Chapter 2: Setting the Scene for NIMLI

Jude Wallace

Introduction

Australia's land information is a national asset, but it is neither well known nor used as widely as it should be. Information about land comes from a variety of sources, supported by different software and applications. For the purposes of this chapter, it is necessary to differentiate three general categories: land information, spatial information and volunteered geographic information.

Land Information

Information generated by processes associated with land administration functions of land tenure, land value, land use and land development – fundamentally parcel and owner information and associated plans. The digital versions of this information are managed according to the technology used by the various agencies: Table 1 below.

Table 1. Basic land information functions in tiers of government in Australia

Number	Tier of government	Principal land information functions
One	National Top tier	Data collection on a national scale for management of the economy, taxation, international obligations and other arrangements conferred by the Constitution and its subsequent interpretation on the Australian government
Eight	State and territory Mid tier	Land information management from land administration functions of tenure and value
565	Local government areas Bottom tier	Land information management for building and development and land-use planning

Spatial Information

Most major software systems are location-enabled so they can identify the place of something according to its XY coordinates and use location information to embellish functions. Geographic information systems (GIS) reveal relativities and relationships of a place. A spatial data infrastructure (SDI) is used to facilitate combinations of data sets while retaining the scalability, visualisation and interoperability essential to users. These variously contribute to spatial enablement of a system or a service, not merely information.

The pace of change is increasing with the cycle of technical obsolescence running fast. While land information languished in the quiet areas of public services, spatial information systems grew exponentially as governments moved increasingly into web services, especially using GIS and web-mapping services. This parallels the extensive increase in digital capacity since 1990. Point clouds, advanced 3D spatial analyses, cloud and tree-penetrating cameras, and other systems are now commonplace, technical advances. Other drivers are the lowering of costs of aerial photography, satellite images and orthophotography (correction of images to remove distortions caused by tilt, curvature and ground relief, and scaling corrections to record features in exact positions). Seamless and scalable data that the world now uses on a daily basis changed expectations about management of spatial information. Radio-frequency IDs, GPS, GNSS, WiFi and other facilities can track people, vehicles and goods. Every valuable item can have a sensor. Every person can carry two or three devices that are location-enabled (phones, cameras, computers, and increasingly ubiquitous data pads) while travelling in location-enabled vehicles.

Volunteered Geographic Information (VGI):

Crowd-sourced, geo-referenced information about events, people and the Earth's surface provided to websites. It is of-the-moment, but usually lacks a provenance that makes it reliable.

Boundaries among these categories overlap, and their characteristics vary according to the histories and practices of systems. A plethora of approaches is the Australian reality. Spatial information gained the ascendency of attention after 1995, and sits behind the major initiative in data collection and access. VGI is slowly transforming from the disorganised and noisy to organised and useful (Goodchild and Li 2012).

Among these changes, this chapter seeks to position land information, particularly information generated by Australia's land registries, in national

land information policy and use. Processes in the registries and similar agencies responsible for land administration functions of land tenure, value, use and development generate information of quality, making it superior to any other information in a national collection. We call this quality AAA, explained in Figure 1 below. Each jurisdiction will extend AAA qualities to a particular data set as needs arise.

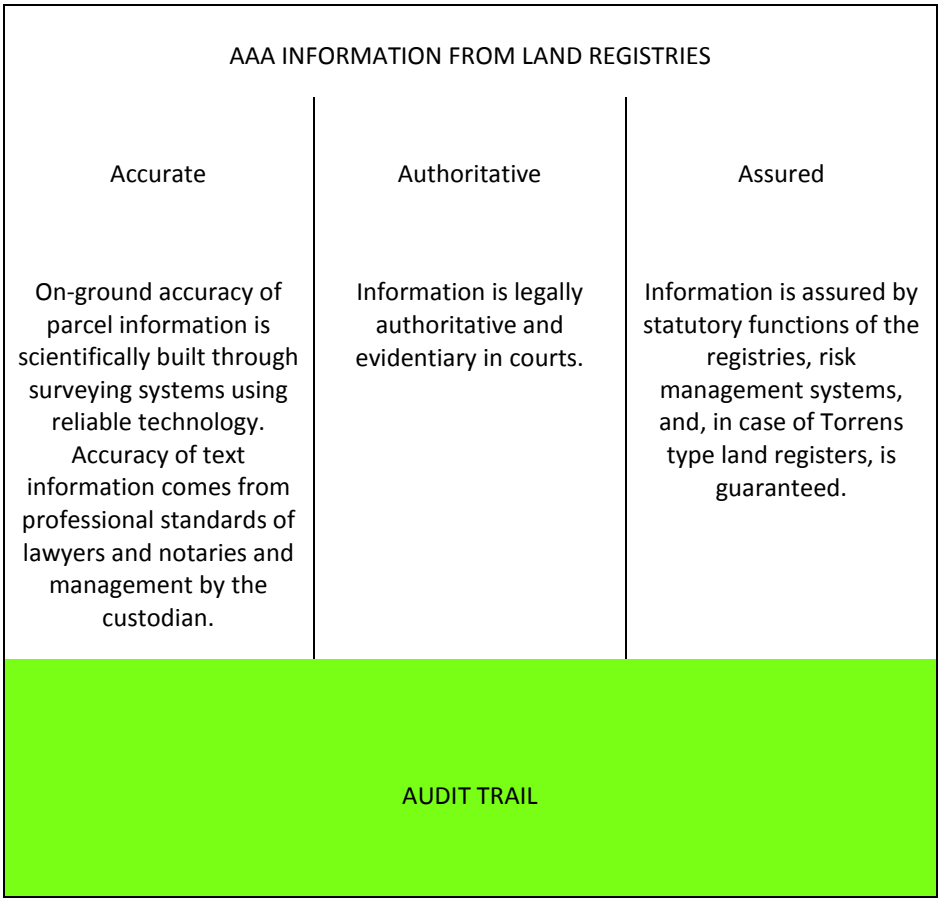

Figure 1. AAA qualities of land information

AAA registry information around the globe is of two kinds: the text information about owners and their arrangements, and parcel information. Most countries, including Australian jurisdictions, still use separate platforms and processes to handle each kind of information. In any event, the recording of transactions and the building of a map of boundaries of parcels are different processes, and vary among jurisdictions, even in Australia.

AAA Information about Owners and Parcels

Owner information is not information about physical things and conditions, that is, the kind of information typically supported by GIS. It is about rights, restrictions and responsibilities (RRRs). Rights are the familiar territory of land markets, ownership and tenures and gain their strength when strangers to the rights (including the government) are required to respect them. Rights are therefore conceptually related to duties owed to an owner by everyone else. Management of land rights in Australia is taken for granted. However, most countries of the world struggle to provide security of tenure. Restrictions are a growth area as governments increase regulatory frameworks to meet the imperatives of climate change, comfortable neighbourhoods, funding for essential services and more. Australian laws place hundreds of restrictions on land activities and uses. Restrictions can be seen as duties owed by a landowner to civil society and government managed by multiple regulating agencies. Responsibilities are vaguer: they are familiar to those who live in condominium titles, where use of an apartment must be proscribed by considerations of mutuality. Broad stewardship responsibilities associated with land ownership are much more specific in Europe than in Australia; in Germany a natural law responsibility of the owner for protection of ecological qualities of the land is recognised, and is evident in Art 14(2) of the German Constitution and cases interpreting it. These responsibilities extend to inter-generational qualities, such as the remediation of industrial contamination through past use of land (Raff 2003).

Historically, management of information about rights developed to meet narrow operations of the property market. Reliable management underpins robust concepts of property that distribute possession of land and resources and provide security for loans. Land information precisely defines the legal objects of ownership and opportunities associated with them. Countries that manage their information about rights in ways that attract public confidence enjoy advantages of wealth generation (Wallace and Williamson 2011). By contrast, information about restrictions and responsibilities is poorly managed, although it is essential for implementation of planning standards, environmental protection, building quality control, contamination removal, taxation compliance and so on.

AAA qualities of text information held in datasets are evident in information about owners, parcels, interests and transactions (OPIT) in Figure 2 below produced by Australian land registries. A proportion of the information is not generated by transactions, but by court and

administrative decisions, bankruptcies and corporate liquidations and work-outs, and social transitions on marriage, death and loss of capacity. The registries collect all these changes in land interests, as well as the transactions of mortgage, discharge, lease, sublease (variously among the states and territories) and other commercial dealings. They variously record covenants, easements and profits a pendre. Each of the eight Torrens systems operating in Australian registries achieve global best practice in land registration and offer simple searches, guaranteed titles, and cheap transactions. Their digital systems manage registration processes successfully but are not spatially enabled or capable of producing interoperable RRR information to the extent these are registered.

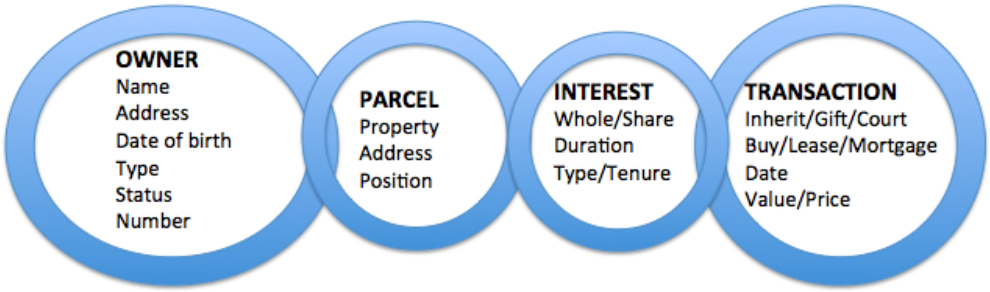

Figure 2. Owner, parcel, interest and transaction information

Variations among the Torrens systems in the eight jurisdictions attract arguments for a uniform national Torrens law in the belief that legal uniformity will reduce costs of doing business. A draft uniform Torrens Title Act was produced by property interests (Property Law Reform Alliance, 2011). Given the difficulties of achieving national parity among embedded property systems, illustrated by efforts over twenty years to achieve a national personal property securities law, other non-legal opportunities for parity in registration practices and common administrative forms and processes remain appealing. Among these opportunities, the national electronic conveyancing system (NECDL) will achieve commonalities that significantly reduce business costs and variations of practice. NECDL will also produce OPIT digital information on a national scale (when fully operational), potentially Australia's most valuable AAA land transaction information. NECDL is therefore a first and necessary step in retrieving the value inherent in OPIT information.

Checks of identities of people and legal entities who apply for registration are not undertaken with the same rigour as, say, in The Netherlands or

Germany where citizens must produce evidence of citizenship and identity in order to register. The witness provisions in Victoria are among the most basic identity checks in land transaction practice, but are now accompanied by proofs of identity during collection of stamp duties. Identity protection is reinforced by security systems in registration processes and criminal and civil laws dealing with fraud and forgery that are, by and large, effective. Identity fraud is rare in Australia. Moreover, NECDL will assist identification because identify confusion and theft must be controlled for a digital conveyancing system to attract public confidence.

During the 1980s and 1990s the registries changed paper systems to digital systems. Mostly, the IT services were built to deliver registration, not information, services. These computer systems are difficult to upgrade to current standards of data interoperability, visualisation and spatial enablement. Computerisation of registration functions delivers copies of a title (folio) from a digital file, which includes text information and copies of the title plan. There is no national file of OPIT information.

Ideally, OPIT and other land information should be spatially enabled in the sense that it is available on the web, seamlessly integrated throughout the nation, geocoded and searchable through a scalable, map-based facility, overlayed on visual images, and capable of servicing multiple attributes detailing RRRs created by agencies within and beyond the registries. The web service also needs to integrate information to permit aggregated queries, such as 'all the land parcels in New South Wales that benefit from licences to access crown land and mixed database queries, such as 'all the land in Collingwood owned by non-rateable entities' (combining registry and ratepayer datasets). The query functions can be rationed according to scale, privacy, and commercial and licensing imperatives so that some queries are publicly accessible and other queries restricted to authorised entities.

AAA Information about Parcel Boundaries

A map or diagram of the boundaries of a parcel produced by a surveyor is spatial information. If the surveyor uses a computer to undertake survey calculation and other tasks, the digital information is spatial data. The cadastral data file, often called a digital cadastral database (DCDB), or similar name, therefore has unique qualities.

Over time, surveying standards and equipment have improved, so that reinstatement of marks and boundaries according to high levels of accuracy is now commonplace. Integration of new tools, including GPS based

measurements and calculations, is negotiated according to their ability to achieve confidence levels.

Developed countries institutionalise the survey system by laying markers at levels to re-establish points and lines on the map. The scientific methods used to ground truth the parcel map help to match physical boundaries and the data about the boundaries to rigorously reflect the scale, boundary position, area and measurements of a parcel of land. This matching must not be confused with accuracy or legal certainty. In Torrens systems, boundaries, areas and relationships among parcels are not legally guaranteed, and need not be.

Early attempts at parcel mapping used drawings on rock, then clay, papyrus and even stone (Bavaria), before the familiar parchment and paper arrived. Paper maps were kept at various large scales so that a small village could be represented on an accessible and functional-sized sheet, but a regional area map would be a smaller scale permitting greater coverage on a similar-sized sheet. This history in part is accounted for by divergent development of two professional groups: the surveyors who managed parcels of land; and the 'mappers' who reflect features of land in general. This distinction remains today: the science of mapping is different from surveying; but both mappers and surveyors make maps as part of their professional activities and the distinctions fade in new technologies.

History remains important, however. Survey maps are specialised products; even more so when they are digitised. Two approaches are generally used to convert paper maps of parcels into digital information; the first involves conversion of paper maps into equivalent digital maps. When this is undertaken, issues about accuracy are often revealed that require information to be adjusted to achieve a 'best fit'. The second involves accumulation of information from new subdivision and survey activities that are undertaken with modern technical equipment. These modern surveys create digital information on the fly that is remarkably accurate across various scales. Most DCDBs amalgamate data from these and other different processes. A DCDB on a national scale is always under construction and constantly improved according to technology and the pace of land development. The digital map is therefore functional, and is built in three distinct environments, (Figure 3 below), each with its own processes, accuracy checks and histories.

Figure 3. The three distinct environments of parcel information (Bennett et al. 2010)

The Parcel Map as AAA Land Information

Compared to other spatial information, data obtained from surveying has unique features relating to how the data is created and the functions it services. When digitised, cadastral information files to some extent carry forward these unique features into virtual or digital environment.

Scientific Standards

Cadastral systems identify coordinates by using surveying techniques and an established coordinate system. Developed countries use a single geodetic standard, such the GDA94 used in Australia.

Scale

Cadastral information is about land parcels that reflect the way people use their land. Parcels define the homes, workplaces, and facilities and connections between them. This people scale is the most important feature of the cadastral fabric. On the technical level the fabric is large scale. That is, it represents large areas on-ground. Useful scales for cadastral data are 1:500 for urban areas and 1:2500 or for non-urban areas.

Legally Authoritative

Civil society requires land allocation systems and boundary definitions that are acceptable according to the social norms and land-use practices within communities. For settled societies, boundary identification is typically a legal function. The activities of surveyors and their surveys produce authoritative information about land boundaries. Likewise most other land information kept by governments, including a comprehensive register of changes in private interests in land, is also legally significant and sometimes determinative. Legal status is an outstanding feature of cadastral information. The survey is legally significant in the hierarchy of evidence used to prove boundaries, even though in most systems other information can be more determinative: for example monuments and intention. The DCDB, by contrast, is neither legally authoritative nor determinative in most countries.

Dynamism and Change

Cadastral information at one extreme is stable and unchanged: many parcels remain untouched for generations. At the other extreme parcel configurations change rapidly as population movements demand high-density infills for urban renewal and conversions of outlying peri-urban and agricultural land to housing. These man-made changes introduce a high level of plasticity into the cadastral fabric.

Dramatic changes to boundaries of many parcel also result from natural disasters such as tsunamis and earthquakes, sometimes on the terrible scale of Japan's tsunami of 11 March 2011, and Aceh's tsunami of 26 December 2004. River changes and coastal deformation also force boundary changes.

Professional Responsibility

The cadastral layer is built by professionals who are usually licensed by the government, and subject to quality assurance and quality control systems, monitoring, and exclusion from the profession in cases of failure or neglect.

Support for High Value Land Information Services

In Australia the parcel map is the most reliable and consistently updated national information and is appropriate for government and business use.

National digital Parcel Map

The computerisation of the parcel maps into a digital database at jurisdiction level was also achieved, but different systems, ontologies (e.g. roads and features) and maintenance programs impede national coherence. The states are variously absorbing the new GPS technologies into surveying methods as accuracy of readings improves. Survey laws and practices also vary. Victoria, for instance, uses adverse possession of whole and part parcels to keep title and actual boundaries aligned. The boundary system is relatively imprecise especially for old parcels. New South Wales aligns parcel and title boundaries through encroachment legislation. Accuracy levels also vary as the states utilise the standards set by the Inter-Governmental Committee of Survey and Mapping (ICSM) and Standards Australia. Western Australia has achieved nearly state-wide survey accurate cadastral map (SACM), and Tasmania has established a survey project to deliver accuracy in its digital cadastral database. Other states would require a convincing business case to resurvey parcels and build the associated map rather than improve accuracy over time by integrating new accurate surveys into the system (ICSM 2003). A Victorian business case was presented in October 2012.

Over time, the digital cadastral parcel files were coordinated into a national dataset through the cooperation of mid-tier government agencies and PSMA. The national file, CadLite, is a commercially available product. Take up of CadLite as a product is increasing. Building footprints are not included, though best practice standards for a modern parcel map would include them as a matter of course. CadLite can be overlayed on other spatial information and, until 2011, was used by Google Maps.

Addressing Systems and Address Information

Australia's addressing systems are successfully established, and undergoing further improvement. A digital version of addresses is the national geocoded national address file (GNAF), another product of PSMA. The address data includes geocodes, with adjustments to account for addresses of properties where these are different from parcels. Geocoding reflects local practices in use of centroids and multiple points in the digital mapping fabric and histories of data collection in the eight jurisdictions.

At state levels, the maturity of the addressing systems vary. GNAF undergoes continuous improvement to eliminate and explain the diversity of buildings, parcels and properties and their relationships over time.

Overall empirical checking of the addresses refines multiple references to a single place.

Differences between Parcels and Properties

Parcel maps and property addresses are inevitably different. Parcels are discrete areas of land designated in a title, separately owned and capable of independent sale. Properties are the various arrays of parcels and developments within parcels that suit a business, agricultural or other configuration. Registries work with parcels. The world works with properties. The two datasets are not equivalent: about 10–15% divergence is estimated. The world often puts many useable properties within one parcel, e.g. a typical office block owned by a single owner and rented to many tenants. A property can also consist of a number of parcels. In agricultural uses these need not even be contiguous. The problem of relating parcel and property maps is additionally complicated by local building laws and practices. In some states, such as Victoria, a building cannot traverse a parcel boundary and set-back requirements are routinely enforced. Addressing systems must therefore reflect the variations among the states, the history of creating formal addresses, and the diverse practices in local government areas that generate new formal addresses.

A map of properties rather than parcels offers functionality for many users and is under construction. The property spatial view was released by PSMA in August 2012.

Towards a National Land Information System

In accordance to the above discussion, two major trends are evident:

- Management of restrictions and responsibilities by states and territories
- Growth in demand for land information by national agencies.

Management of restrictions and responsibilities by states and territories

The growth in statutory restrictions that relate to land is documented (Bennett, Wallace and Williamson 2008). Disclosure of these restrictions was originally mandated in order to provide consumer protection, not land information management. Governments responded to perceived needs of buyers, mortgagees, lessees and developers for transaction-based information that related to specific parcels. The approaches varied. Western Australia, Queensland and New South Wales use a centralised land information approach to streamline the enquiries. Others built enquiry

systems to either indicate properties affected or potentially affected by a restriction (South Australia and Tasmania) or to allow web enquiries determined by intending vendors and buyers. Victoria's system relies on web or mail applications to custodian agencies at the discretion of buyers, lessees and mortgagees. The initiatives used various technologies available at the time.

The last jurisdiction to join the vendor disclosure system, the Northern Territory, suspended the commencement of provisions of the Sale of Land (Rights and Duties of Parties) Act 2010, which supported vendor disclosure on the basis that it would inconvenience Territorians and increase red tape associated with land sales (Attorney General's Press Release, 7 September 2012). Similarly, the newly elected conservative government in Queensland repealed disclosure of house emissions standards.

Victoria moved away from including status of climate change impact on titles and also removed the disclosure requirements in 2010.

Ultimately, disclosure systems will be substantially improved by implementation of a land information system (LIS) in which custodian agencies reveal their decisions and operations by attaching attribute descriptions to affected parcels and disclosing decisions through a map-based web service. Whole of government trends towards spatial enablement, address verification, and visual information services underpin the idea of a map-based LIS as the ultimate solution to management of information about restrictions, and as a secondary function, as a first point of information available to the public and all those affected, including buyers, mortgagees, lessees and others. Enquirers who need legally certified information require a unique service that would remain available for appropriate fees.

Adoption of a land information approach by state and territory governments and improved spatial information systems are inevitable though the changes involved are both extensive and expensive. Construction began after 2000 when the focus on consumers in land transactions shifted towards building information to frame responses to large-scale disasters and to facilitate taxation collection tuned to land holding patterns. The emerging engagement of national agencies in land information will frame future directions.

Growth in demand for land information among national agencies

Especially since 2000, the national government has engaged in collecting and using land information. The range of uses is extensive and growing. Table 2 below, shows a selection of major initiatives, but does not include water and carbon information initiatives, or spatial information initiatives in the Australian government.

TABLE 2. AUSTRALIAN LAND DATA INITIATIVES

Agency	**Database**	**Purpose**
Australian Taxation Office	Land transactions since 1999	To facilitate the collection of income tax, CGT and GST
Australian Electoral Commission	Voters in election districts on electoral roles	To verify voter enrolment and voters addresses according to electoral area boundaries
Australian Bureau of Agricultural and Research Economics	Non-arable land	To facilitate land management
Australian Prudential Regulation Authority	Risks and claims	To better manage insurance business sector
Centrelink	Land ownership	To administer pension entitlements
Australian Reserve Bank	Australian property markets	Australian property market data collectors were commissioned to provide timely and complete information about the property markets in major capital cities.
Australian Bureau of Statistics	House price indices Buildings Land account	Release of 3 June 05 contained price information to December quarter 2004 Historical data and home approval information An environmental dataset about land assets (2010)

Geoscience Australia		National Exposure Information System (NEXIS) Risk assessment opportunities (COAG, 2003)
Department of Climate Change and Energy Efficiency	Performance ratings for buildings	To implement climate change initiatives by providing information about buildings, underpin the Green Buildings initiatives, and allow rating of buildings for operational impacts on environment under the Building Energy Efficiency Disclosure Act 2010 National Greenhouse and Energy Reporting Act 2007 introduced a national framework for reporting information about greenhouse gas emissions, greenhouse gas projects, and energy use and production by corporations. This act will underpin a carbon tax and emissions trading scheme that may be introduced.

These independent initiatives of agencies can be improved and systematised. The Office of Spatial Policy in the Department of Resources Energy and Tourism is reviewing opportunities for streamlining as recommended by the Lawrence Report (2012), notably investigating whole of government initiatives including a licensing framework that would replace multiple negotiations between users and suppliers. In creating a LIS, the treatment of water information illustrates possibilities for land information administrators and users.

The Contrast of Management of National Water Information

Australia unbundled water from land in order to initiate water right trading among private owners. The new trading system required building of institutions to support titling and transactions. Management of water was stressed by the decade of severe drought (2000–2010) and subsequent floods.

The state governments comparatively lacked water governance resources to support large-scale information responses. Continental scale efforts demanded national funding from the Australian Government. A major

initiative involved improving Australia's water information. The Water Act 2007 (Cth) in Section 7 authorised the Bureau of Meteorology to manage water information supplied by over 230 water entities nationwide, including water storage information for 250 sites. The Bureau's role in weather and climate information, and its public standing, made it the ideal entity for coordination of water information, reporting and assessments and forecasts.

The results of these initiatives are now available to the public, business and government. The Bureau's water information services are well used. A comprehensive and accessible description of integrated water governance is available on the web site of the National Water Commission. Comprehensive information about water governance in all mid-levels of government is organised according to colour-coded categories of:

A. legislation, regulation, statutory instruments, licences

B. institutions and individuals

C. non-statutory documents and activities.

The web facility allows diagrammatic description in simple graphics of water governance in all states and territories, national systems and cross-boundary systems according to business areas of water pricing and economic regulation, water planning and management, water markets, water supply and services and water quality management. All the key instruments, documents and descriptors are directly accessible.

This comprehensive overview of water management on a national scale is exactly what is missing from land management where the historical silos remain in place.

Building a land management governance chart would be more difficult than its equivalent in water because of the nature of land, diversity of land uses, the historical and various sources of land concepts and tenures, and the complexity of legal fabric. As an indicator of the difficulties in land management, efforts to build a national tenure ontology or tenure type list strike divergent state and territory approaches. The 1993 Land Tenure Map (updated) provides information on a 50 square kilometre data set and avoids the ignominy of detail.

At the pragmatic level, Australian land administrators have learned to live with solutions that are 'under continuous improvement' in order to gather

the 90+% utility available from taking comprehensive national approaches to solving problems. The national cadastre and national geocoded address file remain indicative successes of this pragmatic approach. Should management of land information be afforded the strategic design, legislative framework, and unlimited funds similar to the water system, Australia would be a world leader. In truth, however, leadership requires clever, not expensive responses. Water governance initiatives that can be adapted for good governance in land administration and land information include:

- Publication of a land dictionary of the most commonly used terms, like the water dictionary of national water commission, perhaps through Geoscience Australia, with key words defined and identified sources of the authoritative definition. Words like 'contract of sale', 'transfer', 'settlement' 'native title', 'freehold', 'leasehold', 'retail lease', 'residential lease', 'road', and so on can be defined to assist public understanding. The construction can be iterative, with new terms added over time.
- Mandate an authority for collection of crucial information in a key organisation, similar to the Bureau of Meteorology and the water information data under the Water Act 2007. PSMA has the track record of information handling and supply and is an obvious candidate.
- Publish an integrated description of land governance arrangements in Australia in a national site hosted perhaps by ANZLIC similar to the water governance page run by the National Water Commission: http://www.nwc.gov.au/www/html/112-water-governance.asp. The governance arrangements should include a description of land information initiatives (e.g. Western Australia's dictionary of interests in land and Queensland's administrative advices), and describe different approaches used in NSW in its information warehouse and central register of interests and Tasmania's Land Information System (LIST).

The water analogy goes only so far: water disrespects jurisdictional boundaries and invites national attention. Land lies within a discrete jurisdiction and its management is jurisdictionally guarded. As a corollary, land information is viewed as a state and territory asset, and its use is negotiated on a case-by-case basis between them and the increasing number of national government users. The cost of administration of this system is not measurable but must be considerable. Its cost and complexity invites consideration of streamlining the interchange through a national licensing arrangement.

Features of a National System

Move from Information Access to Information Services

Google's decisions to move from 'Location based products' to provision of information services (Google 9/7 2012) were designed to strategically position the corporation in the global information trade to support its business model. This paradigm shift from delivery of something to provision of services is a clear future trend and is recognised even in government information strategies (VSI 2014). However the shift is difficult to deliver in the context of land information where accuracy and reliability must be priorities and respect for economic and social sensitivities of information is imperative.

The changes involved are substantial given the differences in approaches:

a. Information delivery approach reflects historical characteristics.
b. Information is provided by silo agencies.
c. Jurisdictions sometimes provide a facility that allows information from multiple silos to be acquired through a single postbox or facility that supplies static.pdf certificates or postal response to web request – the typical vendor disclosure or list based systems.
d. Jurisdictions sometimes provide direct web-enabled access to multiple silos.

Information services approach reflects potential characteristics:

a. The best practice model offers facilities of web-enabled single parcel based enquiry that delivers comprehensive information of all relevant RRRs – a modification of the list system.
b. Information is available on single parcels through a web enabled, geocoded address based service providing a cascade of all the interests affecting the parcel including all or most important government RRRs, sale price and valuation history, transaction history, and authoritative hazard determinations.
c. Generic information services are available throughout governments, business and communities at all levels through a web-enabled, map-based, spatially enabled, whole of jurisdiction enquiry for each RRR and data set. The information is interoperable, scalable, visualisable, capable of supporting mass numbers of parcel-based enquiries and whole of state enquiries.

The move to information services requires custodian agencies to continually update information that is reliable, managed, accessible and sourced direct from them. Users of land information need to spatially

enable their systems so that place is an attribute and a sorter of their non-land information. The information sets need to be capable of integration with information about attributes managed by many other custodians.

Integration of Land Information into Compliance Activities

Compliance activities involve increasingly complicated arrays of attributes, some of which are singularly determinative, and more of which are determinative in unique combinations. Much of this determinative impact comes from attributes identified in legal sources. Ever-changing relationships between land (parcels, properties and sites of business activities), users, managers, owners (as individuals, aggregated owners, corporate owners, trustee holders, land-rich entities, earners of particular incomes, and many more), times, refined legal concepts and relationships among them that determine pension entitlements, taxation liabilities, and more. This attribute data changes rapidly and unpredictably in many situations. With modern compliance activities, it is not just the owner we are interested in. It is the kind of owner and the relationship of the owner with taxing authorities, stamp duty collectors, land tax collectors and so on.

Revitalisation of Land Information and its Functions in Government

Approaches to information management among the states and territories vary according to local needs and capacities. The PSMA model of collaboration is working well to create national scale products of CadLite, GNAF and the newly released property data file.

Obvious Initiatives that Remain

Tools for national system are theoretically identified. SDI is globally recognised, but no implementation path is identified in Australia. The funding and legal structure to establish SDI needs to be modelled nationally. The model of a national LIS needs to anticipate emerging trends:

- gaps in information about lesser tenures, especially leases and mortgages
- inclusion of building information
- inclusion volunteered geographic information
- development of a features of interest dataset by PSMA Australia
- emergence of national electronic conveyancing services by NECDL that change in data generation and usage if managed successfully
- inclusion of information from local governments via the mid-level datasets of states and territories.

Business Model

National Victorian and Queensland governments accept a 'free to use' concept with spatial information, though specification of what is 'spatial' is imprecise. Free to user is an inadequate business model for sustainable land information of AAA quality. The maintenance of highly reliable information capable of underpinning various functions of government, utilities, and business, and instilling community confidence requires continuous operating funds, plus capital to support research and development. The business model of the land information system in Western Australia offers a model for holistic land information management. The free Information Dictionary provides succinct information about 85 interests on land. Interest reports are available to subscribers, and identify some of the interests that affect the 'selected land'. These services are user paid: unless users pay; taxpayers must meet the information maintenance and service costs; and the business of land information is subject to political imperatives, as is every item on the consolidated revenue agenda.

A common licence is an essential step, but information management requires extensive human and financial resources. Articulation of a business case for a national approach, achieved through collaboration among eight disparate state and territory jurisdictions is another essential step.

Conclusion

Land information is a national asset that can be used much more successfully throughout the tiers of Australian governments, and throughout each tier. Different kinds of information have different qualities. The significance of land information from Australian Torrens registries lies in its reliability: its standard is AAA. Owner, parcel, interest and transaction (OPIT) information is well understood as key to the management of rights, restrictions and responsibilities in land. The potential of this information is obvious, even while meeting the limitations of privacy, licensing, compliances and cost.

The information about parcel boundaries is also the best available information Australia produces about the human scale of land use. When translated into digital environments, this information carries the unique features of its source – the activities of surveyors and registry personnel. The digital version of this data set does not have to be legally determinative in order to be remarkably useful.

Now that the parcel map is translated into a national data file, called CadLite, through the collaborative efforts of the eight jurisdictions in the Public Sector Mapping Agency, its use can be much more extensive throughout government. Another national-related product, is the geocoded national address file (GNAF) of the addresses used to identify parcels and properties for practical purposes of mail delivery, census, and voting, among others.

The growth in regulation systems in management of restrictions on land, and the use of land information among national agencies are trends evident to observers. These trends suggest that management of land information would benefit from the national approach taken to management of information about water. There are of course differences. Meanwhile, an information services approach to land information management suggests that OPIT and parcel map information should be primary key data sets for Australia, anticipating the arrival of electronic conveyancing. The services approach also suggests that land information, given its inherent value and cost of maintenance, should attract a fee for use capable of ensuring it retains its AAA status.

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