

Spatially Enabling Mortgage Markets in Australia

Jude Wallace

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1 Introduction

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Australian land administration theory and practice is derived from systems designed and built in the 19th century to service public and government needs for formalising land markets. These systems served the nation well. However reliable this foundation is, it cannot deliver the kind of land information needed in the future. Recent experiences in mortgage markets highlight limitations in the information base generated by Australian land registration. Modern technology, especially new spatial technologies, suggests some ideal solutions. These are futuristic and go beyond the familiar focus of both surveyors and most land administrators who inhabit land markets and related processes.

This argument depends on a multi-disciplinary approach basically derived from the new discipline. Land administration began as a coherent approach to building land related infrastructure after WWII. It received its formal name in 1996 through the efforts of the Meeting of Land Officials (MOLA, now called the Working Party on Land Administration or WPLA) of the UN Economic Commission for Europe. This discipline uses administrative, technical and policy tools to assist management of land, built up from traditions of surveying and cadastral organisation, land titling administration, tenures and related theories. Most activities of land administrators concern delivering infrastructure to manage formal land markets. If the focus is moved beyond land markets, and into mortgage markets, this infrastructure is far from satisfactory. Mortgage markets have a long history, but they changed dramatically with globalization.

2 The basic vocabulary of markets and mortgages

To understand the changes, one needs to travel into unfamiliar territory of complex commodities. Key terms are therefore defined below, not according to their source discipline, but according to a land administration perspective, to assist land policy makers and infrastructure designers.

Collateralised debt obligations (CDOs) resemble bonds, with home owners' monthly payments funnelled to investors. Lenders take their mortgages, including sub-prime mortgages, off their balance sheets by making them into CDOs. These CDO bundles were marketed in global financial markets to buyers who are informed by letters on their face that rate investment risks, according to assessments by the world's major rating agencies.

Commoditization is the process of turning something into a saleable and tradable commodity. The important quality for land administrators is the abstract nature of these commodities. Indeed though we think of selling and mortgaging land, the commodity is really the abstract rights, opportunities, liabilities and restrictions that are bundled by land administration systems into the concept of land itself. For practical purposes, however, we talk of selling the land. But modern markets can commoditize virtually anything.

Complex commodities are abstract concepts that operate at another level of separation from physical land. There might be a physical asset down the chain of entitlements, but it is remote

from the parties who create and trade the abstract commodity. They therefore require an administrative framework to support creation and trading processes. In many cases this framework is separate from a national land administration system (LAS).

Extendible commercial paper (XCP) is commercial paper issued with an initial scheduled maturity, but which may, at the option of the seller, be extended on the schedule maturity for some fixed period to a final maturity, usually at a higher rate of interest. They are also called extendable commercial notes, or ECNs and secured liquidity notes or SLNs (Moody's 2003). Collateralised debt obligations are among ECP products.

Mortgagees Lenders on security of land. They are also called mortgage originators.

Mortgagors People who give their land as security for loans – the borrowers.

Primary mortgage market is the market where borrowers obtain loans on security of land from mortgage originators, who are frequently divided into banks and non-banks.

Securitization is the process of homogenizing and packaging financial instruments into a new fungible instrument. Acquisition, classification, collateralization, composition, pooling and distribution are functions within this process. New products are invented constantly.

Secondary mortgage market is a secondary mortgage market is where mortgages are bought and sold between mortgage originators and global investors. In the US the market started with products like Fannie Mae which bundled Federal Housing Administration insured loans. The market, like any commercial area, has its ups and downs. Markets operate in most developed countries.

3 The modern market place and its problems

3.1 Manageability of complex commodity markets

This point about manageability of course applies equally outside government, to systems and processes in the private sector that are essential to our social and commercial activities. Of special interest to land administrators is the way it might be applied to complex commodity markets. These complex markets were first placed in the context of land markets in 2006 (Wallace and Williamson 2006a). The markets were identified to explain how formal land markets of the world depended on governance and administration at basic simple commodity trading levels in order to leverage markets into higher stages of development. The mortgage markets provide an obvious example of how this happens.

The consequences for any country of being able to manage both its simple and its complex markets in land and related commodities are enormous: wealth acceleration results. Figure 1 below explains how societies and their economies build up these layers of markets, through processes of imagination, organisation and administration. The processes of creation are sometimes exhilarating and uncontrolled – with resulting increases in risk. But generally these processes are successful and produce enormous wealth out of land. In this way, the amount of land in a country may be finite, but the interests that can be created out of it are unlimited (Wallace and Williamson 2006a).



Figure 1. Stages of development of formal land markets (Wallace and Williamson 2006a)

Most countries can only dream about managing processes needed to support these highly-g geared formal land markets. Even at the basic level, successful administration of land is a rare capacity. Mostly countries with successful systems are developed, run through effective democratic governments and enjoy globalised economies. The expertise of these countries lies in building the secure registries and cadastres that manage trading in private interests in land in ways that attract business and public confidence. These systems in turn support the fundamental institution of property in land, an institution axiomatic with land markets. This institutional capacity then spreads out to more abstract and novel commodities, illustrated in Figure 2.

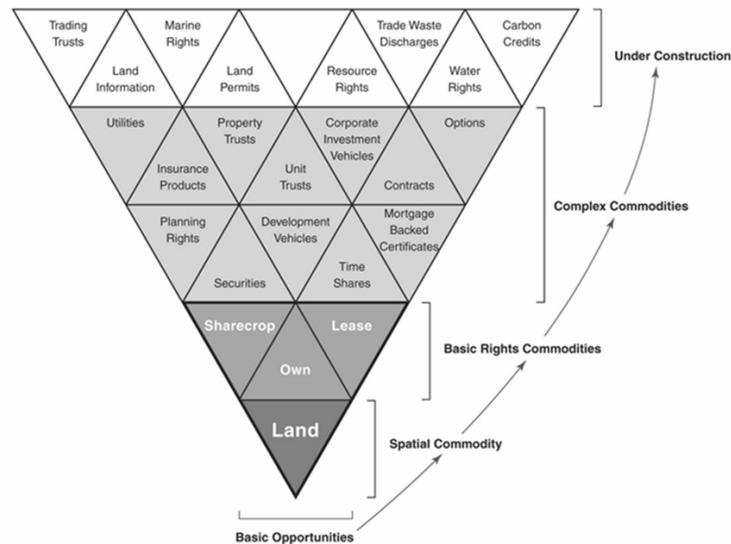


Figure 2. Complex commodities in formal land markets

These commodities sometimes relate directly to land parcels and their administration systems, but sometimes they are independent. There is however a major limitation to the way even successful countries administer land: the information generated by processes within a LAS is out of date, untimely and unsuited to the needs of modern complex markets. Land registration is not noted for its immediacy. Land transactions take up to ninety days to complete. By comparison, information for global markets for complex commodities needs to be instantaneous. Hence the LAS even in these successful countries cannot feed adequate information to high-level policy makers whose task is to implement fiscal and monetary policies in the nation, or to businesses and the secondary market participants, or even to citizens who want to buy loans in the primary market. History merely explains why this is so. It cannot justify denial of modern information needs in the face of new technologies.

The same information problem can be explained from a different perspective. Land obviously stays within national boundaries. However money invested in land in the developed economies is increasingly global. This is why the administration of land from the viewpoint of a nation needs to mature to cope with the speed of transactions in both finance markets and land markets, the acceleration and depreciation of the cost of money, and the various types of credit investments in land (in addition to tracking parcel ownership and mortgages).

4 Manageability of mortgage markets

Australia enjoys a vigorous and successful secondary mortgage market. The secondary mortgage market follows the basic model popularised in the United States in the 1930s when the Federal Government became involved. The Australian version is illustrated by the Victorian Secondary Mortgage Market Regulations, SR 9/1995. This market was achieved independent of land administration, though, as Figure 3 shows, it depends on administrative reliability in the primary mortgage market because securities in this market are bundled to support mortgage backed certificates sold in the secondary market. As a contrast, consider the inability of many African and Asian countries to build similar secondary markets because their credit law, security titles and administration of land securities are inadequate. This kind of derivative market continues to develop. Apart from the secondary mortgage market, many other different types of asset backed commercial paper enter the financial markets from time to time.

Australian Torrens registers and land registration systems merely contain a basic set of information about credit transactions in the primary mortgage market. Given modern debates about land registration, this set falls into the category of “above the line” information – that is information that is both registered and guaranteed by the state. It is therefore totally reliable. Typically this includes the number of the instrument, the parties, the date and priority or standing of the interest among the range of other registered credit securities (if any).

A great deal of loan information is not in the register, though it might be included “below the line” if registries opened up business opportunities to service new commercial areas. Today registered, above-the-line, information is commercially neutral. Not even the amounts, whether the loan is cross-collateralised, whether other debts are attached in addition to those secured directly by the land, appear in the details kept in the land register. The status of a borrower as a debtor, guarantor, non-trading or trading company, trustee, etc is not necessarily recorded. Nor is the kind of loan: it could be a premium, residential, security valued at least 20% higher than an authorised valuation and so on, or it could be a sub-prime deal, meaning the borrower’s capacity to pay and the value of the security to cover the debt on default involve credit risks. Nor is the status of the lender or the source of the money as local, borrowed directly from investors, or obtained on some trade in the international, wholesale money market, or bought in foreign

currency, with exchange risks hedged or not hedged. These details are maintained in the bank or lender of source. They are commercially sensitive and will never be, and should never be, on a public record.

However, this information does need to be organised by loan originators for purposes of internal management. It also needs to be more or less transparent, at least in terms of national volumes, for purposes of management of the macro economy. And it also need to be organised for purposes of non-land markets, principally the secondary mortgage market and other complex commodity markets. This dichotomy of public information about a security - the above the line information - and the commercially-sensitive and private institutional information remains axiomatic in what follows.

4.1 Relationship between mortgages and money

That the market for money and the market for loans secured on land are related hardly needs proof. However, the relationship postulated here between land selling on the one hand, and the international price of money and conditions of provision of money into land sales on the other, needs a little demonstration. Rather than undertake a theoretical analysis, we can examine events in 2007 surrounding credit failures in the sub-prime, primary mortgage market of the United States. Many other examples could be used to illustrate the same information problem, but the sub-prime mortgage failure is perhaps the clearest demonstration of information needs in modern land markets at least in developed countries. The example also has the advantage of clearly demonstrating how the need for land information has changed dramatically since our basic land registration and cadastral systems were invented. And, more importantly, how spatially enabling government could offer a solution to problems of offering poor quality and untimely information to managers of our national economy.

The development of Collateralised Debt Obligations

The rise of complex commodities in land and peripheral markets is unfamiliar territory for land administrators. There are (at least) four related markets: security markets (where people buy money on security of land – for present purposes these are house buyers who seek loans for the purchase), land markets (where people buy and lease land), and money markets (where people with amounts of money trade funds for yield from any source). Day-to-day operations in these markets are confused by currency issues and complications in equity and cash markets that are too complicated to refer to here. This analysis is therefore necessarily superficial in terms of global finance, but relies on its capacity to illustrate fundamental issues about changes in the nature of land information especially since 1995.

The land market combined with global banking, brokerage and investment activities spawned a commercial paper market in the mid 1990s. These commercial papers are closely aligned to the primary mortgage market. By 2007, lenders in US had given a trillion dollars to mortgage originators spend to the sub-prime market. This spawned US economic growth especially in the previous 5 years. In August 2007 this credit supply dried up. Growth risks for 2008 became evident. Mortgages were being reset in dramatic ways, with non-recourse mortgagees (lenders) walking away, and interest rate hikes contributing to more loan failures. This market failure rate was manageable, at least in the early stages, but other aspects of the fall out had adverse potential for Australia. To explain these risks and how they relate to land administration and mortgage lending, we need to do some more homework.

There are three markets involved in the problem. The housing market, the credit market (the cost and terms of borrowing money) and the global money market. Initial signs of the problem arose when the housing industry in the US turned down. In its heyday the real estate book added 30,000

housing-related jobs a month for construction workers, mortgage brokers and real estate agents. By mid 2007 the system began to crack. The bust turned to a contraction, losing 15,000 jobs a month. In 2005 housing starts were 2.1 million. In 2007 starts were expected to be only 1.4 million. By 28 August 2007, economists predicted that the median price of American homes would fall for the first time since federal agencies began keeping statistics in 1950.

The impact of the housing market downward trend on the mortgage market was immediate and felt through a new commodity: collateralized debt obligations (CDOs). These were the principal financial device that enabled lower income people to become home buyers. Credit standards had been relaxed and down-payment requirements lowered. These changes opened up a low-end property market, where price vulnerability was extreme. The packaging of these mortgages into CDOs also encouraged lending because it created an instant money flow into these sub-prime mortgages. These CDOs were then sold to funds investors world wide, including in Australia, particularly where municipal councils in NSW bought in.

5 The impact of CDO risks in Australia

About one quarter of Australia's \$870 billion mortgage market is securitised by lenders. Capital markets are a "force for good and evil" commented Samuelson (2007). Securitisation makes it easier for countries, companies and individuals to borrow and tap investment capital. The problem was that the financial system developed new products so quickly that no one understood how it operated.

In Australia, central bank did not have to do much to manage the credit contagion. However, institutions dependent on short term funding were particularly vulnerable. Mortgage loans were affected because one of the major originators, RAMS, used a novel funding model. About 43% of its loan book was funded through 30-day extendible commercial paper (XCP) partly built on the CDO system on the US debt markets. In what is believed to be the first time in the \$US139 billion XCP market, an Australian issuer invoked a clause forcing lenders to extend, giving RAMS a 180 day period to try to put in place an alternative, longer-term, and likely higher cost, financing. (The Australian 2007). Thus a mortgage originator in Australia was looking to finance its loan book on a money market that was limiting the supply of money and selling money for higher prices.

By the end of August, everyone was looking for information on which to base projections. Home buyers seeking new loans needed to decide which lender to approach. Existing mortgagors looking to bail out of loans that could involve increasing costs needed to judge time and opportunity. Government and reserve bank officials needed to run the national economy. Their needs for much better information about land and land transactions were, however, merely another instance of a growing problem.

6 The need for a revolution in land information

The credit problem showed clearly that Australia would benefit from improving the way governments and businesses organised information about mortgages. Mortgage information is only one sub-set of the new kinds of information needed about modern land markets. Particularly agencies like the Australian Tax Office needed accurate and testable information about the physical world (parcels and parcel transactions) so they could add other information that was by nature relative – that is unique to a person, time, classification and so on. Increasingly, governments need relative information about land and its owners, managers and users. The information is relative because it is related to ever-changing relationships between land (parcels,

properties and sites of business activities), users, managers, owners, (as individuals, aggregated owners, earners of particular incomes etc), times, refined legal concepts and relationships among them. By combining the scientific testable information with relative information, agencies generated case by case outcomes to very important questions.

New information relativities are illustrated by a simplified version of capital gains tax in Figure 3, below. While most of the information in the decision chain is variable or relative, the constant and unchanging part of the story is, of course, the land.



Figure 3. Relative nature of land information in CGT collection (Wallace and Williamson 2006)

Similar considerations apply in the case of goods and services taxes and asset tests involved in calculating entitlements to social security. The Australian government is keenly aware of new information needs. Large scale databases and collections of information and data matching procedures indicated in the *Table 1. Australian land data needs*, below, were proposed for national agencies. These initiatives replicated the datasets held in state and territorial agencies, which, in their turn, involve substantial replication of core land information.

TABLE 1. AUSTRALIAN LAND DATA NEEDS		
Agency	Database	Purpose
Australian Taxation Office	Land transactions since 1999	To facilitate the collection of CGT and GST
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 Monitors was commissioned to provide timely and complete information about the property markets in major capital cities.
Australian Bureau of Statistics	House price indices	Release of 3 June 05 contained price information to December quarter 2004.

In all these newly diagnosed information needs, spatial enablement can and should play a role.

7 Introducing the concept of “Spatial Enablement”

Technological opportunities in land administration improved dramatically after 2000. The change is particularly evidenced in large scale, spatial systems that are available 24/7. These altered the mood of the world about the function of computers, the value of images, and the variety of applications that could be created. In fact these spatial systems were not possible until computing capacity reached proportions undreamt of in 1980. More importantly, spatial systems are underpinned by some thirty years of thought, planning and research, coupled with a large dose of innovation. This background is mostly invisible but its significance is obvious if we ask what motivated Google executives to build Google Earth and Google Maps, Microsoft to build Virtual Earth, Oracle to build Oracle Spatial, and so on. These, and the many related endeavours, illustrate the readiness of the private sector to invest billions of dollars in an idea and to back their prediction that computers will become essential to the ways people organise themselves, their activities, their information, their business processes and many other aspects of their lives. For these decision makers, people and personal uses of spatial systems were sufficiently attractive business drivers to justify massive investments. Meanwhile, what about governments?

Governments are of course composed of people, but their take up of new ideas is highly constrained and variously bureaucratized. The major constraint is the most difficult to overcome: it is the lack of understanding about what spatial enablement delivers. Anyone who finds the concept of spatial and its partner concept of spatial enablement difficult should think about the 24/7 systems. This will identify the first stage of spatial enablement. Here spatial involves the excitement of images, and the simple, visible answers to ubiquitous questions such as “where am I?” The second stage then becomes clearer. This stage involves converting the non-spatial information and processes used to manage our finances, our health, our education, our taxation and so on, into spatially enabled systems.

This second stage is still largely inchoate – we can see how it might work but in sketchy outline. Since it was first identified in the land administration context (Wallace and Williamson 2006), however, there have been remarkable developments. Illustrative is the conversion of business processes by spatially enabled systems in the Australian Department of Family and Children’s Services and Indigenous Affairs (FaCSIA). The new approach reorganised processing and information related to hundreds of grantees under dozens of grant schemes. These grants are not normally seen from the viewpoint of their spatial footprints, but the use of spatial technologies demonstrated how this improved management processes.

This second stage of spatial enablement involves the linking data with a geocoded reference, the north/south, east/west 2D codes, and even height, to give a precise reference on the Earth’s surface. Geocoding allows the data to be mixed and matched with other information about the same place to reveal an open-ended range of relationships and processes. The technical opportunities of using 2D XY coordinates plus 3D height, and even plus the 4th dimension of time, to reveal relationships are now real. But the linking must not merely deliver “pretty pictures” or gather even more data. The business driver of improving processes in government must ensure that the new approaches deliver real efficiency gains by saving time, improving understanding and, obviously, creating information once and using it many times over.

The logic of stage two of spatial enablement allows relationships between a numbers of factors below to be spatially organised:

People – who might be owners of land, clients of an agency, taxpayers or any particular relationship. These aspects could also include evaluative or qualitative aspects, for example tracking success and failure rates of some policy application.

Activities – the commercial, social and institutional activities and processes.

Locations or places – measurements, position in terms of coordinates, relations in space, and spatial components.

Times – an historical, future or real-time perspective. The crucial impact of time inclusion allows the order of events to be spatially tracked.

Using connections explained by systems-thinking (Bellinger and others 2004) these factors produce results which might be thought of as:

Data – the collection of results provides the data mass – in itself of little value.

Information – the spatial enablement is a “first sort” conversion of data into the much more valuable commodity of information.

Knowledge – in a high end application of spatial enablement, the spatial logic contributes to conversion of information into knowledge.

In many respects, this kind of schema follows the time-honoured framework of ordinary relational databases. But spatial systems convert the results into much more people friendly results. The power of the visual over the verbal both reduces the amount of information and organises it into “brain-ready” stuff. For the spatially informed, this is not “a picture tells a thousand words”, but a “map condenses thousands of spreadsheets”. The result of the conversion chain of data into information and then into knowledge to deliver wise and informed decisions is a vast increase in manageability. It is the vast improvement in *manageability* of business processes that is the attraction of spatial enablement of the non-spatial government processes. These processes can then influence the capacity of business to perform commercial functions, and people in general to perform their activities. This story is told graphically in Figure 4 below.

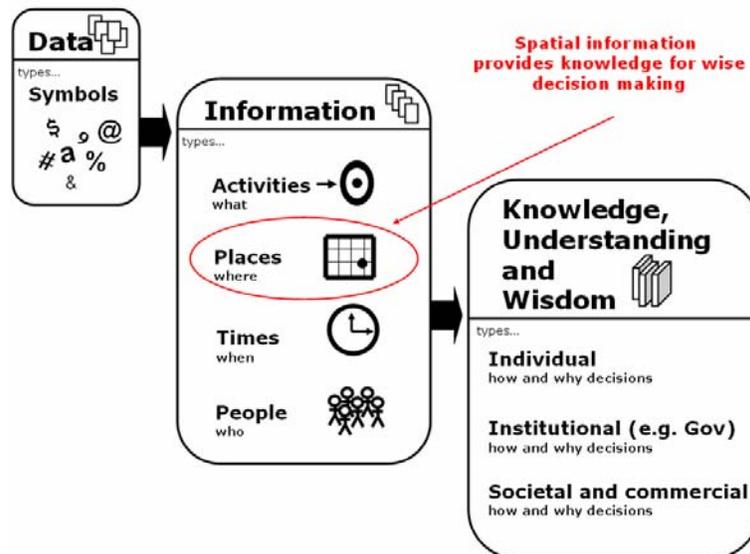


Figure 4. Place as a sorting system to improve manageability

8 Spatially enabling government

8.1 Improving the quality of registration information

Despite some internationally renowned successes built on the national geocoded address file (GNAF), Australian's LASs are incapable of providing information that relates times of transactions, types of mortgages, and sale price trends. These information sets are becoming critical for management of Australia's mortgage markets. One part of the solution to the information problem lies in reappraising the nature of above the line information already maintained in every land register. The first step lies in converting the information produced by transaction registration into authoritative registers.

The concept of authoritative registers (called "authentic" in EU) arose out of the efforts to achieve information coherence throughout the EU for key data sets: motor cars, people, land and businesses. These registers ensure that essential data sets are built once and used many times for the benefit all public authorities, and, indeed, all who seek to use them for legitimate purposes. Mortgage market participants could be among this group.

An authoritative property register is a single source of data provided by government to be used throughout government and for other purposes. It is built up from the activities of surveyors in the production of new land parcels and digitisation of records of existing parcels (van der Molen 2004). The Netherlands is leading the development of six "key registers":

- popular census
- business entities
- land and cadastre
- geographic information 1:10 000, and
- buildings and addresses.

Now the Netherlands is working on a register of car number plates (not cars); register of social securities, register of incomes and register of real-estate values. They plan a register of non-citizen inhabitants, register of large-scale topography, and the register of geological and soil data. At the periphery is a possible register of large-scale topo data, though the needs for agricultural subsidies in EU make the 1:10 000 small scale register essential. The unique Netherlands situation in land management illustrates how planned national responses to information needs can deliver capacity to manage land, where about 60% of the surface is below river and sea levels. These registers are expensive to run, but their capacity to return value to the nation is clear.

In the European model, the registers related to properties are of often two kinds: the map or cadastre and the information about owners and interests, though in some instances these are concurrently maintained by one agency. The spatial enablement of the cadastre carries with it spatial enablement of the text information. Other arrangements rely on two data files, each held by a separate agency, with links through a unique real estate property unit identifier (UNECE 2004).

8.2 Spatially enabling land information

In Australia thus far, the cadastre or property map is the focus for spatial enablement. The digital cadastre or parcel map is the basis of Australia's GNAF established by the Public Sector Mapping

Agency (PSMA). Together these service the new spatial systems that increasingly improve access to and organisation of information.

Even greater business efficiency and process reliability for government however lies in spatially enabling another data set held by registries: the attribute information, especially details of owners and interests. Australians transact millions of dollars worth of land transactions a year – sales, mortgages, leases being the main sub-sets, but additionally land changes hands through commercial work-outs, inheritance, marriages and divorces. This “transactional base” information is vital for government, though since mid-nineteenth century it is maintained basically for internal purposes of registration institutions and operations of simple land markets. This focus will inevitably change. But whether the focus will engage opportunities of new spatial technologies is another question. Even if spatial enablement is restricted to the above the line, public information, it would begin to change the way we think about land registration.

Meanwhile, efforts at reforming land registration since 2005 have concentrated on establishing national electronic conveyancing (NEC), including electronic funds transfer, to relieve the paper burden of transactions. This project stalled in August 2007 when the major banks indicated they would not be part of Release 2 in Victoria, largely because they could not afford to adapt internal processes to suit only one of the eight jurisdictions. The national initiative now depends on the Victorian model being seen as capable of absorbing transaction processes unique to the other seven states and territories.

Spatially enabling the registries is another separate idea that is unaffected by the protracted negotiations to introduce NEC. Given the need for coherence in information and processes in a federation like Australia elimination of barriers to conduct of national business remains essential. With the advantage of foresight, and confronting the lessons in co-operation coming out of NEC experiences, a significant change in thinking about registries would be needed before the ideas and innovations discussed here could appear. Not the least barrier is the lack of timeliness in registry information.

For land based information to remain outside this new technical world will doom it to obsolescence. Countries who benefit from a spatially enabled digital cadastral database that contains survey accurate information are international leaders in transformation of the cadastre as a tool of government, business and society.

Spatial enablement for Australia now relies on using the concept of place and location to organise both spatial and non-spatial information and processes. It is a ubiquitous part of eGovernment and broader government ICT strategies in most jurisdictions and in the Australian government. Its importance is recognized by two initiatives as part of wider SEG strategy of the On-line and Communications Ministerial Council reporting to the Committee of Australian Governments (COAG) – the National Address Management Framework (NAMF) and the National Information Sharing Strategy (NISS) where the spatial information industry will be used as a test bed. The NAMF has the major characteristics of the authoritative register: collected once and use by all, reliable and timely.

9 Future directions

These initiatives will only be taken up in land registries after a great deal of planning and effort, plus legal and technical research. To the great credit of those who make national land policy and who stimulate initiatives, GeoScience Australia and the ANZLIC are undertaking the first steps

towards defining Australia's future registries. They have called for detailed research on legal and administrative frameworks capable of managing the institution of property as it relates to land. This research is a preliminary step in the journey towards spatially enabled registries. Meanwhile, given the mortgage market needs, registries themselves might consider how they could adapt their processes to provide services to the institutions that operate in both Australia's primary and secondary mortgage markets where the attractions spatially enabled information are already apparent. For those who need the connection explained, consider a world in which the registry geocodes land and mortgage attributes (the details about loans described earlier) and provides spatially enabled information back to lenders to improve their internal management processes. This is of course a tiny beginning in a very long journey that could go anywhere.

We need registrars who freed of their institutional restraints and invited to think like the 24/7 system executives who looked at a globe of the World on the computer screen and asked "What if....?".

10 Acknowledgements

Under Professor Williamson's leadership, the Centre Spatial Data Infrastructures and Land Administration gave its researchers access to ideas from land administration and spatial professionals in government, private sectors and, of course, research institutions around the world. The collegiate environment facilitated a public interest research program of international dimensions. This unique experience encouraged analysis of connections between apparently unconnected processes and people. It also encouraged critical responses to allow us to refine ideas and better predict what might be done.

11 References

- Bellinger, Gene, Durval Castro and Anthony Mills,(2004), *Data, Information, Knowledge and Wisdom*, <http://www.systems-thinking.org/dikw/dikw.htm> [Accessed 30 August 2007].
- Moody's (2003), *Report on the Fundamentals of Asset-Backed Commercial Paper*. <http://pages.stern.nyu.edu/~igiddy/ABS/moodysabcp.pdf> [Accessed 28 August 2007].
- Samuelson, Robert,(2007), "Capital markets' explosive growth has magnified investment risks", *Australian Financial Review*, Monday 13 August 2007.
- The Australian "Rams puts its faith in securitisation as shares plummet 36pc", *Friday*, 17 August (2007), page 19; "Rams' sudden about-face on 2008 profit forecast turns it into one of the great IPO flops", *Friday* 17 August 2007, page 20.
- UN ECE, (2004), *Guidelines on Real Property Units and Identifiers*, ECE/HBP/135. Geneva, Switzerland
- Van der Molen, Paul, (2004), 'Authentic registers and good governance', *Workshop on Real Property Administration in Developing Information Society*. UN ECE, Working Party on Land Administration, Vilnius, Lithuania, 22-25 September.
- Wallace, Jude and Ian Williamson, (2006), "Building sustainability accounting in land administration systems in Australia", *Sustainability and Land Administration Systems*, Ian Williamson, Stig Enemark and Jude Wallace (editors), Department of Geomatics, Melbourne, 31.
- Wallace, Jude and Ian Williamson,(2006), "Building land markets", *Land Use Policy*, 23:123-135

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