

Chapter 1: Introduction

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Designing a National Infrastructure to Manage Land Information

Australia's land administration agencies focus on state and territory processes. They should be able to provide the integrated information needed by policy makers, business and community stakeholders required to serve modern and complex markets and resources management, which increasingly require a national focus. This has resulted in the need for an infrastructure to nationally integrate disparate, state-based land information and administration processes to meet national needs. The NIMLI project addresses these needs.

The need for a national framework to manage land administration that is evident at both national and state levels can be assisted by Australia's strong track-record in the integration of information. Due to the importance of information about built environment, this local level of government also needs to be integrated within the national framework. In addition, a range of private sector interest groups and even community organisations should also play a role within the national framework.

This chapter is an introduction to the land-related research projects of the Centre for SDIs and Land Administration. The chapter introduces the composition of different elements and major outcomes and drivers, applications and demonstrators of the research projects. In particular, the chapter summarises a snapshot of the publications delivered through these projects.

Identification of the National Drivers

As part of the (NIMLI) project and the result of an intensive international study by the Centre on the drivers for a national land information infrastructure, Bennett et al., (2012) show that the national drivers are complex and change frequently, generally due to political, scientific and environmental debates raising policy issues. This study has suggested the drivers can be classified into the following categories and as shown in Figure 1:

- economic management
- environmental management (built and natural)
- social management
- harmonised governance
- technological possibilities.



Figure 1. National Drivers for an Infrastructure to Manage Land Information

Economic Management

Land generally is a fundamental resource for economic activity. Land as a physical commodity is subject to economic forces of supply and demand similar to any commodity or service (Bennett, 2012). The greater the demand for land, the higher the value of the land. The economic theory of derived demand suggests that the demand for land information and public access to the information is tied to the increasing value of land and increasing complexity of the land-related commodities. The increased value of land information should lead to improvements in recording procedures to deliver more cost effective access to land information resources.

In Australia for example, trends towards sharing land information are more obvious than ever before. Institutional barriers to SDIs are rapidly diminishing. The need to share data to solve state and federal issues is increasingly recognised. For example, a seamless national economy such as that espoused by the Council of Australian Governments Reform Council (COAG Reform Council, 2009) demands data sharing by those contributing to and governing the economy. Information sharing was also recognised in the ‘National Market for Retail Leases’ report prepared by the Australian Government’s Productivity Commission (Australian Government Productivity Commission, 2008). From an economic perspective, the need to present land and property information on a coherent national scale is now undeniable. A national infrastructure for land information in Australia

is the next step in achieving greater economic efficiency in land administration.

The transferability of rights in land underpins an active and secure land market that plays a key role in the country's economic situation. However national banks, insurers, property and superannuation funds, and developers usually struggle with the jurisdiction-based laws and processes in a market, that is increasingly national in focus. At the macro-economic level, organisations such as the Reserve Bank of Australia (RBA), in any jurisdiction require national property information to make informed decisions about national monetary policy. Currently, authoritative land transaction and ownership information in Australia, for example, is the domain of the states: there is no requirement for the states to deliver this information to national agencies. A more collaborative solution appears necessary.

Another example is taxation of land. Effective land taxation requires reliable information about property location, ownership, values, and the people and entities who enter or intend to enter the market, either as owners or renters.

Countries who have 'unbundled' interests in land and resources, are enjoying multiple markets in complex commodities related to land (Wallace and Williamson, 2006). In this context, the modern land market needs seamless national datasets for economic management. Unbundling has opened up new sources of economic activity for the nation. Ownership information for the complex rights, restrictions and responsibilities (RRRs) associated with land is critical in the enforcement of a wide range of laws and regulations (Bennett et al., 2008). Additionally, assignment and maintenance of ownership information are important administrative tasks required to support marketing and exchange of property rights in biota, carbon, water, environmental interests, conservation arrangements, property investment schemes and more.

These initiatives must be accommodated within a nationally consistent land tenure infrastructure in order to sustain a globally competitive land market that continues to attract international investment and reasonably priced credit. These increasingly global markets in money and property demand that the cadastral structure of land parcels be refocused to deliver information about new property objects at a national level.

Natural and Built Environmental Management

Environmental management also requires access to national datasets: the natural environment does not respect state or local borders. Effective management of cross-border situations increasingly requires access to national land data sets.

Drought relief provides another example. For example, the Australian Government provides financial assistance to farmers affected by prolonged drought, in the form of a 'Farmers Income Support Payment'. To be eligible for this assistance a farmer must be living in an 'exceptional circumstances' declared area. Centrelink, an agency operated by the Commonwealth Government, is responsible for allocating the assistance. Centrelink, like the rest of the federal government, has limited access to parcel and property information. To fill in the gaps, farmers who apply for an exceptional circumstances income support payment are required to provide Centrelink with the addresses of their farms (accompanied by rates notices), and hand-drawn maps of its location (including property boundaries, roads, and towns all with approximate distances). This immature spatial representation is used by Centrelink to verify that locations of farms are within the exceptional circumstances drought declared areas. In the past, these inadequate arrangements led to difficulties in the validation of claims and identification of fraudulent claims.

Drought relief examples bring into focus the broader case of disaster management. Many disasters, including floods, cyclones, bushfires, locust plagues, and spreading livestock disease, are unconstrained by state and territory borders; however, they continue to be managed within jurisdictional confines. These land administration inadequacies combine with jurisdictional, institutional, and human obstacles to impact on disaster management at all government levels. In many cases, access to a national land information framework would radically improve disaster mitigation, preparedness, response and recovery.

Management of the built environment also requires national land information. The dynamics of housing provision also shed some light on the need for a national framework to manage land information. Processes of adding housing units to existing stock require the collation and analysis of several data sets throughout various hierarchies of government – federal, state and local. These processes strike disparate land-use planning strategies that might be better integrated into a national approach involving both land-use planning strategies and information management.

Ultimately the national scale approach would improve understanding of how strategies influence agencies and people engaged in housing production including landowners, developers, financial institutions, planning authorities, building contractors, professionals in the building industries, and their parties that might be impacted by development proposals.

Identification and mitigation of risks to infrastructure and the natural environment along the coastal zone also demand aggregated land and property information at the national level (DCC, 2009).

Social Management

Governing the activities of people and communities requires access to land information on a national scale: land information allows people, communities, and their activities to be linked. Responding to organised crime on a national level and allocating welfare and relief-funding, demand such an approach.

Law enforcement and emergency management are national activities. However, law enforcement and emergency management responses are reliant upon the parcel and address layers: they link people and activities to an identifiable position. A national infrastructure that links local, state and national land information would also act as a platform for a wide range of other non land-related activities (e.g. law enforcement) and datasets to be linked.

The current national government's desire to include 'Social Inclusion' principles in all decision making will also need to be underpinned by national datasets that link people, place, and societal activities.

Harmonised Governance

Good governance is often described as the fourth pillar of sustainable development. Increasingly, harmonised governance is seen as being an important part in delivering good governance. Harmonised governance attempts to reduce legal and administrative complexities for citizens by demanding that different arms and levels of government integrate their responsibilities and administrative process. The need to harmonise the governance systems of different levels of jurisdictions in line with national governments is always recognised by most stakeholders. Harmonisation can save millions of dollars and radically improve the ability of businesses, communities and governments to operate on a national level. Meanwhile, private sector frustrations about inadequate and out-of-date arrangements

continue to grow. The national umbrella organisations all see benefits in more timely and seamless spatial and land information.

Technological Possibilities

Spatial information and technologies are changing the way business and governments manage activities and solve problems. Much information relates to place and locations. Some of this is spatial information, but a great deal is information that can be organised according to its impact on a place.

Global technology companies such as Google and Microsoft are the popular players in this paradigm shift. Google's easily accessible Web 2.0 friendly web-mapping platforms have commoditised once complex and expensive GIS processes. Additionally, freely available high-resolution imagery and 3D visualisation tools have demonstrated the power of spatial information. Users of government information systems increasingly demand this level of visualisation and functionality.

The contemporary information revolution is not only about merging phones and computers. The commoditisation of spatial information management platforms allows SDI practitioners to move their focus from organising spatial information to *spatial organisation of information*. This involves using place information as a sorting and accessing method for handling masses of other information.

These emerging spatial technologies potentially expand the capacity of governments. They provide possibilities for ordering information that are profoundly world changing. The more difficult task involves embedding new technologies into the most conservative and fundamental processes in land information and management of the land market, particularly, into the land registries. Regardless, the opportunities provided by emerging technologies are driving changes in the way governments interact with their citizens, principally in initiatives to spatially enable their processes, as well as their information.

Defining the Scope and Components

Based on the analysis of national drivers, at least eight design elements are required to deliver a national infrastructure to manage land information according to the study by the CSDILA research team as reported by (Bennett et al., 2012) and illustrated in Figure 2.

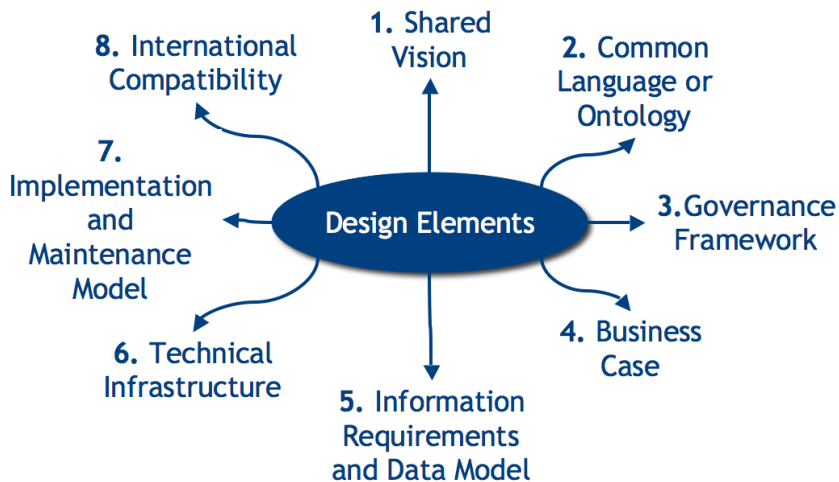


Figure 2. Design Element for a National Infrastructure to Manage Land Information (Bennett et al., 2012)

Shared Vision

While the need for a national infrastructure is now clear, its characteristics and functionality are not. How the underlying policy, legal, institutional, and technical components should be built and governed remains unresolved. Some suggestions envisage a relatively simple postbox system for lodging land registrations to the respective national-based systems using a single point of entry and streamlined, single electronic data entry building on national electronic conveyancing ideas for example. More radical visions involve integrated transaction management delivering authoritative information relating to addresses, valuations, tenures, development processes, planning systems, and the management of complex commodities.

Integration of land information with other datasets covering people, business and legal entities, vehicles, and others, following the European Union idea of authoritative registers, is also worth considering. Issues of data inclusion, data currency and data authenticity all need assessment. The development of this vision will require relationship management beyond state and national governments, and should include local governments, and private sector stakeholders in community and business sectors.

Common Languages or Ontology

Attempts by researchers and jurisdictions to create ontological frameworks for management of land information are now common. The European Union developed a process-based ontology for managing property transactions through comprehensive activity diagrams that allow comparisons in EU countries (Bennett et al., 2012). These analyses of property processes allow a seamless approach to the local detail in each jurisdiction, overcoming the differences between land registration and deed registration approaches in property sales and mortgages.

An example in Australia of similar activity is ANZLIC's efforts through its Standing Committee for Land Administration and Property Rights (SCOLA) that has been working for some time on establishing a national set of principles for consistent characterisation of property interests to facilitate electronic enablement and Web-based access. Work of this nature is critical in developing the necessary common language to support a national infrastructure.

Governance Framework

A governance framework is essential. The nature of this framework needs determination. Arrangements relating to policy, legal, and institutional aspects must survive changes of government, administrative fashions and budgetary priorities. In relation to policy, the guiding principles of the framework need determination. Legal principles to guide changes of existing legislative frameworks need to be articulated. For example, the ability to use the data as evidence in Australia's courtrooms and tribunals is essential. Whether a minimalist or maximalist approach to legal changes is best, it also needs analysis. This applies to institutional arrangements, should a new framework attempt to reorganise the functions of entrenched land administration agencies. The preferred relationship between the three levels of government, peak national bodies, and the private sector needs to be determined, as does the role of public/private partnerships.

Business Case

Satisfactory performance of the infrastructure is crucial to its sustainability and must be underpinned by a strong business case. The infrastructure must be financially attractive to use and simultaneously assured of sufficient income to expand incrementally in terms of its usage and data sets. Whether the national approach focuses on providing information or delivering transaction capabilities needs to be determined. The efficiencies

and cost savings for participants, users and customers will need to be quantified and assessed against the cost of all proposed systems.

Data Typologies and Data Model

In the longer term the ideal situation would see all forms of land information seamlessly integrated into a national framework. Data relating to tenure, valuation, development, planning, the environment, topography, demographics, imagery and the land market would be included. A subset of this information would form candidates for initial consideration.

A data model is also required, that is a harmonised Data Model, in order to standardise land-related datasets. However, the applicability of the Harmonised Data Model still requires testing in a range of contexts. In Europe, the Core Cadastral Domain Model or Land Administration Domain Model has been in development for almost a decade (van Oosterom et al., 2009). The move in this model towards property objects as opposed to land parcels greatly strengthens the model particularly in its ability to support the management of property rights, restrictions, and responsibilities (RRRs) and other non-parcel issues. Processes are currently being undertaken for this model to gain ISO accreditation.

Technical Infrastructure

A technological infrastructure to enable the data sharing is an essential design feature. The role of next generation web-mapping tools, open source land administration architectures (Kalantari, 2009), and 3D visualisation platforms need careful evaluation: these tools will be integral parts of any solution over the next decade. An assessment of the appropriateness of tools ranging from LandXML, which simply allows land information to be shared between applications, to OWL, the Web Ontology Language, designed for use by applications that need to process the content of information, also needs to be made.

Implementation and Maintenance Models

A plan for implementation identifying costs involved and timelines needs to be articulated. The maintenance of any new infrastructure is problematic. Historically, outputs of many national projects cease on completion of the construction phase because insufficient planning and resources are not available to ensure sustainability. Great care is needed to preserve in-house competence and ownership of the all parts of any national infrastructure, including budget allocations among the partners and related agencies for national priorities. Similar issues also emerge if existing institutions and agencies are reconstructed, particularly the loss of the internal knowledge

base. Systems for maintaining and, especially, updating any new infrastructure need to be identified in at the initial conceptual stage and built to deliver sufficient institutional, financial and human capital for the long haul.

International Compatibility

Designers of a framework for integrating national land information must look beyond jurisdictional borders and ensure interoperability with international standards. Whilst not essential in the current context, the ability for land information systems to interact on a global level will become increasingly important, particularly as global land markets mature.

Organisations Consulted for Research

NIMLI maintained watch over all land information related initiatives in the development of uniform property law, Spatial Data Infrastructure, Volunteered Geographic Information, Productivity Commission, and other policy makers, and international initiatives in Europe especially. However, extensive consultation has been with staff from a wide range of organisation at the federal, state and local levels, as listed below:

- ANZLIC
- PSMA Australia Limited
- MDBA
- Office of Spatial Policy
- Australian Taxation Office
- Grattan Institute
- Reserve Bank of Australia
- Australian Urban Research Infrastructure Network
- Major City Unit
- Department of FaHCSIA
- Dept of Sustainability, Environment, Water, Population & Community
- Department of Sustainability and Environmental, Land Victoria (Land Registration Services, Office of Valuer General)
- Department of Planning and Community Development
- VicRoads
- Municipal Association of Victoria
- Several local councils in Victoria
- Land Property Information NSW
- Landgate, WA

Finding 1: Disparate Land Information in Australia

Investigation on the effectiveness of land data structure and data flow was a critical path in undertaking the project. NIMLI took the widest scope of 'land information' into its project to identify opportunities for its better management throughout all levels of government.

Integrated land use and land development datasets (Development Assessment processes) was identified critical to aid the future Strategic Planning of Capital Cities in Australia. Current arrangements with land-use and land-development data, does not provide an effective foundation for strategic planning at the national level. This is imperative to accommodate integration across functions, including land use and transport planning, economic and infrastructure development, environmental assessment and urban development. In particular to ensure Australian cities are globally competitive, productive, sustainable, liveable and socially inclusive and are well placed to meet future challenges (climate change) and growth.

It has been identified that there are inadequate dynamic flows of authoritative information about market transactions (tenure and value) between the state land agencies and federal macroeconomic policy makers. As such there is an information asymmetry between the government collectors and users of land information.

It has been identified that land information regarding risk of: riverine flooding, bushfire, earthquake, severe weather (storm wind gusts, lightning, hail, thunderstorms, intense low pressure systems, tornados, heavy rainfall, flash flooding, blizzards, heat waves etc.), cyclone (includes gale force winds and storm surge), tsunami, landslide, sea level rise, other fire related incidents (house fire), fraud, drought, disease outbreak, asbestos, and pests (white ants, locusts, fruit fly etc.) need to be properly structured to serve decision-making processes at the national level.

Finding 2: Institutional Arrangements

In addition to current arrangements by which land information is collected and managed, institutional arrangements have been identified as a major factor in achieving an infrastructure to disseminate land information for national needs. The concept of a seamless national economy, as outlined in the COAG partnership agreement in 2008, certainly demonstrated that there was an increased focus on a national approach on many fronts. There are several areas that relate to land information including the national

electronic land conveyancing and the planning strategy. The establishment of the national personal property security register also provided some messages for the national land information infrastructure in that the COAG involvement brought about its successful delivery after decades of minimal success. Urban Housing has been identified as a key area by the AURIN Management Board and approved by DIISR as being of national significance.

At the national level, there has been minimal effort to coordinate or define the Commonwealth's requirement for land information until recently. Whilst in the past there has been little interest from the federal government agencies except for ABS, ATO and the RBA, increasingly many other agencies are seeking this information to support their various activities. The sourcing of this information by the various departments is generally done in isolation of other departments. However, PSMA Australia has played a significant role in building national spatial datasets; however, these have been limited to Cadlite, addresses and road centrelines. Other key datasets identified as disparate in the previous section, such as land use, land development / planning, have not been produced yet.

It has been argued that the land information, which is the subject of this research, is essentially generated and maintained at state and territory level. However, it was observed that the role of local government in generating this information is also significant. Much of the land information (such as address) is generated as an outcome of land-development processes, which are regulated at the local government level.

In establishing a national infrastructure for land information, there are considerable lessons to be learnt from the manner in which PSMA Australia and NECDL (i.e. National Electronic Conveyancing System) have been established and the collaborative efforts to bring about national information related to land administration. For instance, funding derived from the licensing of information is critical to the ongoing maintenance of data in most of the jurisdictions. The recent Lawrence report prepared on behalf of the Federal Government highlighted many of the issues facing the development of a national land information infrastructure, not the least being the lack of funding available to build and maintain national land information. Also it was argued that the public does not sufficiently have access to appropriate data that will allow them to make meaningful contributions to decision making.

Although there have been difficulties in assembling datasets due to different data formats, significant issues were identified with regard to the willingness of agencies to release data. Issues of confidentiality and privacy and particularly funding/pricing model and inconsistent land-administration processes are major challenges.

Project Outcomes and Products

The project has discovered issues and challenges that impede achieving a national infrastructure for managing land information. To address these issues and provide solutions to the challenges, the project is offering the following options, concepts and a tool to facilitate realising the national infrastructure:

AAA Classification

Accurate Assured Authoritative (AAA) qualities of land information generated in land tenure, value, use and development differentiate this land information from all other kinds, and define its status vital for all functions of government. This is an important message to be communicated with government officials. However, issues here are the streamlining of the vertical integration of use patterns among the three levels of government.

Attribute Organisation

Owner, parcel, interest and transaction (OPIT) information in text or attribute format generated through registration processes has AAA qualities. However, OPIT is required to be spatially enabled. The NIMLI project has identified barriers to its use and advantages of improved availability.

Data Integration Parameters

The following 16 parameters were identified as critical for land information integration to achieve a national infrastructure. An Integration model was developed to demonstrate the outcomes:

- I). data creation: collection format
- II). data coordination and information flow
- III). storage and Maintenance of data
- IV). technology and technical issues
- V). data services funding/pricing model
- VI). spatial datasets dissemination and use

- VII). economic considerations
- VIII). environmental considerations
- IX). social considerations
- X). communication between agencies
- XI). public participation
- XII). organisational structure
- XIII). commitments and responsibility
- XIV). resources of the agencies
- XV). dispute resolutions
- XVI). capacity building.

Benefits of NIMLI for State's Land Administration Systems

As it has been highlighted, most of the outcomes from NIMLI relate to the aggregation of jurisdictional state data and there are important lessons to be learnt that are relevant at this level.

Key lessons for the jurisdictional systems relate to the lack of consistency between the systems with regards to terminology (i.e. absence of any standards). Whilst harmonised data models exist in some cases as a general rule each jurisdiction has to translate their data into the model rather than modify their approach to the capture and storage of the data. In reality there has been no incentive to bring this about, as there are no benefits for the jurisdictions in doing so.

The other key lesson is the interest in timely data. Increasingly having data that is three months out of date is considered less than acceptable. Users are seeking current data. This may necessitate the manner in which the jurisdictions' aggregate data from local government and once again bring about increased costs to the jurisdictions with minimal benefit to them.

Also another lesson is that the jurisdictions should be collectively pushing the Commonwealth Government to set out its requirements for land information in a clear definitive manner. The current approach of each Commonwealth agency pursuing its own needs retards any move towards a standardised national approach. Whilst it is recognised, ANZLIC now appears to be pursuing this goal and it is unknown as to how detailed this will be and if it will be representative of all the Commonwealth agencies' requirements. The question remains however, what incentives will be provided to the jurisdictions to bring their data towards a standardised approach.

Structure of this Booklet

This booklet provides a detailed discussion supporting the findings, products and future direction in relation to a national infrastructure for managing land information. Chapter 2 sets the scene for such an infrastructure. The chapter explains different types of land information and its classification. The chapter argues Australia's land information is a national asset, but it is neither well known nor used as widely as it should be. Chapter 3 argues that the resolution to leverage off land information can only be achieved by the implementation of a national land information infrastructure through a collaborative effort between all the governments of Australia. Chapters 4, 5 and 6 present case studies to support the realisation of the national infrastructure. Chapter 4 presents the interrelationship across land administration functions (land tenure/registration, land value, land use and land development) and between different levels of government in the management and delivery of land for housing production at the national level.

Chapter 5 draws on principles from natural capitalism, to design a land market information flow lifecycle to establish an operational link between land administration agencies and central macroeconomic policy departments, in federated market economies. Chapter 6 looks at the issue of land information from a risk management perspective in understanding how land administration systems and agencies need to change their contributions to the management of risks affecting land and property.

For a future research direction, the rest of the booklet puts emphasis on the importance of 3D land information, as well as accessibility and discoverability of the information. Chapter 7 provides an understanding of the institutional infrastructure required to support a shift towards a three-dimensional paradigm in managing information regarding rights, restrictions and responsibilities associated with land and property. Chapter 8 provides some examples of three-dimensional modelling and its application in urban planning, disaster management, asset management, environmental monitoring, navigation and intelligent transport systems.

Technically, chapter 9 illustrates the challenges involved in representing 3D land information. Chapter 10 highlights the emergence and importance of Building Information Modelling as part of the national land information infrastructure in our country at its different levels to facilitate land management and the support of sustainable development. Chapter 11 illustrates the main difference between the Australian jurisdictions in

cadastral data modelling, and calls for a uniform national data model. Chapter 12 introduces new dimensions to facilitate sharing the information within the national land information lifecycle and the need to provide and maintain complete, up-to-date, and precise metadata for shareable land-related datasets. Finally, Chapter 13 presents the development of an integrated land information platform along with four demonstrator projects that cover the most pressing issues facing the North West region of Melbourne: walkability, employment clustering, and housing affordability and health services.

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