. Governance arrangements for soil information in Australia have, to this point, failed to provide a readiness for discovery, access and use of nationally consistent data and information. There is a clear and urgent need for directive action with long term institutional support.

Establishing national data governance is the most important first step required to improve the accessibility and use of Australian soil data and information.

Governance and ownership arrangements for soil data and information are remarkably diverse across Australia. The many Australian organisations with responsibility for soils data and

information (mainly government agencies, but also within industry, research and private sectors) have different information systems, access and pricing models and attitudes to information connectivity. As a consequence, custodial, access and licensing arrangements vary considerably. This makes it challenging to efficiently access, use and share soil data, particularly where data come from a range of providers, or are required for national, multi-jurisdictional or regional applications.

Currently there is a limited capacity for the national collation of consistent soil data and the dissemination of agreed information products. Achievements to date have largely been made through collaborative and cooperative approaches (including the National Committee on Soil and Terrain, and the Australian Collaborative Land Evaluation Program) or through specifically funded, non-ongoing project activity (such as under the National Land & Water Resources Audit, the Natural Heritage Trust or more recently, the Terrestrial Ecosystems Research Network). However, these approaches lack long-term strategic support. The resultant national soil data and information infrastructure is struggling and remains incapable of responding in a timely manner to the needs of an ever increasing range of users (including for example, international climate change modeling, national carbon accounting, species diversity forecasting, water resource management and regional agricultural suitability assessments).

1.3 The problem space

The underlying problem is that there is no authoritative national mandate or agency responsible for ensuring ongoing collection, management and dissemination of Australia's soil data and information. The fragmented and variable governance of soil data and information assets needs to be significantly improved. Governance includes implementing roles and responsibilities for data custodianship; developing and applying national soil data and information standards; and agreement to ongoing collection, management and open dissemination of the best available soil data and information products.

Opportunities to improve Australian soil data and information governance exist through –

- securing high level commitment to the importance of soil data and information, including recognition and resourcing for ongoing availability of critical and timely data
- supporting jurisdictional agencies to undertake agreed roles and responsibilities for primary soil data custodianship
- management and implementation of a set of national (and international) soil data and information standards (including methodologies, vocabularies, classifications and information models)
- active collection, collation, management and dissemination of all soil data and information to all users under non-restrictive licensing
- ongoing national collation of the best available, consistent soil data and delivery of standardised, amalgamated, value-added and endorsed national soil data and information products.

A Strategic Framework and Principles are proposed which guide the delivery of improved national soil data governance. The framework and principles provide support to the information infrastructure and data sharing aspirations of many current initiatives, such as the National Collaborative Research Infrastructure Strategy, the National Plan for Environmental Information, the National Primary Industries Research Development and Extension Framework, the 2011 Strategic Roadmap for Australian Research Infrastructure, the Australian Government AP 200 Location Project and the Declaration of Open Government.

A number of options for improving governance, access and use of Australia's soil data and information assets are available, ranging from –

- do nothing – leaving individual users to negotiate their own arrangements with multiple custodians on an as needs basis for each project
- strengthen existing cooperative arrangements – using National Committee on Soil and Terrain and Australian Collaborative Land Evaluation Program activities to progress national data sharing arrangements with individual jurisdictions and data owners
- formalise an inter-governmental agreement – committing to open sharing and free access to publically funded soil data and information; through to,
- implement a nationally agreed, mandated program – ensuring ongoing collection, collation and dissemination of soil data and information, similar to the approach used for water data under the Water Act 2007, such as through the National Plan for Environmental Information under the auspices of the Bureau of Meteorology.

1.4 Recommendations for moving forward

Recommended actions for improving national governance arrangements for soil data and information include –

1. identification of **an authoritative mechanism** to provide an agreed, national mandate to ensure all soil data and information are made readily available to all users, for free, with minimum restrictions on use. This could be progressed through discussion between the Soil RD&E Strategy Task Group, the National Plan for Environmental Information, the National Collaborative Research Infrastructure Strategy and all relevant jurisdictional environmental information initiatives
2. supporting the Australian Collaborative Land Evaluation Program to further progress a set of **national soil data and information standards**, to be endorsed and managed through the National Committee on Soil and Terrain (NCST)
3. all jurisdictions to implement nationally agreed **roles and responsibilities for custodianship**, including the dissemination of all publically funded soil data and information under Creative Commons Attribution 3.0 licensing
4. support **national data collation** within the Australian Soil Resource Information System and the development **and dissemination** of standard national soil data and information products endorsed by the NCST.

2. INTRODUCTION

Soils are an important component of priority national issues, such as agricultural sustainability and food production, climate change and carbon sequestration, biodiversity conservation and provision of ecosystem services, human health and infrastructure development (DAFF 2011). The complexity of soil, in terms of spatial and temporal variance, and the range of interacting characteristics and attributes, makes soil extremely challenging to know, quantify and manage.

Appropriate soil data and information are essential to support evidence based policy, planning and resource management decisions.

Data governance is important to improve the long-term management and use of strategic corporate data and information assets. A primary goal of data governance is to establish processes, people and technology to efficiently and effectively manage authoritative, fundamental data and information so that it can be readily discovered, accessed and used by many. Governance defines who has rights and responsibilities and who makes decisions regarding content, access and use of data and information assets.

Improving national governance arrangements is the most important step towards establishing a solid foundation for improving the accessibility and use of Australian soil data and information.

The Australian Collaborative Land Evaluation Program (ACLEP) has made considerable advances over the past 5-10 years to collate available site specific and mapped soil data from around the country within the Australian Soil Resource Information System (ASRIS). However, ongoing progress with this national collation is hampered by many factors, including –

- many soil data not being available in digital or standardised forms, requiring significant resources for jurisdictional agencies to capture this historic data resource
- a significant loss of many highly skilled and knowledgeable members from the soil science workforce and limited recruitment and applied experience of new employees in this area making future capture of historic data even more problematic
- variable individual, agency and jurisdictional implementation of ‘ownership’ and ‘custodianship’ concepts for soil data (collected largely if not exclusively with public government funding) resulting in complex and time consuming individual negotiations for rights to access and use soil data and information
- different jurisdictional business models resulting in a wide range of open data accessibility, confidentiality/privacy, intellectual property and liability, and cost recovery/commercial pricing being applied to soils data.

To shed light on the governance issue and recommend ways forward, ACLEP has reviewed the current governance arrangements for Australian soil data and information, considered what is needed for improvement, and looked at options, issues and opportunities. ACLEP has compiled this report to re-ignite discussion and engender action through the National Committee on Soil and Terrain (NCST), the National Plan for Environmental Information, the Soil Task Group, the Department of Agriculture, Fisheries and Forestry, and other interested parties.

3. DATA GOVERNANCE

Good data governance allows us to create, maintain, discover, access and use data assets (Wilson & Bleys 2008). Data are unique assets in that they actually increase in value through use. Increased access and use of data can help with validation and improvement of data assets and their incorporation with other data can have synergistic benefits to analyses and decision making.

Data governance is the term given to encapsulate a range of principles, processes and mechanisms which ensure good information management. Data governance has technical, economic, intellectual and socio-political aspects (Wilson and Bleys 2008) making it complex and often poorly understood and implemented.

A good description of data governance and some of the basic requirements is:

"Data governance refers to the overall management of the availability, usability, integrity, and security of the data employed in an enterprise.

A sound data governance program includes a governing body or council, a defined set of procedures, and a plan to execute those procedures.

The initial step in the implementation of a data governance program involves defining the owners or custodians of the data assets in the enterprise. A policy must be developed that specifies who is accountable for various portions or aspects of the data, including its accuracy, accessibility, consistency, completeness, and updating. Processes must be defined concerning how the data is to be stored, archived, backed up, and protected from mishaps, theft, or attack. A set of standards and procedures must be developed that defines how the data is to be used by authorized personnel. Finally, a set of controls and audit procedures must be put into place that ensures ongoing compliance."¹

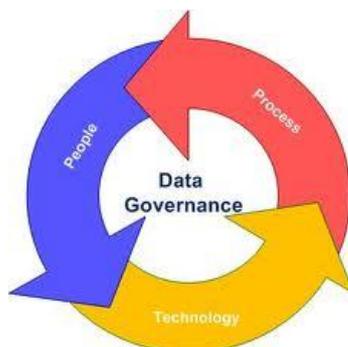


Figure 1 Components of Data Governance in a cycle of ongoing activity

Long term management of data requires commitment at the highest organisational levels and provides benefits not just for current business activities and needs but also provides a background infrastructure for future use and for external and unknown user requirements.

¹ datagovernanceblog.com

4. NEEDS FOR NATIONAL SOIL DATA AND INFORMATION

There is a clear need for soils data and information in matters of multi-jurisdictional interest. Examples are diverse and increasing for e.g. the management of the Murray Darling Basin, Office of Northern Australia interests in agricultural development, or enhancing the biodiversity values of eastern Australia's Grassy Box Woodlands. Consistent and comprehensive soil data is essential for national reporting and assessments such as previously undertaken by the National Land and Water Resources Audit (NLWRA), national State of Environment Reporting and proposed future environmental accounting through the Bureau of Statistics and the Bureau of Meteorology National Plan for Environmental Information. Soils are intrinsic as components of whole-of-Australia and international issues (such as climate change and soil carbon sequestration) and to reporting on international conventions on desertification or biodiversity. There is a demonstrable and high priority need to be able to collate the best available soils data from around the country into a consistent national data set which can be made available for use in a range of initiatives.

There are also Australia wide direct soil information activities (such as developing and refining the Australian Soil Classification (Isbell 2002) or developing a national soil condition monitoring program) that can only be achieved through a national approach or a central agency such as CSIRO, or an operational program such as The Australian Collaborative Land Evaluation Program (ACLEP). These national activities provide synergies and productivity increases driven by efficiencies, effective use of data and deeper collaboration within and between jurisdictions and internationally. They can only be serviced effectively through appropriate resourcing and the support of all Australian jurisdictions.

5. SOIL DATA GOVERNANCE IN AUSTRALIA

Soil data governance within Australia is very convoluted. Under the Australian Constitution responsibility for management of natural resources is largely acknowledged to rest with the individual States and Territories, with no clear overarching requirement for national consistency.

Short term priorities and competing needs of individual jurisdictions throughout Australia mean widely differing approaches to soil data management and dissemination have evolved over time and in response to local issues of importance. This continues to make national coordination, co-operation and collaboration a difficult set of ideals and has resulted in a large variance in the available nationally consistent soil data holdings in terms of extent, quality and content (Figure 2).

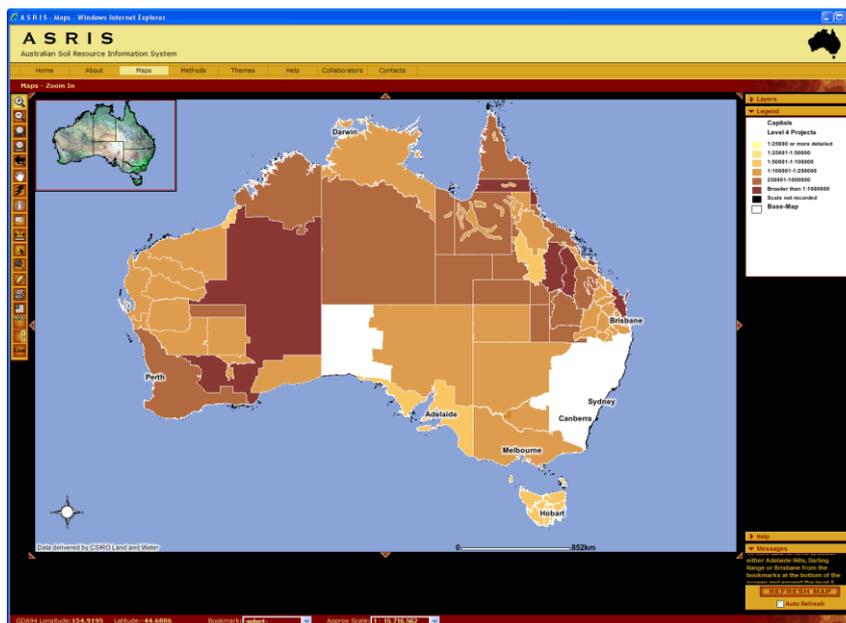


Figure 2 Example of ASRIS national data availability and range of inconsistent project scales for Level 4 data

NCST members completed a short questionnaire on the current soil data governance and management regime within their jurisdiction, as a snapshot of the situation rather than comprehensive review. A summary of key findings of this questionnaire is provided below.

<p>Governance</p>	<ul style="list-style-type: none"> • Mostly within a single agency in each state, although some specific soil data are managed across agencies. • Most states have been subject to frequent departmental changes and re-shuffles, with associated changes to operating procedures making it difficult to maintain continuity. • Limited mechanisms for coordination and communication on soil information management within states, mostly informal and <i>ad-hoc</i>.
<p>Data needs analysis</p>	<ul style="list-style-type: none"> • Limited assessment of specific user needs for soils data. Victoria has undertaken recent work in this area. • Mostly servicing environmental modelling and research, agricultural and regional planning users, although a widening range of users are requesting data. • Significant gaps occur in required data, particularly outside traditional agricultural zones. Some historical data exists in some areas but requires large investment to migrate to digital systems. • General loss of soil skills and knowledge across the workforce and reducing capacity to support users.
<p>Data capture</p>	<ul style="list-style-type: none"> • Very limited investment in new soil data capture. • Current investment in the Tasmanian Wealth from Water project and Victorian soil projects are significant but a national anomaly. Small projects are current in the WA Ord irrigation area and the Qld reef catchments. • Minimal active field survey programs or projects in most states.

Standards	<ul style="list-style-type: none"> • Most states are using ACLEP/NCST standards (eg Blue, Yellow, Green handbook series). • Data are being managed in digital systems, but different data bases and formats. • Most states can re-package and provide data compliant to current ACLEP/ASRIS data standards but this requires substantial work. • Particular data are often missing and must be estimated with very low confidence.
Information systems	<ul style="list-style-type: none"> • Digital data are available for viewing through a number of portals but limited amounts are available for download outside of agencies. • Variable cost and licensing associated with data access. • Some move towards Creative Commons Attribution licensing for soil data distribution. • Very few web services currently provided and limited capacity available within agencies to implement this technology.

Table 1 Summary of jurisdictional responses to soil data governance questionnaire

From the above it can be seen that there is a wide range of data governance mechanisms, concepts and systems in place throughout Australia. Good governance and information management practices are often in place within a single agency, but there is limited cross-agency or whole of government coordination or control. Data use is focussed on traditional clients with only ad hoc interaction with a potentially wide user base. Agencies have limited skills and capacity for expanding data provision and services to other clients. There are few new data capture programs and decreasing abilities to capture valuable historic non-digital data. Standards are adopted where available, but missing data transfer standards and on-line mechanism make delivery to ASRIS time consuming and expensive. Online data access is limited to within agencies and access and licensing is variable. Advancement in use of new web technologies for direct online data delivery and access are poorly implemented within most agencies.

The soil information situation is often compared to existing national mandates in other areas such as climate and water data through the Bureau of Meteorology, or geological data through GeoScience Australia, or national statistical data collected through the Australian Bureau of Statistics – however, all these have some level of national mandate and supporting legislation which provides a very different situation to soil data (Box 1).

BOX 1

*Lessons from other sectors***Geology – long established cooperation**

Extracts from - STRATEGIC REVIEW OF Geoscience Australia May 2011.

Arrangements governing interaction between Australian Government agencies vary considerably, from formal Memorandums of Understanding (MoUs) and subsidiary agreements to completely irregular interaction with no formal governance. Formal agreements are seen as important for clearly defining roles and responsibilities, for defining benchmarks for managing delivery, as well as for funding arrangements where relevant.

GA's relationships with counterpart agencies in the State and Territory Governments are complicated by a range of different policy drivers and the broad range of functions housed within two or more separate agencies.

The National Geoscience Mapping Accord (NGMA) was introduced in 1990 to accelerate geological and geophysical mapping and provide a more appropriate framework for exploration.

The National Geoscience Agreement, a memorandum of understanding, was enacted to provide the framework for ongoing geoscience cooperation between the Commonwealth Government and the states.

Water – national imperatives and solutions

Extracts from - A Commission vision for Australian water data arrangements, National Water Commission January 2008.

Water data should be regarded as a shared national asset with common-good benefits. It should be readily accessible to all stakeholders for planning, policy and management and accountability purposes. Water data should be available to be shared across agencies and jurisdictions. Free and open access to water data should be 'the default position' - denial of access should be a rare and exceptional event based on overriding reasons.

Current data sharing arrangements are insufficient for sustainable water planning. A national enabling framework is needed to facilitate the sharing of water data.

Water Act 2007 Act No. 137 of 2007 as amended

... to make provision for other matters of national interest in relation to water and water information...

The objects of this Act are:

(h) to provide for the collection, collation, analysis and dissemination of information about:

- (i) Australia's water resources; and
- (ii) the use and management of water in Australia.

Part 7—Water information

Division 2—Functions and powers of the Bureau and Director of Meteorology

120 Additional functions of the Bureau

- (a) collecting, holding, managing, interpreting and disseminating Australia's water information;
- (e) issuing National Water Information Standards;
- (f) giving advice on matters relating to water information;
- (h) any other matter, relating to water information, specified in the regulations.

eHealth – new needs

Extracts from - The inaugural Data Governance event May 2011, Health Informatics Society of Australia.

Data and information (and the integrity of both) are critical to organisational decision making and monitoring in healthcare. However, despite the recognised importance, the quality of the health information landscape in Australia does not effectively support activities such as health surveillance, guidance for policy, service planning, innovation and clinical and operational decision-making.

In an environment of exponentially increasing use of information systems in healthcare it is increasingly difficult to control the information in these systems. Information Governance provides a platform that promotes quality, safe, valid and ethical use surrounding information use. Data and information governance can be used to increase the power of the information required to inform decision making and direct practice.

6. A NATIONAL VISION FOR SHARING SOIL DATA

ACLEP promotes a vision that “*natural resource management in Australia is underpinned by appropriate soil and land resource information and knowledge to ensure sustainable economic and environmental systems*”. To facilitate this, the best available soil data must be made readily and openly accessible to all potential users. Institutional and organisational barriers to data discovery, access and use must be reduced. Data needs to be available as authoritative and standardised data and information products such that users can easily and efficiently incorporate them into their own business needs and processes.

Australian governments are largely responsible for the collection and management of Australia’s soil data assets.

The Spatial Information Action Agenda (Geoscience Australia 2006) called for recognition at all levels of government that spatial information forms part of public infrastructure and that spatial data should be made freely available.

The National Land and Water Resources Audit, in 2007, published a statement of intent for the development of an Australian Natural Resource Information Infrastructure (NLWRA 2007). This provided a vision that “*information can be easily accessed and integrated to support decision making for sustainable natural resource management*”. The statement provided a set of guiding principles and a phased and measurable approach for moving forward. The statement was endorsed at the time by the Natural Resource Policies and Programs Committee and the Natural Resource Management Standing Committee. With the demise of the Audit, little has been progressed to achieve this specific vision, which was underpinned by a need for genuine commitment.

A number of government initiatives and commitments have since been announced, although open, public access to standardised national soil data has not greatly been improved over the intervening 5 year period.

In July 2010, the Australian Government made a declaration of open government “built on better access to and use of government held information, and sustained by the innovative use of technology.”² The declaration states that “collaboration with citizens is to be enabled and encouraged. Agencies are to reduce barriers to online engagement...”

The Victorian Government also committed to open access to public sector information in its response to the 2009 Parliamentary Inquiry into Improving Access to Victorian Public Sector Information and Data. “Opening up public sector data and information is a major opportunity to increase engagement with the community and realise a range of social and economic benefits”.³

Data.gov.au provides an easy way to find, access and reuse public datasets from the Australian Government and state and territory governments. The main purpose of the site is to encourage public access to and reuse of government data by providing it in useful formats and under open

² <http://www.finance.gov.au/e-government/strategy-and-governance/gov2/declaration-of-open-government.html>

³ <http://www.egov.vic.gov.au/government-2-0/government-2-0-action-plan-victoria.html>

licences. It was created following the Government's Declaration of Open Government⁴ and response to the Government 2.0 Taskforce.⁵

On 11 May 2010 the Minister for Environment Protection, Heritage and the Arts announced a new initiative to address the environmental information needs of the nation. The National Plan for Environmental Information is the first step toward a long-term commitment to reform Australia's environmental information base and build this critical infrastructure for the future.⁶

A recent initiative of the Secretaries Board of the Australian Public Service, the APS200 Location Project, reviewed the policy and governance surrounding creation, management, sharing and utilisation of location information across the Australian government. A project report delivered in July 2011 seeks to address issues with a whole-of government framework. The Office of Spatial Policy has now been established within the Department of Resources, Energy and Tourism to progress this, including development of an implementation plan (including formal governance arrangements).

Recently the Australian Government Department of Innovation, Industry, Science and Research (DIISR) released the 2011 Strategic Roadmap for Australian Research Infrastructure⁷. This has direct relevance to the soil community, identifying Terrestrial Systems as a priority research capability area and highlighting the need for a renewed focus on Australian soils to address important research questions.

The 2011 Roadmap recognises the challenge and difficulty arising from the range of researchers, organisations and jurisdictions involved and recommends coordination through key initiatives such as the National Plan for Environmental Information and state government programs. The Roadmap acknowledges the need and role of data governance in achieving the desired outcomes. It identifies an accelerating need, over the next 5-10 years, for an eResearch infrastructure as an enabling capability to support research including an increasing demand for enhance international connectivity. Many underlying governance requirements are noted, including – building stronger collaboration and coordination, integration within and across disciplines, improved management of national and global research data environments, and the need to move towards a national research data management framework supported by strong data management leadership. Such a framework must include access to data, standards and agreed schemas, a requirement for long-term data management plans, development and use of tools, provision of links between data and publications, and importantly, the support of institutions to facilitate data sharing.

Moves towards more open government, along with rapid technological advances in internet based data access and on-demand use, provide an exciting opportunity for the soils community to provide improved access and use of Australia's soils data and information assets.

The soil community requires support by committed governments to the vision to make all available soil data and information freely and publically available in standardised national formats. There is an imperative to strengthen the national soil partnership, agree to roles for data custodianship and governance arrangements and appropriately resource soil data capture, management and dissemination programs.

⁴ <http://www.finance.gov.au/e-government/strategy-and-governance/gov2/declaration-of-open-government.html>

⁵ <http://www.finance.gov.au/publications/govresponse20report/index.html>

⁶ http://www.bom.gov.au/inside/eiab/Environmental_Info_fact_sheet_100511.pdf

⁷ <http://www.innovation.gov.au/science/researchinfrastructure/Pages/default.aspx>

A strategic framework and set of guiding principles for implementing this soil data sharing reform are presented below.

Together, we need to share and enable a common vision, strategic framework and guiding principles for improved soil data and information access within Australia. Recommended approaches to these are presented in the tables below, and are consistent with those previously supported by the National Land & Water Resources Audit, the National Plan for Environmental Information, and more recently the Australian Government AP 200 Location Project and the 2011 Strategic Roadmap for Australian Research Infrastructure.

Strategic Framework for Soil Data and Information

Vision	<i>Natural resource management in Australia is underpinned by appropriate soil and land resource information and knowledge to ensure sustainable economic and environmental systems.</i>	
Outcomes	<ul style="list-style-type: none"> • Sustainable Australia • Innovation and productivity 	<ul style="list-style-type: none"> • Safety and security • Social inclusion
Strategic Goals	<p>Informed policy development and decision making at all levels</p> <p>Improved service delivery</p> <p>Better engaged and informed public</p>	
National Drivers	<p>Climate change and carbon sequestration</p> <p>Agricultural development and food security</p> <p>Water availability and efficient use</p> <p>Ecosystem services and biodiversity conservation</p>	<p>Infrastructure development and management</p> <p>Regional Australia and tourism</p> <p>Defence and emergency management</p> <p>Health and social services</p>
Context	<p>National Soil Policy discussion paper</p> <p>Stocktake of current soil investment for RD&E strategy</p> <p>National Plan for Environmental Information</p> <p>2011 Strategic Roadmap for Australian Research Infrastructure</p> <p>Australian Government AP200 Location Project</p> <p>National Government Information Sharing Strategy</p> <p>Declaration of Open Government</p>	

Table 2 Strategic Framework for improved soil data and information governance

Principles for improved soil data and information sharing

Fundamentality	Soils are recognised as critical components of natural systems that provide a range of essential ecosystem services
Responsibility	Agreed roles and responsibilities for authoritative soil data and information governance and custodianship are consistently implemented
Accessibility	Soil data and information should be easy to find and readily accessible to all potential users
Availability	Soil data and information should only be withheld in exceptional circumstances, made explicit to potential users (e.g. privacy or confidentiality)
Standardisation	Nationally agreed standards for soil data and information collection, transfer and integration are implemented to provide a consistent information infrastructure
Licensing	Soil data and information products will be provided under minimally restrictive Creative Commons Attribution 3.0 licensing

Table 3 Principles for improved soil data and information sharing

7. THE ROLE OF ACLEP

There is no national body with a strong mandate to address this cross-jurisdictional issue, without perhaps considering COAG. Recent restructuring of Ministerial Councils and reporting arrangements has left no clear direct line of communication for soil related issues to peak government forums.

Australian Government initiatives such as the National Plan for Environmental Information (NPEI - DSEWPAC/BOM), the Terrestrial Ecosystems Research Network (TERN - DIISR) and the APS 200 Location Project (Department of Resources, Energy and Tourism) have an interest but not a clear mandate for authoritative cross-jurisdictional leadership and decision making. ANZLIC – The Spatial Information Council and other national information management organisations provide guidelines and processes, but not decisions and directives. Individual agencies such as DAFF and CSIRO have an interest in the outcome, to improve efficiencies in access and use of soil data for their purposes, but can only control activity within their single agency.

Coordination approaches such as the National Committee on Soil and Terrain (NCST) and the Australian Collaborative Land Evaluation Program (ACLEP) strive to improve operational efficiencies and technical interchanges within the soils community and a wide user base, but struggle with bottom-up approaches to management within individual agencies and cannot effectively engage across agencies for whole of government consideration. Individual jurisdictional agencies are bound by different models of operation and are limited in supporting national approaches unless there is a clear benefit to the jurisdiction for such involvement.

It appears that we have lots of mechanisms for communication at different levels, many tools and approaches for improved data sharing, but no clear national authority and mandate. This is not unique to the soils community and is a shared challenge across many areas of Government and private sector activity. The question therefore remaining is who can provide the required leadership and do something to improve the current soil data access dilemma?

Over the past decade or more, ACLEP has developed a nationally consistent collation of soil data and information within the framework of the Australian Soil Resource Information System (ASRIS). The aim is to create and make available, as complete a national data set as possible for the widening range of users and uses. This national process has been supported by collaborating member jurisdictions of the National Committee on Soil and Terrain and their affiliate agencies. Participation by jurisdictions has occurred to varying degrees, often dependant on many things including operational, institutional, or political issues and availability and capacity of skills and knowledge.

The national collation of soil data within ASRIS is managed by CSIRO through the Australian Collaborative Land Evaluation Program (ACLEP). This program is currently funded through CSIRO and DAFF along with in-kind support by the NCST members, however this program operates with annual work plans and funding approvals. The long-term management and availability of this essential national information infrastructure is therefore tenuous and consideration needs to be given to securing the future of ACLEP and ASRIS.

Proposals for the development of well supported and managed national environmental information systems have been around for many years, such as that envisaged by the National Land & Water Resources Audit's proposal for an Australian Natural Resource Information

Infrastructure (ANRII)⁸, or the Australian Government Environment department’s National Environmental Information System to support national State of the Environment reporting. There is hope that such a robust national system will be forthcoming in the future through the emerging National Plan for Environmental Information being developed by the Bureau of Meteorology⁹. Such a system however, will still rely on an ability to collate data from multiple projects and providers across multiple jurisdictions, using agreed data and information standards and will have to deal with many of the issues currently being faced in the soil data domain by ACLEP through the development of ASRIS.

8. OPTIONS FOR IMPROVING NATIONAL SOIL DATA GOVERNANCE

A number of options for improved governance and greater access and use of Australia’s soil data and information assets are available, ranging from –

- do nothing – leaving individual users to negotiate their own arrangements with multiple custodians on an as needs basis for each project
- strengthen existing cooperative arrangements – using National Committee on Soil and Terrain and Australian Collaborative Land Evaluation Program activities to progress national data sharing arrangements with individual jurisdictions and data owners
- formalise an inter-governmental agreement – committing to open sharing and free access to publically funded soil data and information; through to,
- implement a nationally agreed, mandated program – ensuring ongoing collection, collation and dissemination of soil data and information, similar to the approach used for water data under the Water Act 2007, such as through the Bureau of Meteorology National Plan for Environmental Information.

Obviously the ‘do nothing’ approach is untenable in the long term. The current system is inefficient and frustrating for data users. It leads to significant duplication of effort and expenditure of a large proportion of project funds through time consuming data access negotiation, access and integration activity. The only support for the current approach seems to stem from data owners being able to more readily control the use of their data, forced interaction between data owners and users leading to possible collaboration and more informed use of data, and more exclusive use of publically funded data by the agencies that have collected it. The benefits of such control are far outweighed by the potential efficiency savings, increased access and use, innovation and broader research, policy and management outcomes that would be provided by a more nationally consistent, streamlined, open approach to data governance and access.

The second option is the approach that has been pursued by ACLEP, through the NCST, for a number of years. Whilst this cooperative approach has been successful with some jurisdictions and for some types of soil data and information, it has resulted in significant gaps in the national data holdings and a significant constraint to access and use of nationally consistent data by third parties. ACLEP is currently able to utilise data for some CSIRO, Australian Government and multi-jurisdictional analysis processes, but it is restricted to only making the data visible and not

⁸ <http://lwa.gov.au/products/pn21251>

⁹ <http://www.bom.gov.au/inside/eiab/NPEI.shtml>

readily accessible to other users. Large numbers of requests for downloads of visible data are regularly received from a wide range of government, education, industry and private users, which need to be referred on to multiple data owners for further access negotiation and process.

ACLEP is considering possible approaches to seek agreement from jurisdictional data owners that all data managed within ASRIS can be made publically available under unrestrictive licensing in the future. This may cause little concern in some jurisdictions but may also stop some jurisdiction supplying data to ASRIS in the future. Since ACLEP and the NCST have no legal standing, any agreements between parties will need to be facilitated through an agency (such as CSRIO or DAFF) with that agency accepting any ensuing responsibilities or liabilities.

Development and endorsement of a high level agreement between governments would provide a solid grounding for improved soil data governance and sharing. Similar approaches have been successful in the past, for example the 1992 Intergovernmental Agreement on the Environment¹⁰, the 2001 National Land & Water Resources Audit-ANZLIC Data Access and Management Agreement, and the geological survey 1990 National Geoscience Mapping Accord and the National Geoscience Agreement memorandum of understanding. Progressing a national agreement would be likely to take considerable time and require significant involvement and negotiation from each jurisdictional government. It would need to be at level high enough to ensure commitment of all relevant agencies. This may be achievable at an agency level or may require escalation to a ministerial forum.

The highest level of mandate would be provided through a legislative arrangement. Without a significant national imperative it is unlikely however that soil (at least as an issue on its own) would drive the development of national legislation. The Water Act 2007 was a response to such a national imperative, but it was supported by a significant shift in government policy and considerable financial investment to achieve whole-of-Australia outcomes. It is likely that soils may be covered under national environmental information legislation¹¹ being developed by the Australian Government Department of Sustainability, Environment, Water, Population and Communities, although it is unclear at this stage how binding such legislation would be on other jurisdictions.

9. ISSUES AND OPPORTUNITIES

9.1 Ownership

Ownership is generally assigned to the original creator of a data entity. Where data creation projects have been funded through one agency and are undertaken by another (or co-funded) or sub-contracted to third parties or private individuals, the lines of obvious ownership can easily become blurred. Unless funding contracts and sub-contracts explicitly state ownership rights for data then funding agencies can find themselves not owning data and being reliant on additional negotiation of access and use rights. Most current contracts are explicit in terms of ownership, intellectual property, liability and licensing, but ownership of historic data is much less clear.

¹⁰ <http://www.environment.gov.au/about/esd/publications/igae/index.html>

¹¹ <http://www.environment.gov.au/npei/index.html>

State/territory jurisdictions generally claim ‘ownership’ of soils data (where they have been the data collecting agency) and the Commonwealth (as funder or co-funder for a considerable amount of Australia’s soil data) has tended to agree with this approach as long as it has a non-exclusive right to use and (usually) sub-license the data for any purpose. Accordingly, CSIRO (as ACLEP) as the manager of ASRIS probably has a ‘legal’ right to utilise the nationally collated data, including distributing data to others and creating products from it. However, this approach could be seen as antagonistic to the national ‘collaboration’, which needs to be protected as the back-bone of the current ability to manage and use soil information for cross-regional, national and even international purposes. A move to enforce such data use would not be supported by ACLEP or the NCST. A new acceptable, approach has been proposed through the development of ‘standard national soil data products’ which provide a level of interpretation and abstraction from jurisdictional data inputs (see further discussion in section 9.5).

9.2 Custodianship

Custodianship embodies the principles of stewardship, care and long-term management. It does not infer ownership, and may often be a responsibility assigned to a management agency by individual data ownership agencies. In this sense, ACLEP acts as custodian for the nationally collated data held in ASRIS, which is individually owned by many contributing agencies.

The Queensland Spatial Information Council Custodianship Standard 2010 defines a Custodian as: “An organisation accepting the obligations for the collection, maintenance and provision of a dataset in accordance with a specified standard or specification. A custodian may also be the owner” (State of Queensland Department of Environment and Resource Management 2011).

The Australian Government Custodianship Guidelines outline the rights and responsibilities of Spatial Data Custodians¹². Custodianship is seen as being at the core of efficient and effective spatial information management. The benefits of custodianship are that a custodian agency is most likely to become the preferred supplier for information under its custody. This is because it holds the most comprehensive, accurate and, ultimately, credible information.

The role and responsibilities of custodianship should not be taken on lightly. Organisations must be committed to their roles as custodians and assign resources to maintain, update and provide access to sets of data and authoritative products from them (Wilson and Bleys 2008).

9.3 Access to data

Access to data should ideally be made through the custodian, not from a secondary source as this would ensure the user has the latest, best available data set. As a general principle, access to data should not be denied other than on grounds of privacy, national security, or confidentiality and in those instances the reason needs to be stated clearly. Access may be subject to specified use restrictions (such as rights to sub-license, copy or use for commercial purposes) under the conditions of a data licence.

Where possible, data should be provided through internet enabled search and delivery mechanisms. Clickable, standardised licensing should be provided such that users can access data in a timely manner. Some spatial data sets associated with soils can be large and not easily

¹² <http://www.osdm.gov.au/OSDM/Policies+and+Guidelines/Custodianship/default.aspx>

distributed through online mechanisms. In such cases, processes for physical transfer on temporary storage devices may be required and some minimal cost for media or to cover transport charges may be appropriate.

9.4 Rights to use

The main issue with the current ASRIS national data is that there is no available historic register of just who owns what and who has what rights to use, sub-license etc. any particular data. This comes mostly from a long history that has seen soil data collected and developed by a wide range of national, state, CSIRO and other (public and private) projects. Funding of these projects does not necessarily directly imply ownership, and in many cases projects have been jointly funded usually by a mix of state/Commonwealth agencies and sometimes with private or industry investment. Most early project contracts (20-30 yrs ago, when digital information systems were just developing) did not usually explicitly deal with ownership or use/licensing of resultant data. More recent projects (last 10-15 years, with sharing and re-use of data becoming more common) have tended to have some clauses dealing with use etc, although the contract detail is variable and in any case finding and analysing all these agreements would be virtually impossible. As our digital data understanding has matured, most current contracts tend to at least contain indications of licensing use and rights, although clauses concerning intellectual property and liability often continue to be the negotiation sticking points.

The situation at present is that the specific license conditions which attach to particular records within ASRIS data cannot easily be determined. No register of the individual license conditions exists and data have been provided to the central ASRIS repository over a number of years, under different conditions and varying degrees of documentation. Determining and applying specific license conditions for different components of ASRIS data is unrealistic. A “gentlemen’s” agreement therefore exists between the ACLEP/ASRIS management team and the members of the NCST, that state/territory agency data (and to a large extent any information product derived directly from them) will not be made available to third party users through the ASRIS web interface, unless specific permission is granted by the multiple custodial state/territory agency. This creates a frustrating situation for potential users, who can often see what they want on ASRIS but cannot readily access and use it without protracted negotiation and agreement to lengthy and restrictive license conditions.

9.5 New ASRIS data products

Recently, ACLEP has used the primary soil data (site and map based) that have been provided by the jurisdictions to comply with standard ASRIS data models, to create a nationally consistent set of the best available soil data for Australia. Data have been interpreted and modelled into a set of ‘standard national soil data products’ which represent specific soil attributes (such as soil carbon or pH in the top 30cm) as a gridded/raster surface at 250m resolution across continental Australia (Figure 3).

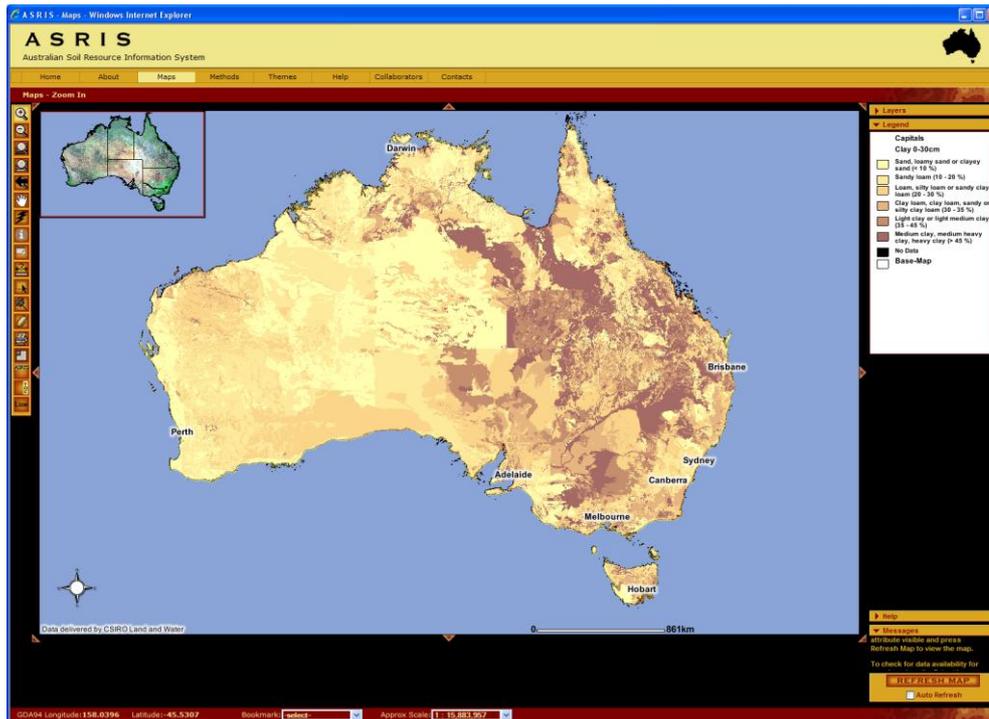


Figure 3 Example standard national soil data product – clay% in top 30cm interpreted from best available ASRIS data layers.

The data products are representations of the ASRIS data that has been generalised to a degree and cannot be de-constructed to the original source data and therefore should not breach any existing licensing conditions. They have been reviewed and endorsed by jurisdictions through their members of the National Committee on Soil and Terrain, with ‘approval’ from the NCST for publication and distribution of the data sets through ACLEP/ASRIS.

‘Standard national soil data products’ are endorsed by the NCST as authoritative representations of the best available national data. A remaining question with the approach however, is just who is the actual legal entity taking responsibility/liability for these data, as ACLEP is only a collaborative program. The recommendation is that CSIRO or DAFF, as current key funders of the ACLEP work plan, should shoulder this responsibility (although all jurisdictions contribute significantly through in-kind and direct inputs). Since ACLEP is based within CSIRO it would be easier for CSIRO to hold the responsibility/liability internally, but that requires further discussion with DAFF and other partners. A form of collaborative agreement between NCST member agencies and CSIRO may be appropriate to provide certainty to this arrangement.

9.6 Licensing

Another question is under what license conditions should these ‘standard national soil data products’ be released? The intention of the ACLEP and NCST activity is that these are openly and freely available with no restriction on their use other than attribution of source (i.e. ACLEP including reference to individual contributing agencies).

Creative Commons (CC)¹³ is a way of managing copyright in the digital environment. It is gaining widespread acceptance and use by creators, educators, cultural institutions, researchers, government officers and the general community (see AusGOAL <http://www.ausgoal.gov.au/>).

On 25 May 2011, the Australian Information Commissioner launched the Principles on Open Access to Public Sector Information. These Principles provide practical steps to help build a culture of proactive information disclosure and community engagement in the Australian Public Service, including -

Principle 6: Clear Reuse Rights

The economic and social value of public sector information is enhanced when it is made available for reuse on open licensing terms. The Guidelines on Licensing Public Sector Information for Australian Government Agencies require agencies to decide licensing conditions when publishing information online. The default condition should be the Creative Commons BY standard, as recommended in the Intellectual Property Principles for Australian Government Agencies, that apply to agencies subject to the Financial and Management Accountability Act 1997. Additional guidance on selecting an appropriate licence is given in the Australian Governments Open Access and Licensing Framework (AUSGOAL).¹⁴

Creative Commons is becoming a widely accepted and standardised approach across many governments and is regularly used for example by the Australian Bureau of Statistics, GeoScience Australia and the Department of Agriculture, Fisheries and Forestry. The Bureau of Meteorology recommends using the Creative Commons Licence (Creative Commons Attribution Licence) for water information¹⁵. Creative Commons licensing has been applied to soil data in Queensland under the Government Information Licensing Framework. The Terrestrial Ecosystems Research Network (TERN) is developing a standardised licensing framework which includes use of Creative Commons licenses which will be applied to new national soil data sets currently being developed by the TERN Soil and Landscape Grid of Australia Facility¹⁶.

A likely approach suitable for soil data is therefore to use 'Creative Commons By Attribution 3.0 Australia' licensing¹⁷.



ACLEP is now trialling this licensing approach with release of the new national 250m gridded soil attribute data sets¹⁸, and is further considering the best mechanism(s) for release of the national data sets, initially through ASRIS (as this is the system that will manage the actual data) but potentially with links to other 'portals' such as the CSIRO Data Access Portal, the Atlas of Living Australia, TERN Soil and Landscape Facility Portal and/or www.data.gov.au.

¹³ <http://creativecommons.org.au/>

¹⁴ <http://blog.ausgoal.gov.au/2011/07/07/oiac-cites-ausgoal-in-principle-6/>

¹⁵ <http://www.bom.gov.au/water/regulations/dataLicensing/ccLicense.shtml>

¹⁶ <http://www.tern.org.au/Soil-and-Landscape-Grid-of-Australia-pg17731.html>

¹⁷ <http://creativecommons.org/licenses/by/3.0/au/deed.en>

¹⁸ <http://www.asris.csiro.au/themes/NationalGrids.html>

10. SOLUTIONS AND RECCOMENDATIONS

The national ASRIS data collated and maintained by CSIRO is largely considered the intellectual property of the contributing agencies (mostly Australian, State/Territory Governments) and cannot be freely distributed to third parties due to current licensing restrictions. The proposed 250m (and future 90m) raster/grid “standard national soil data products” delivered through ASRIS will overcome some of the current licensing restrictions and issues, particularly for derived products if not input data.

For a longer term solution to the licensing dilemmas of ACLEP, it is hoped that a case can be made to recognise the untenable nature of current licensing confusion and to acknowledge the collaborative government funding and public good nature of soil data and information. All government soil data and information should be made freely and publically available for no cost through digital download. The Creative Commons By Attribution 3.0 license should be used for all available soil data and information so as to provide freedom to operate for all.

Without blanket implementation of open, less-restrictive licensing, some form of agreement (a simple letter, or MoU, or Bilateral Agreement or even legislation?) from an appropriate level of each government may be required. Given the status of ACLEP as a program and not a legal entity, it is likely that negotiations would need to be progressed through CSIRO or some other Australian Government agency and the relative agencies in each jurisdiction. Since access and licensing are not only an issue for soils data, and because of the nature of whole of government to government agreements, it is also probable that such approvals could only be achieved at the most senior levels, possibly requiring the involvement of a Ministerial forum or even the Council of Australian Governments.

It is recommended that further discussions consider possible future approaches and responsibilities for soil data governance, custodianship and access, particularly aligning to activities under the National Primary Industries Research Development and Extension Framework and with the Bureau of Meteorology National Plan for Environmental Information.

10.1 Recommendations for moving forward

Recommended actions for improving national governance arrangements for soil data and information include –

5. identification of **an authoritative mechanism** to provide an agreed, national mandate to ensure all soil data and information are made readily available to all users, for free, with minimum restrictions on use. This could be progressed through discussion between the Soil RD&E Strategy Task Group, the National Plan for Environmental Information, the National Collaborative Research Infrastructure Strategy and all relevant jurisdictional environmental information initiatives
6. supporting the Australian Collaborative Land Evaluation Program to further progress a set of **national soil data and information standards**, to be endorsed and managed through the National Committee on Soil and Terrain (NCST)
7. all jurisdictions to implement nationally agreed **roles and responsibilities for custodianship**, including the dissemination of all publically funded soil data and information under Creative Commons Attribution 3.0 licensing

SOLUTIONS AND RECCOMENDATIONS

8. support **national data collation** within the Australian Soil Resource Information System and the development **and dissemination** of standard national soil data and information products endorsed by the NCST.

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Contact Us

Phone: 1300 363 400

+61 3 9545 2176

Email: enquiries@csiro.au

Web: www.csiro.au/flagships

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