Australian Government
Department of Education, Science and Training

Sustainability and Land Administration Systems

Proceedings of the Expert Group Meeting

Melbourne, Australia, 9 - 11 November 2005





Edited by
Ian Williamson,
Stig Enemark and
Jude Wallace

THE UNIVERSITY OF MELBOURNE

Department of Geomatics
The Centre for Spatial Data Infrastructures and Land Administration

SUSTAINABILITY AND LAND ADMINISTRATION SYSTEMS

Proceedings of the Expert Group Meeting on

Incorporating Sustainable Development Objectives into ICT Enabled Land Administration Systems

9-11 November 2005, Melbourne, Australia

Edited by

Ian Williamson

Stig Enemark

and

Jude Wallace

February 2006

Cover Design: Rohan Bennett

Published by:
Department of Geomatics, University of Melbourne
Parkville, 3010, Australia
Email: geomatics-info@unimelb.edu.au
ISBN 0-7325-1624-2

PROJECT PARTNERS

Thank you to our partners in the International Sciences Linkages project "Developing an ICT Enabled Land Administration System"

This project is proudly supported by the International Science Linkages program established under the Australian Governments innovation statement, *Backing Australia's Ability*.

AUSTRALIAN PARTNERS

The publication of these proceedings have been supported by the Department of Lands, NSW and Department of Geomatics, The University of Melbourne.

ORGANISING COMMITTEE

ORGANISERS

Chair
Ian Williamson

Steering Committee
Ian Williamson, Stig Enemark, Jude Wallace, Andrew Binns and Abbas Rajabifard

COORDINATORS

Research Outcomes and Documentation
Jude Wallace and Andrew Binns

Overall EGM
Andrew Binns

Open Workshop
Andrew Binns

Travel and Administration
Colleen Bermingham

Website
Rohan Bennett

ICT support
Rohan Bennett, Mohsen Kalantari and Hossein Mohammadi

PUBLICATION

Coordinators
Abbas Rajabifard and Andrew Binns

Editing & Cover
Andrew Binns and Rohan Bennett

Centre for Spatial Data Infrastructures and Land Administration
Department of Geomatics,The University of Melbourne
http://www.geom.unimelb.edu.au/research/SDI_research/index.html

EGM Web Address
http://www.geom.unimelb.edu.au/research/SDI_research/EGM/

FOREWORD

Land administration systems (LAS) are rapidly evolving with their role expanding dramatically due to many global drivers including sustainable development, evolving land markets and information and communication technologies, yet there are many issues and questions to be addressed and answered as each country or jurisdiction develops the most appropriate strategy to develop appropriate systems to serve their needs. Unfortunately there are no simple steps to follow in this rapidly changing environment.

In response to this challenge, the Australian Government through the International Science Linkages program established under its innovation statement, Backing Australia's Ability, sponsored a research project to explore new ICT enabled LAS models that could inform the development of Australian state systems. Previous research had identified important principles and concepts adopted by Western European countries in their own LAS. As a result the project was designed to identify best practice from both Western Europe and Australian LAS to assist in developing a new model in the context of a wider land management paradigm. A key component of this project was an international Expert Group Meeting between Australia and Europe that I had the pleasure of coordinating together with my two colleagues Stig Enemark and Jude Wallace.

The meeting brought together some of the best minds in Australia and Western Europe to analyse ongoing research in the area and to contribute to the development of a new ICT enabled land administration model.

The resulting meeting far exceeded our expectations and we are delighted and very grateful for the very considerable time and effort contributed by all those involved. The fact that we were able to bring together such an experienced and senior group of experts for a week is testament to the importance of the issue.

I am also very grateful for the excellent support from the members of the Centre for SDI and Land Administration, Department of Geomatics, University of Melbourne who spent months making sure the meeting would be a success.

But at the end of the day all participants hoped that their contributions would help make their own land administration systems more relevant, more efficient and better able to respond to current and future drivers. I am confident that the meeting has contributed to this outcome. I am also confident that the resulting proceedings of the meeting will be useful to others who are currently or will inevitably be grappling with the same issues.

Ian Williamson
EGM Coordinator

EXECUTIVE SUMMARY

Leading land administration practitioners and academics from Australia, Denmark, The Netherlands, Germany and Switzerland met from the 9th – 11th November 2005 to refine a vision for the next generation of ICT and spatially enabled Land Administration Systems (LAS). It was recognised that Western European countries have a long tradition of accommodating sustainable development objectives into their land administration systems and that Australia could learn from these experiences. At the same time these European countries acknowledge they can learn from ICT enablement of Australian land administration systems.

This Expert Group Meeting (EGM) was an important part of a research project being undertaken by the Centre for SDIs and Land Administration, Department of Geomatics, The University of Melbourne, for the Department of Education, Science and Training, supported by the International Science Linkages program established under the Australian Governments innovation statement, *Backing Australia's Ability*.

The objective of the EGM, shown diagrammatically in Figure 1 below, was to combine Australian and European experiences in critically evaluating a model which was developed during the inaugural visit to Melbourne by Professor Stig Enemark, the European counterpart in the project, in February 2004.

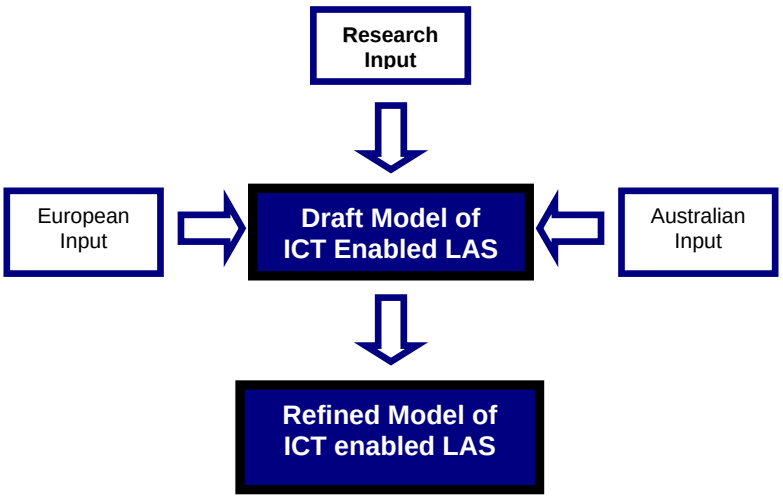


Figure 1 – EGM objective

Each of the attendees at the EGM was invited to present a focused paper presenting their views on the model from the perspective of their individual jurisdiction or research area. The model was built to identify the goals and structures for national land administration systems to help nations articulate coordination needs, capacity building, technological reforms and overall designs. Building an ideal model, then comparing its components against reality to identify betterment paths, is a well tested method of achieving international congruity and understanding about LAS and spatial information. The growth in interest in the relationship between LAS and spatial data infrastructures (SDIs) illustrates the necessity of building a robust vision for designing systems, identifying emerging problems and incorporating their possible solutions. The initial land management model that includes the core land administration component is presented in Figure 2 below.

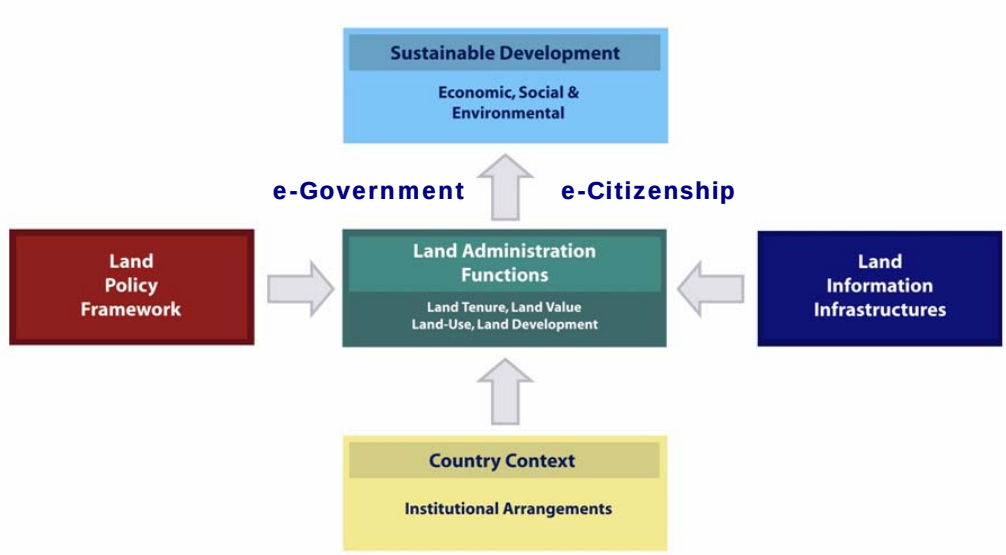


Figure 2 – Initial Land Management Model Incorporating the Land Administration Functions

The EGM was held over three days, with Day 1 focusing on the European approach to LAS and Day 2 focusing on the Australian approach. The development of a set of principles to inform a new integrated LAS model from both an Australian and European perspectives was the major outcome of these first two days. The final day attempted to gain a consensus on key principles for the next generation of ICT enabled LAS and included research input from the project team within the Department of Geomatics at the University of Melbourne on spatially enabling governments and *iLand*, the concept of integrated, spatially enabled land information available on the Web – a central component of new land administration systems.

Day 1 - European Approach

It was found that sustainability principles are far more embedded in European laws and customs than in Australia. For example the environment was a key political driver in the establishment of a Spatial Data Infrastructure for Europe (INSPIRE). Europe also tends to legislate spatial enablement and codify self regulation which differs some what from the Australian cooperative approach, however institutional issues are still the major stumbling block in relation to achieving change within LAS in both Australia and Europe. Within Europe it is recognized that good governance in a complex world now requires an integrated data approach and to achieve this, a unique, integrated and coordinated cadastre and land registry is required. Europe's cadastre's are generally complete and highly accurate allowing their utilization in a range of management and planning activities. An initiative in Europe not seen in Australia is that of the development of authoritative registers to manage people, location and activities. Countries such as Switzerland and Germany have also implemented a common data model in the cadastral domain, which is essential for interoperability, especially in a federated country.

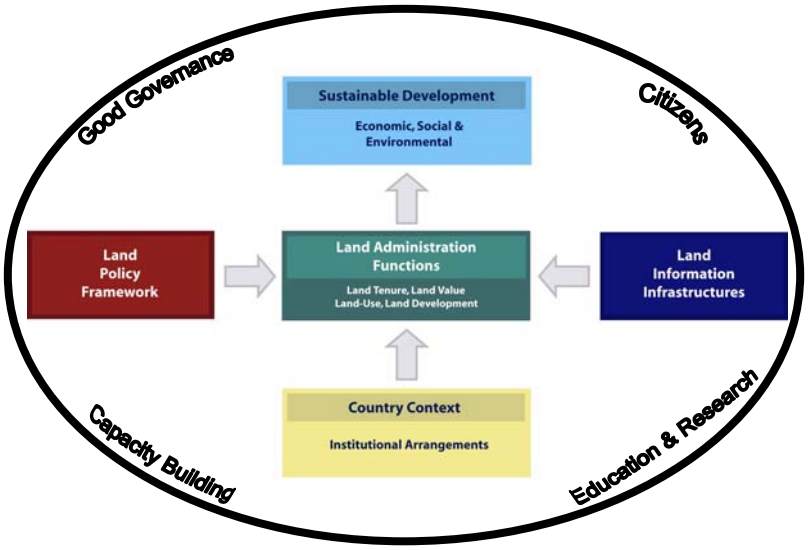
Day 2 - Australian Approach

Australia is attempting to embrace sustainability principles at all levels of government within its land administration systems and is using the concept of 'unbundling' property (creation of water rights, carbon credits etc) in order to help achieve this i.e. markets will support the most efficient use of natural resources. This unbundling however has resulted in disparate management systems which often fall outside of LAS. Technologies such as ICT convergence, web services, interoperability and coordinated cadastres are seen as

important in helping to unlock the value in existing systems, although their potential is currently underutilised.

Day 3 - Developing the new Model

The final day of the EGM was spent defining the key issues and initiatives that impact on the development of a new ICT enabled vision for LAS in the context of a wider land management model (Figure 3). It was agreed that development of an ICT based LAS will not automatically lead to sustainability. Sustainability is delivered by a mix of factors, with LAS being only one of them and this should be represented in the new model. It was also found that a lack of common understanding and common terminology impeded the discussion. A connection to people was also found to be missing from the initial model. The model was seen to be dehumanized with this being considered an important issue. It was found that the role of the private sector also needed to be embedded more into the model, as well as the important role that capacity building and education play.



- **Land**: holistic term including property as an asset and natural resources
- **People**: interact with land administration system through rights, restrictions and responsibilities
- **Sustainability**: facilitated through good governance in LAS
- **Innovation**: achieved through continuous monitoring and evaluation

Figure 3 – Additions to the original model

The final model (Figure 4) is based on the concept that spatial enablement of land administration systems managing tenure and registration, valuation, planning and development will allow the information generated by these activities to be much more useful in government and the wider community. The achievement of sustainable development goals will be easier to evaluate. Adaptability and usability of modern spatial systems will encourage much more information to be collected and made available. The "map-mashing" trend following Google Earth and other major international applications shows a high public take up and popularization of spatially enabled systems. For governments, building a suitable land policy framework will be assisted by better information chains. The services available to private and public sectors, and to community organisations should commensurably improve. Ideally these processes are dual: modern information and communication technology, the engagement of users in design of suitable services, and the adaptability of new applications should increase and mutually influence.

The global initiatives are the starting point, but in a national case, modifications to suit the particular context will be built. The new land administration systems of the future will be local, regional and global in their capacity.

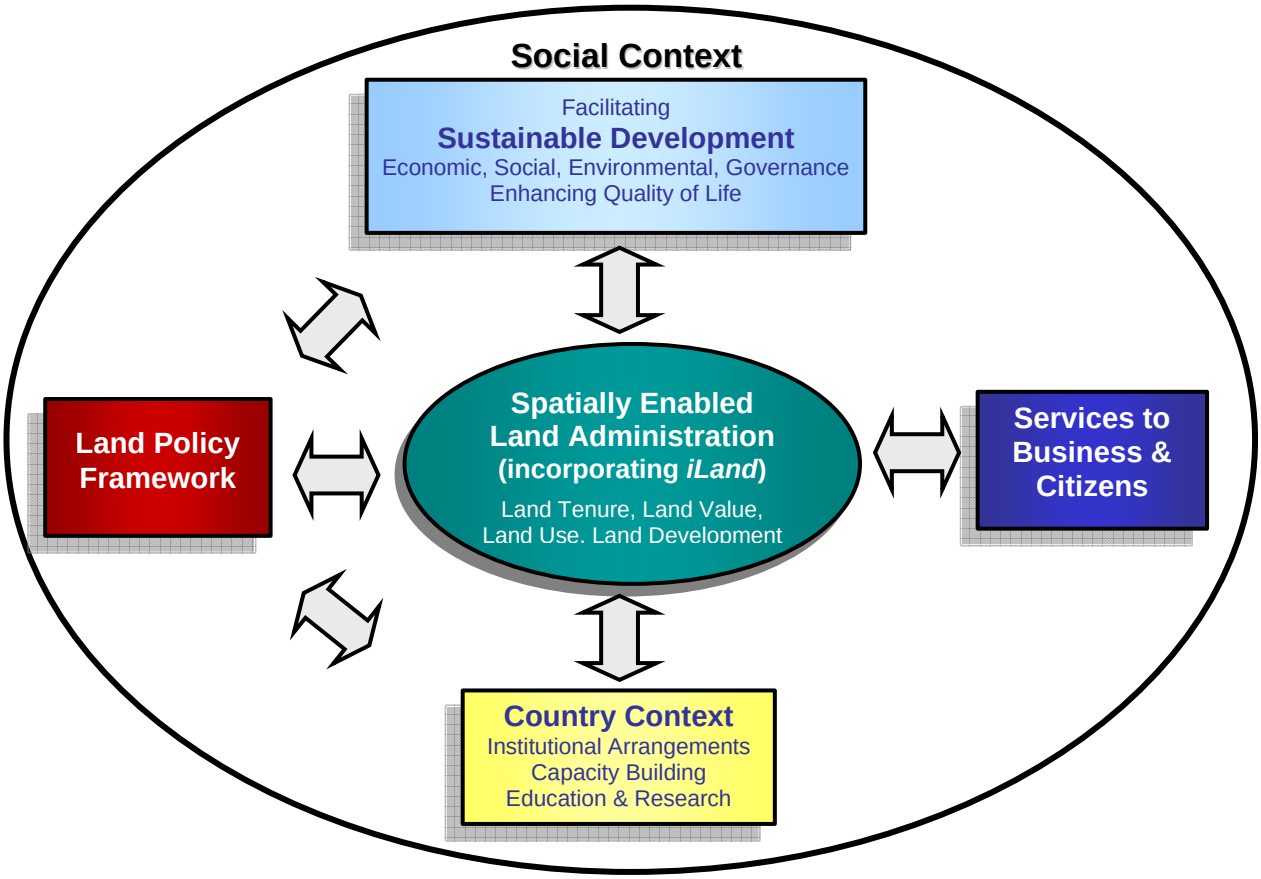


Figure 5 – Final Land Management Model – A Land Management Vision

Steps to Achieving the Vision

In order to achieve the new ICT enabled LAS within a land management vision, a number of steps were identified during the final day of the EGM. These included:

- Produce a final discussion/white paper for Australia as a potential future policy paper
- Raise the importance of the debate at ministerial level in Australia through a ministerial council of land ministers
  - Problem cases need identification (e.g. contaminated land). This will build an argument for government action at the ministerial level
- Develop a common language through further dialogue between stakeholders
- Develop a register of restrictions and interests which is critical to achieving sustainability
- Develop a network of people who should be used as a reference group to provide advice to and receive advice from, on land administration issues
- Involve others – users, other professionals, community
- Build capacity at social, institutional, data processing and individual levels – renewable self sustaining cycles
- Engage with the intended audience (citizens, politicians and NGOs)
- Collaborate/monitor/standardise internationally to build capacity of society, institutions and individuals

TABLE OF CONTENTS

PART 1 – RESEARCH VISION AND LAND MANAGEMENT PARADIGM

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

A LAND ADMINISTRATION VISION

Ian Williamson
Director, Centre for Spatial Data Infrastructures and Land Administration
Professor of Surveying and Land Information
Head, Department of Geomatics
The University of Melbourne, Australia
Email: ianpw@unimelb.edu.au

SUMMARY

An important government activity of all nation states is building and maintaining a land administration infrastructure. This includes cadastral surveys to identify and subdivide land, land registry systems to support simple land trading (buying, selling, mortgaging and leasing land) and land information systems to facilitate access to the relevant information increasingly through a Internet enabled e-government environment. For most countries a cadastre is at the core of the land administration system (LAS) providing spatial integrity and unique land parcel identification in support of security of tenure and effective land markets. For many cadastral and land administration officials and for much of society, these are the primary, and in many cases the only roles of the cadastre and land administration system. However the potential and role of the cadastre and land administration system has rapidly expanded over the last couple of decades.

Most governments assume that the primary task of this infrastructure is to support the operation of an efficient and effective land market. But what is a land market in a modern economy? Since our LAS were developed, land commodities and trading patterns have undergone substantial changes: they have become complex, corporatised and international. Are our current LAS designed to support a modern land market that trades in complex commodities such as mortgage backed certificates, water rights, land information, time shares, unit and property trusts, financial instruments, insurance products, options, corporate development instruments and vertical villages? Modern land markets involve a complex and dynamic range of activities, processes and opportunities and are impacted upon by a whole new range of restrictions and responsibilities now being imposed on land. They are continually evolving, primarily in response to economic energy and sustainable development objectives. They are also being driven by developments in information and communications technologies.

While modern land markets offer almost unlimited opportunities for LAS to expand their relevance and usefulness, one commodity in particular - land information - has the ability of transforming the way both governments and the private sector in modern economies do business. The e-land administration concept as part of e-government initiatives is now being replaced by *iLand* – a new vision for spatially enabled land information. While the original purpose of cadastres was essential and useful in facilitating simple land trading to support expanding economies, and modern land markets with their complex commodities offer potential opportunities to take another leap forward, it is the land information derived from the LAS that has the potential to transform the way modern societies function. It has the potential of transforming how tax is collected, how heath services are delivered, how

the environment and our cities are managed, how we respond to emergencies and terrorism, how wars are fought and how elections are run. Linked to such transformational technologies such as Google Earth and Microsoft's Virtual Earth, land information has the potential for spatially enabling government (and society).

This paper argues that there are considerable, virtually untapped benefits to be gained if modern LAS focus on supporting modern land markets. However it is the opportunities offered by land information and *iLand* that have the potential to far surpass the benefit and impact of the original purpose for which cadastres and LAS were built and possibly even the potential benefits offered by modern land markets.

The challenge now rests with land administration administrators around the world to capitalize on the opportunities provided by modern land markets and *iLand*.

INTRODUCTION

Land surveyors and land administrators are experts in designing, building and managing the spatial component of our cadastres as the central component of land administration systems (LAS). They are experienced in creating, describing and defining land parcels and associated rights and restrictions. Historically, the primary reason that society requires these skills is to support an efficient and effective land market in which the rights in land are traded to promote economic development. By the mid nineteenth century, trading involved buying, selling, mortgaging and leasing of land. By the mid twentieth century, we as professionals, along with land administration and cadastral officials and associated legal professionals, assumed that we understood land markets and that we had developed appropriate professional skills to serve the needs of those markets.

Unfortunately these professionals were involved in supporting the land trading activities, not designing them. Simply there is little documentation in the literature on how to design and build a land market or even on the development and growth of land markets (however see Wallace and Williamson, 2005a).

It is ironic that surveyors pride themselves on working from the "whole to the part", yet in the case of land markets there is little effort given to designing land markets and then designing the cadastre, LAS and supporting spatial skills to support them. Historically, we went the other way round: we often design LAS and hope that they will support efficient and effective land markets.

Our current land administration (LA) skills are appropriate for simple land markets where the focus is traditional land development and simple land trading; however land markets have evolved dramatically in the last 50 years and became very complex, with the major wealth creation mechanisms focused on the trading of complex commodities. As with simple commodities such as land parcels, all commodities require quantification and precise definition (de Soto, 2000). While land surveyors and LA administrators have not embraced the administration of complex commodities to a significant degree, these modern complex land markets offer many opportunities for surveyors and LA administrators if they are prepared to think laterally and capitalize on their traditional measurement and land management skills.

While the expansion of our LAS to support the trading of complex commodities offers many opportunities for surveyors and cadastral administrators, it is one particular commodity - land information - that has the potential to significantly change the way societies operate and how governments and the private sector do business.

This paper argues that the growth of markets in complex commodities is a logical evolution of our people to land relationship and our evolving cadastral and land administration systems. It proposes that the changing people to land relationships, the need to pursue sustainable development and the increasing need to administer complex commodities within an ICT (information and communications technologies) enabled virtual world, offer new opportunities for our LA systems. However if these opportunities are to be achieved then there are many challenges to be overcome.

The paper draws upon current research that is being undertaken within the Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne (http://www.geom.unimelb.edu.au/research/SDI_research/) to better understand and address these challenges. This includes the need for a collaborative whole of government approach to managing spatial information using spatial data infrastructure (SDI) principles, the need to better understand the role that the LAS plays in integrated land management (land markets, land use planning, land taxation etc), the need to seamlessly integrate built and environmental spatial data in order to deliver sustainable development objectives, the need to improve interoperability between our land information silos through e-land administration, the need to better manage the complex issues in our expanding multi-unit developments and vertical villages, the need to better manage the ever increasing restrictions and responsibilities relating to land and the need to incorporate a marine dimension into both our cadastres and land administration systems. All these initiatives come together to support a new vision for managing land information - *iLand*.

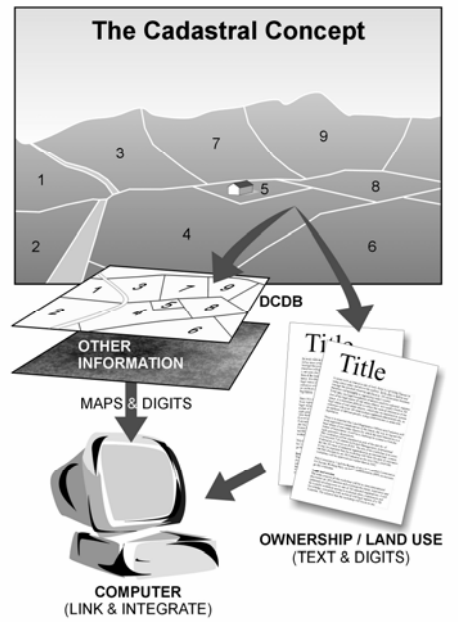


Figure 1 -
The Cadastral Concept
(FIG, 1995)

EVOLUTION OF LAND ADMINISTRATION SYSTEMS

In order understand how LAS are developing and where they are heading, it is useful to understand their components and how they evolved.

Central to most LAS is a cadastre. While having a cadastre is not mandatory for a LAS, all modern economies recognize its importance and either incorporate a cadastre in their LAS or have incorporated key components. For example while Australian LAS have not evolved from a cadastral focus like their European counterparts, today they have developed cadastres which equal and sometimes have improved upon the classic European approach.

The cadastral concept shown in Figure 1 (FIG, 1995) is simple and clearly shows the textual and spatial components, which are the focus of land surveyors, land registry and cadastral officials. The cadastre provides a spatial integrity and unique identification for land parcels within a LAS. However while the cadastral concept is simple, implementation is difficult and complex. While this model is still a useful depiction of a cadastre, it does not show the evolving and complex rights, restrictions and responsibilities that a modern society demands in order to deliver sustainable development objectives. It also does not show the important role the cadastre plays in supporting integrated land management or in providing critically important land information that plays a key role in enabling the creation of a virtual society and at a more practical level e-government. However other initiatives of the International Federation of Surveyors (FIG) do highlight the changing role of the cadastre, such as CADASTRE 2014 (FIG,1998) and the Bathurst Declaration on land administration for sustainable development (FIG, 1999).

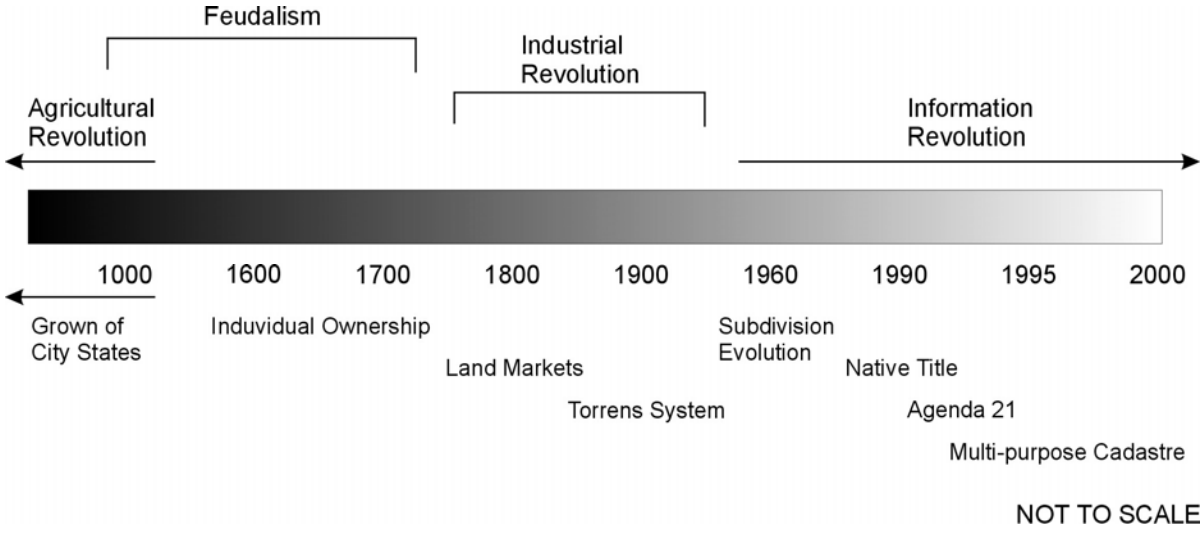


Figure 2 - Evolution of people to land relationship (Ting and Williamson, 1999a)

To understand the evolution of LAS it is worth considering the changing people to land relationship over the centuries. Even though Figure 2 depicts a Western example of this evolving relationship, a similar evolution can be plotted for all societies. This diagram highlights the evolution from feudal tenures, to individual ownership, the growth of land markets driven by the Industrial Revolution, the impact of a greater consciousness about managing land with land use planning being a key outcome, and in recent times the environmental dimension and more recently the social dimension in land (Ting and Williamson, 1999a). Historically an economic paradigm drove land markets however this has now been significantly tempered by an environmental and more recently a social paradigm. Simply the people to land relationship in any society is not stable but is continually evolving.

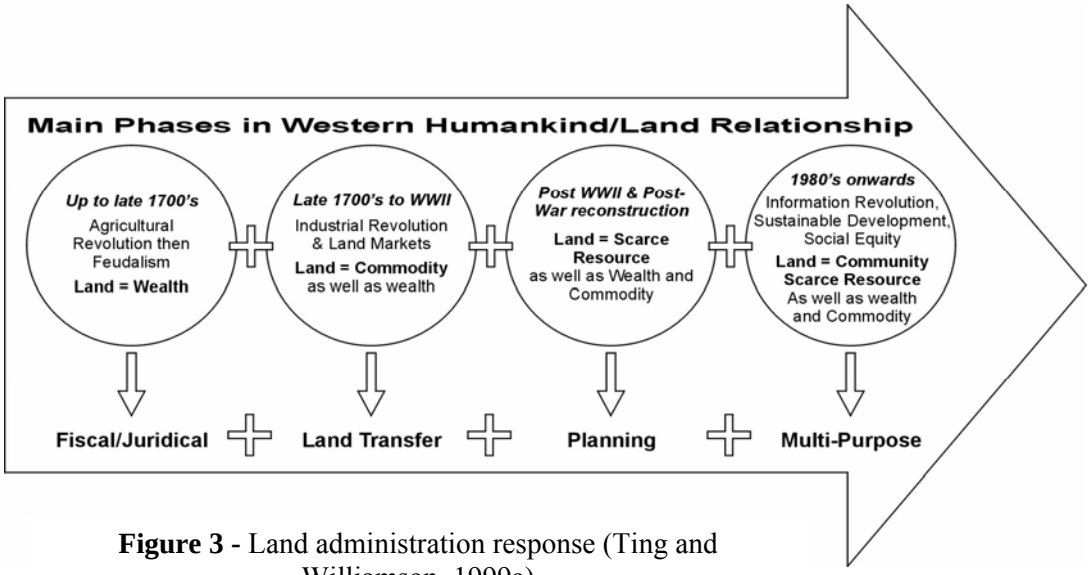


Figure 3 - Land administration response (Ting and Williamson, 1999a)

In turn most civilisations developed a land administration or cadastral response to this evolving people to land relationship. Figure 3 depicts the evolution of these responses over the last 300 years or so in a western context. The original focus on land taxation expanded to include support for land markets, then land use planning and over the last decade or so

has expanded to provide a multi-purpose role to support sustainable development objectives (Ting and Williamson, 1999b).

Even considering this evolution, current LAS are still based on a 19th century economic paradigm with the objective to define simple land commodities and to support simple trading patterns (buying, selling, leasing and mortgaging), particularly by providing a remarkably secure parcel titling system, an easy and relatively cheap conveyancing system, and reliable parcel definition through attainable surveying standards.

Arguably, Australia led the world in adapting their LAS to support land parcel marketing. Major innovations of the Torrens system of land registration and strata titles are copied in many other countries. However, because of the pace of change, the capacity of LAS to meet market needs has reduced. The land market of say 1940, is unrecognisable in today's modern market. After WW II new trading opportunities and new products were invented. Vertical villages, time shares, mortgage backed certificates used in the secondary mortgage market, insurance based products (including deposit bonds), land information, property and unit trusts and many more commodities now offer investment and participation opportunities to millions either directly or through investment or superannuation schemes. The controls and restrictions over land have become multi-purpose, and aim at ensuring safety standards, durable building structures, adequate service provision, business standards, social and land use planning, and sustainable development. The replication of land related systems in resource and water contexts is demanding new flexibilities in our approaches to land administration (Wallace and Williamson, 2005b).

Australian LAS that service parcel based trading and related market activities were overhauled in the 30 years commencing in 1970 to:

- comply with National Competition Policy
- reorganise the 19th century legislative structures establishing single office - single function administrations (Surveyor General, Registrar General, Valuer General) with modern management and performance enhanced organisational structures
- provide opportunities for more competitive professional services and private sector involvement, and
- capitalize on opportunities available from digital and web technologies.

The combination of new management styles, computerization of activities, creation of data bases containing a wealth of land information, and improved interoperability of valuation, planning, address, spatial and registration information allowed much more flexibility. However, Australian LAS remain creatures of their history of state and territory formation. They do not service national level trading and are especially inept in servicing trading in new commodities. However modern societies, which are responding to the needs of sustainable development, are now required to administer a complex system of overlapping rights, restrictions and responsibilities relating to land – our current land administration and cadastral systems do not service this need. A diagrammatic representation of the development of land administration (and cadastral) systems from a policy focus is shown in Figure 4.

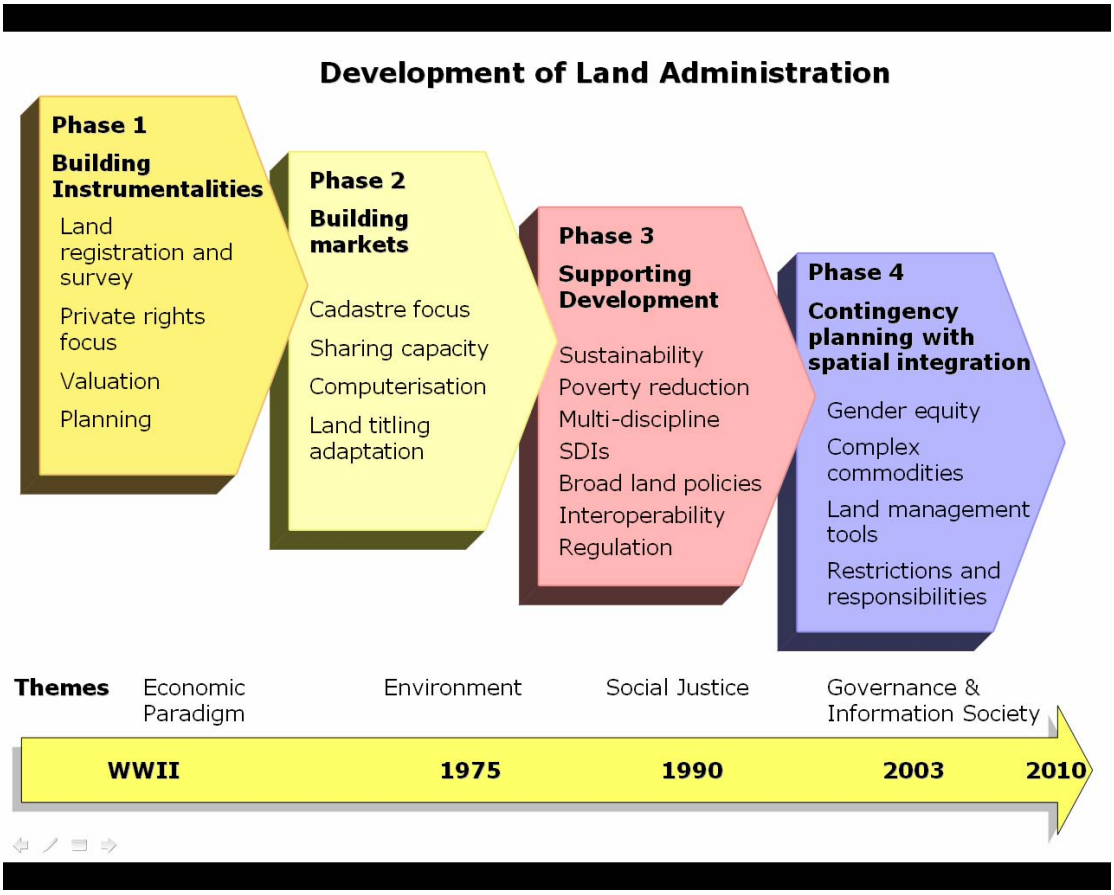


Figure 4 - Development of Land Administration (Wallace and Williamson, 2005c)

Modern societies are also now realising that there are many rights, restrictions and responsibilities relating to land, which exist but have not been formalised by governments for various policy or political reasons. This does not mean these rights do not exist but that they

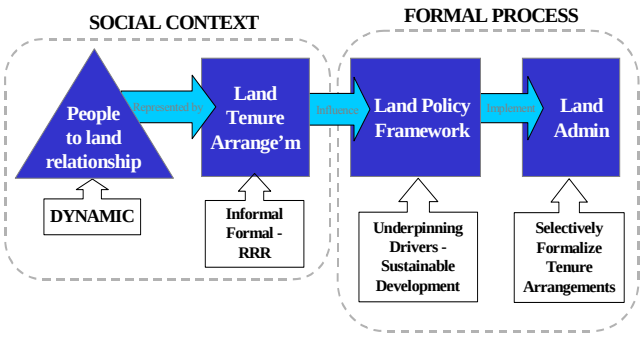


Figure 5 - Formalisation of tenures

Figure 6 - Land Administration Arrangements (Enemark, Williamson and Wallace, 2005)

simply have not been formalized in recognizable land administration frameworks. A good example is the recognition of indigenous aboriginal rights in land in Australia in the 1980s. Prior to the Mabo and Wik High Court decisions and the resulting legislation in Australia, indigenous rights did not formally exist. Their existence was informal but strongly evidenced by song

lines, cultural norms and other indigenous systems, a situation still familiar in the developing world where indigenous titles await more formal construction.

The process of formalising tenure and rights, restrictions and responsibilities in land is depicted in Figure 5. An understanding of both formal and informal rights is important as we move to develop land administration and cadastral systems that are sensitive to sustainable development objectives. Additionally, we need to recognize that change management processes and adaptation of formal systems always lag behind reality: all mature systems will simultaneously sustain both informal and highly formalized rights because the systems are not yet ready for emerging interests. Frequently, some rights will be deliberately held in informal systems: one of the largest and most significant management tools in Australia, the trust, remains beyond the land administration infrastructure and involves utilization of paperwork generated by lawyers and accountants and held in their filing drawers.

Other rights involve minimal formalization for different reasons. Residential leases, too common and too short term to warrant much administrative action, are traditionally organized outside LAS. That these land rent-based distribution systems remain potentially within the purview of modern LAS policy makers and administrators is illustrated by Australia's development of a geo-referenced national address file (GNAF). Indeed the development of spatial, as distinct from survey, information provides the timeliest reminder that information about land is potentially one of the most remarkable commodities in the modern land market. Certainly this commodity of information is of core interest to LA administrators.

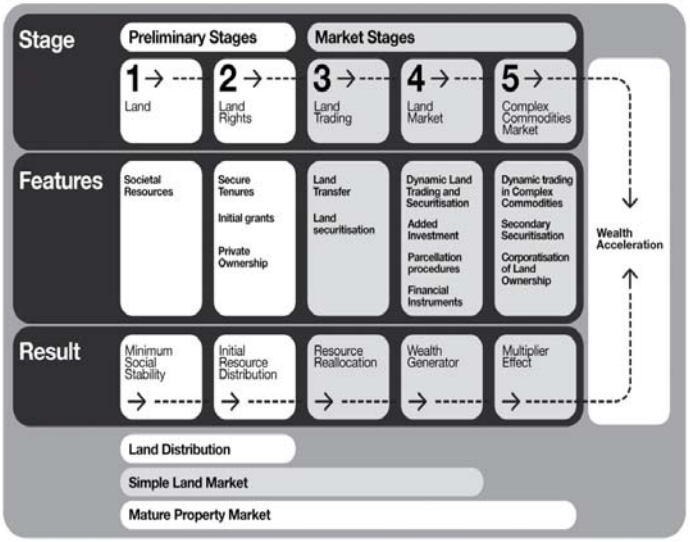


Figure 7 - Evolution of land markets (Wallace and Williamson, 2005a)

An integrated model for a modern land administration system (Enemark et al, 2005) that draws on the above principles is shown in Figure 6. Even this can go further. Modern land markets have evolved from systems for simple land trading to trading complex commodities such as mortgage backed certificates, water rights and carbon credits. Our understanding of the evolution of land markets is limited but it must be developed if LA administrators are going to maximise the potential of trading in complex commodities by developing appropriate land administration systems (Wallace and Williamson, 2005a). Figure 7 shows the various stages in the evolution of land markets from simple land trading to markets in complex commodities. The growth of a complex commodities market showing examples of complex commodities is presented diagrammatically in Figure 8.

THE ROLE OF LAND ADMINISTRATION SYSTEMS IN SUPPORTING *iLAND*

This brief review of the evolution of cadastres, land administration systems and land markets shows that the traditional concept of cadastral parcels representing the built environmental landscape is being replaced by a complex arrangement of over-lapping tenures reflecting a wide range of rights, restrictions and responsibilities and that a new range of complex commodities building on this trend have emerged. To a large extent these developments are driven by the desire of societies to better meet sustainable development objectives. There is no reason to believe that this trend will not continue as all societies better appreciate the needs to manage the environment for future generations and deliver stable tenure and equity in land distribution.

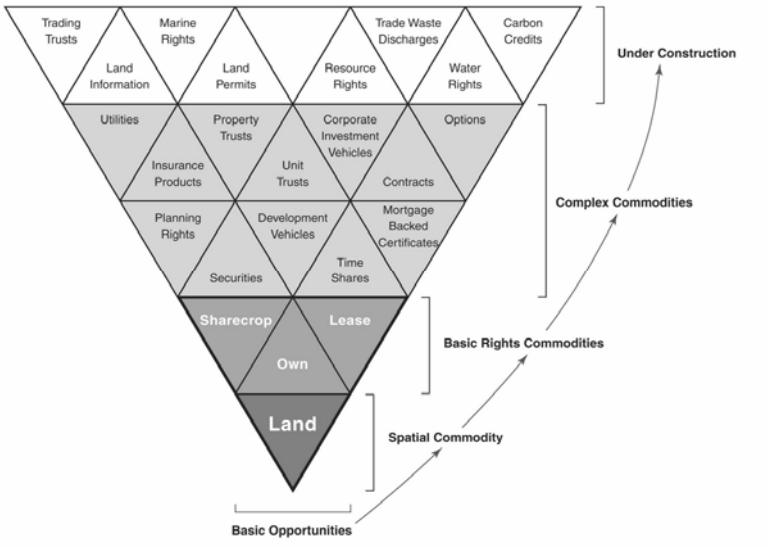


Figure 8 - Complex commodities market (Wallace and Williamson, 2005a)

While the growth of complex commodities offers huge potential for cadastral systems to play a greater role in delivering sustainable development objectives and supporting the trading of these complex commodities in particular, it is one complex commodity, land information, that offers the potential for transforming the way government and the private sector do business. The potential offered by land information in a virtual world in spatially enabling government is so large, it is difficult to contemplate. We are starting to glimpse this potential in such initiatives as Google Earth and Microsoft's Virtual Earth, but this is barely a start. These predictions of the importance of spatial information are also recognized in many other influential forums such as in the prestigious journal NATURE and recently in the Australian Prime Minister's statement on frontier technologies for building and transforming Australia's industries (December, 2002) – both these examples place the growth and importance of the geosciences alongside nanotechnology and biotechnology as transformational technologies in the decade ahead.

With regard to the importance and growth in land administration and its cadastral core as shown in Figure 4, Figure 9 attempts to show through a technology focus, how land administration and cadastral systems have been transformed over the last three decades or so. The figure shows five stages in the evolution of our cadastral systems from a technology perspective. The first stage recognizes that historically cadastral systems were manually operated with all maps and indexes hard copy. At this stage the cadastre focused on security of tenure and simple land trading. The 1980s saw the computersiation of these cadastral records with the creation of digital cadastral data bases (DCDBs) and

computerized indexes. However this computerization did not change the role of the land registry or cadastre, however it was a catalyst to start institutional change world wide where the traditionally separate functions of surveying and mapping, cadastre and land registration started coming together.

Figure 9 - Technical evolution of land administration

With the growth of the Internet, the 1990s saw governments start to web enable their land administration systems as they became more service oriented. As a result it became possible to access cadastral maps and data over the Internet. It facilitated digital lodgment of cadastral data and opened up the era of e-conveyancing. However the focus on security of tenure and simple land trading within separate institutional data silos still continued. At the same time this era also saw the establishment of the spatial data infrastructure (SDI) concept (see Williamson et al, 2003 and Rajabifard et al, 2005). The SDI concept, together with web enablement, started to see the integration of different data sets (and particularly the natural and built environmental data sets) with these integrated data sets now considered critical infrastructure for any nation state.

At the present time there is a significant refinement of web enabled land administration systems where the common driver is interoperability between disparate data sets which is being facilitated by the partnership business model. This is now the start of an era where basic land, property and cadastral information is now being used as an integrating technology between many different businesses in government such as planning, taxation, land development, local government. Examples of this are the new Shared Land Information Platform (SLIP) being developed by the state Government of Western Australia (Searle and Britton, 2005). A key catalyst for these developments is also the development of high integrity geocoded national street address files such as the Australian GNAF (Paull and Marwick, 2005). These developments have also been a catalyst for the development of "mesh blocks" which are small aggregations of land parcels that are now revolutionizing the way census and demographic data is collected, managed and used (Toole and Blanchfield, 2005). This era has also offered the potential for better managing the complex arrangement of rights, restrictions and responsibilities relating to land that are essential to achieving sustainable development objectives (Bennett et al, 2005). This is also driving the re-engineering of cadastral data models that will facilitate interoperability between the cadastre, land use planning and land taxation for example (Kalantari et al, 2005).

This is now the start of an era where the potential of land and cadastral data has started to be realized. What this era has shown is that the use and potential of cadastral data as an enabling technology or infrastructure outweighs its value to government from supporting simple land trading and security of tenure. It is also the start of an era when governments now realize that the cadastre does not stop at the waters edge. Cadastres must include a marine dimension where there is a continuum between the land and marine environments. It is now recognized that without such basic infrastructure the management of the

exceptionally sensitive coastal zone is very difficult if not impossible (see Strain et al, 2005).

However this is not the end of the story – researchers, practitioners, big business and government are now seeing the huge potential from linking "location" or the "where" to most activities, polices and strategies, just over the horizon. Companies like Google and Microsoft are actively negotiating to gain access to the world's large scale built and natural environmental data bases. In Australia they are negotiating to get access to the national cadastral and property maps as well as to GNAF. At the same time new technologies are being built on top of these enabling infrastructures such as the Spatial Smart Tag which is a joint initiative in Australia between government, the private sector and Microsoft (McKenzie, 2005). We are starting to see the realization that cadastral and land related information will dramatically spatially enable both government and the private sectors, and in fact society in general. In the near future spatially enabled systems will underpin health delivery, all forms of taxation, counter-terrorism, environmental management, most business processes, elections and emergency response for example.

This will be the era when cadastral data is information and a new concept called *iLand* will become the paradigm for the next decade. *iLand* is a vision of integrated, spatially enabled land information available on the Internet. *iLand* enables the "where" in government policies and information. The vision as shown diagrammatically in Figure 10 is based on the engineering paradigm where hard questions receive "designed, constructed, implemented and managed" solutions. In *iLand* all major government information systems are spatially enabled, and the "where" or location provided by spatial information are regarded as common goods made available to citizens and businesses to encourage creativity, efficiency and product development. The LAS and cadastre is even more significant in *iLand*. Modern land administration demands such a LA infrastructure as fundamental if land information is to be capable of supporting those "relative" information attributes so vital for land registries and taxation.

While future markets of complex commodities will continue to rely on the underlying cadastre and land administration system, how many surveyors and LA administrators will embrace the definition and management of complex commodities that do not rely on traditional cadastral boundaries and that require merging of value, building purpose, land use and personal owner information? How many LA administrators are capable of seeing the international context of land information and its importance to their national government in presentation of its investment face to the world? Will they embrace *iLand*?

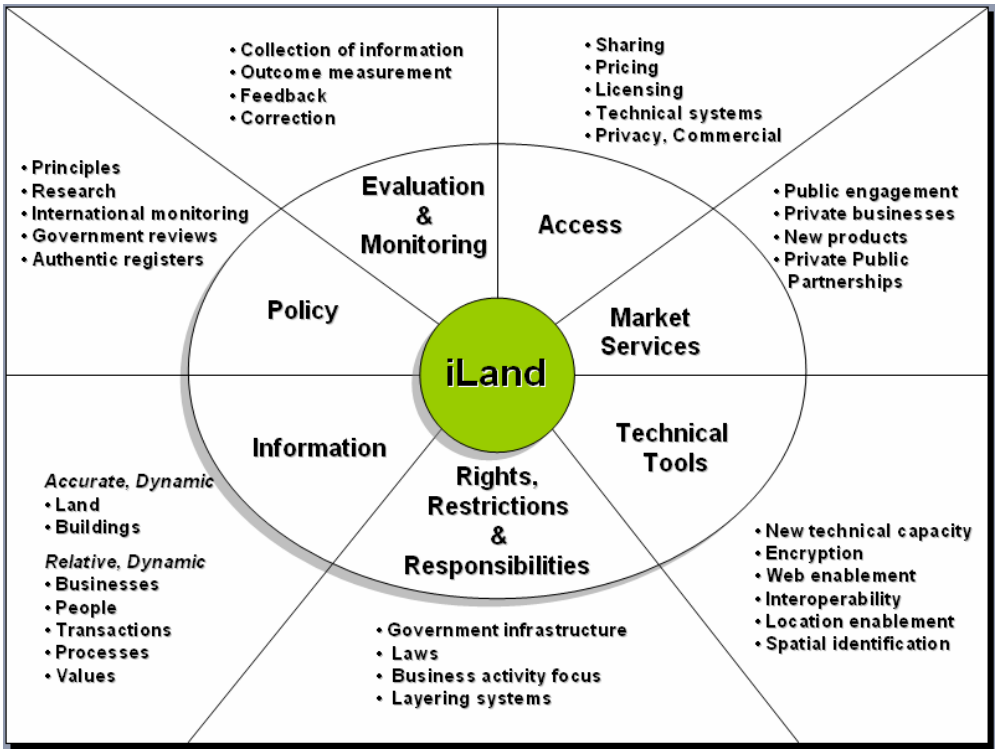


Figure 10 - The *iLand* vision (Wallace and Williamson, 2005)

CONCLUSION

This paper attempts to show that the people to land relationship is dynamic with the result that the land administration and cadastral response to managing this relationship is also dynamic and continually evolving. A central objective of the resulting land administration systems is to serve efficient and effective land markets. Because of sustainable development and technology drivers, modern land markets now trade in complex commodities, however our current land administration systems and the majority of the skills of land surveyors and LA administrators are focused on the more traditional processes supporting simple land trading. I believe the growth in complex commodities offers many opportunities for LA administrators if they are prepared to think laterally and more strategically.

The paper then focuses on one particular complex commodity, land information, and shows how it has grown in importance over the last few decades to be now considered by many to be more important and useful to government that the traditional role of supporting security of tenure and simple land trading. The paper shows that land administration and their core cadastral components are evolving into a new vision and essential infrastructure called *iLand* that spatially enables government and provides the "where" for all government decisions, polices and implementation strategies.

The paper presents a challenge to LA officials to design and build modern land administration and cadastral systems that will better support the creation, administration and trading of complex commodities and particularly use land information to spatially enable not only government but society in general. Unfortunately without these systems modern economies will have difficulty meeting sustainable development objectives and achieving their economic potential.

ACKNOWLEDGEMENTS

I wish to gratefully acknowledge the assistance of my colleagues in the Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne in the preparation of the article. The article draws on the ongoing research of current members of the Centre such as Dr Abbas Rajabifard, Andrew Binns, Kate Dalrymple, Rohan Bennett, Mohsen Kalantari, Hossein Mohammadi and Lisa Strain. I am particularly grateful for the input of Ms Jude Wallace, Senior Research Fellow in the above Centre. The paper builds on previous articles such as "A vision for spatially informed land administration in Australia" presented at the Spatial Sciences Institute Biennial Conference in Melbourne, September, 2005, and "Understanding land markets", Journal of Land Use Policy (forthcoming), both co-authored by Jude Wallace and Ian Williamson, and "Land markets in a changing world – opportunities for surveyors" presented at the FIG Working Week in Cairo April, 2005 by Ian Williamson.

REFERENCES

Bennett, R., Wallace, J. and Williamson, I.P. 2005. Integrated land administration in Australia. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Dalrymple, K, Wallace, J. and Williamson, I.P., 2004. Land Policy and Tenure in Southeast Asia 1995-2005, 4th Trans Tasman Surveyors Conference, Auckland, New Zealand, 13-16 October.

Dalrymple, K, Wallace, J. and Williamson, I.P., 2004. Innovations in Land Policy and Rural Tenures. 3rd FIG Regional Conference, Jakarata, Indonesia, October 4-7. http://www.fig.net/pub/jakarta/papers/ts_10/ts_10_1_dalrymple_etal.pdf

Dalrymple, K, Wallace, J. and Williamson, I.P. 2005. Transferring our knowledge and systems – tenure formalisation. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

De Soto, Hernando, 2000, The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else, Bantam Press, London, 235 pp

Enemark, S., Wallace, J. and Williamson, I.P. 2005. Land administration arrangements. Accepted by the Spatial Sciences Journal, Spatial Sciences Institute, Australia.

FIG, 1995. The FIG Statement on the Cadastre. International Federation of Surveyors, FIG Publication No 11. http://www.fig7.org.uk/publications/cadastre/statement_on_cadastre.html Accessed 8th August, 2004

FIG, 1998. CADASTRE 2014. International Federation of Surveyors. (http://www.fig.net/commission7/reports/cad2014/) Accessed 1st November, 2005.

FIG, 1999. Bathurst Declaration on Land Administration for Sustainable Development. International Federation of Surveyors (http://www.fig.net/pub/figpub/pub21/figpub21.htm) Accessed 1st November, 2005.

Kalantari, M., Rajabifard, A., Wallace, J. and Williamson, I.P. 2005. Towards e-land Administration – Australian on-line land information services. Proceedings of the

Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

McKenzie, D. 2005. Victorian Spatial Smart Tag – How to bring spatial information to government's non technical users. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Paull, D. and Marwick, B. 2005. Maintaining Australia's Geocoded National Address File (GNAF). Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Rajabifard, A., Binns, A. and Williamson, I.P. 2005. Creating an enabling platform for the delivery of spatial information. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Searle, G. and Britton, DM. 2005. Government working together through a shared land information platform (SLIP). Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Ting, L., Williamson, I.P. Grant, D. and Parker, J. 1999a. Understanding the Evolution of Land Administration Systems in Some Common Law Countries. The Survey Review Vol. 35, No. 272, 83-102. http://www.geom.unimelb.edu.au/research/publications/IPW/EvolnLandAdmin_SurvReview_.pdf Accessed 8th August, 2004.

Ting, L. and Williamson, I.P. 1999b. Cadastral trends: A synthesis. The Australian Surveyor Vol. 4, No. 1, 46-54. http://www.geom.unimelb.edu.au/research/publications/IPW/CadastralTrendsSynthesis.html Accessed 8th August, 2004

Toole, M and Blanchfield, F. 2005. Mesh blocks – from theory to practice. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Strain, L., Binns, A., Rajabifard, A. and Williamson, I.P. 2005. Spatially administering the marine environment. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Wallace, J. and Williamson, I.P. 2005a. Building land markets. Accepted for publication in the Journal of Land Use Policy.

Wallace, J. and Williamson, I.P. 2005b. A vision for spatially informed land administration in Australia. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

Wallace, J and Williamson, I.P. 2005c. The theory and practice of land administration. In preparation.

Williamson, I.P., Rajabifard, A. and Feeney, M-E.F. (Editors). 2003. Developing Spatial Data Infrastructures – From concept to reality. Taylor and Francis. 316p.

Williamson, I.P. 2005. Land markets in a changing world – opportunities for surveyors. Proceedings of the FIG Working Week and GSDI 8, Cairo, April 16-21, 2005. http://www.fig.net/pub/cairo/papers/ts_10/ts10_02_williamson.pdf Accessed 25 September 2005.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

THE LAND MANAGEMENT PARADIGM FOR SUSTAINABLE DEVELOPMENT

Stig Enemark
Vice-President of International Federation of Surveyors
Head, School of Surveying and Planning
Aalborg University, Denmark
Email: enemark@land.aau.dk

SUMMARY

Land management is the process by which the resources of land are put into good effect. Land management encompasses all activities associated with the management of land that are required to achieve sustainable development. The concept of land includes properties and natural resources and thereby encompasses the total natural and built environment. Land Administration Systems (LAS) are institutional frameworks complicated by the tasks they must perform, by national cultural, political and judicial settings, and by technology. This paper facilitates an overall understanding of the land management paradigm.

The paper presents a model for sharing LAS among countries with diverse legal systems and institutional structures by identifying an ideal and historically neutral LAS model for: servicing the needs of governments, business and the public; utilising the latest technologies; and servicing rights, responsibilities, restrictions and risks in relation to land in support of sustainable development. The model is designed for developed economies but allows incremental adoption of the model by countries at transitional stages of economic development.

The model reflects drivers of globalisation and technology development which support establishment of multifunctional information systems incorporating diverse land rights, land use regulations and other useful data. A third major driver, sustainable development, stimulates demands for comprehensive information about environmental conditions in combination with other land related data. It is argued that development of such a model is important or even necessary for facilitating a holistic approach to the management of land as the key asset of any nation or jurisdiction.

INTRODUCTION

While national strategies and models of LAS vary across European countries, common policies, strategies and technology solutions are becoming apparent and offer timely lessons for other regions in the world. Land administration systems are increasingly being tested against an emerging vision of a more unified model appropriate for developed economies but also capable of providing direction for transitional economies.

The new vision builds on the model developed by Dale and McLaughlin (1999) but concentrates on functions and systems delivery, in contrast to their comprehensive analysis of existing systems with a focus on land information management. The basic understanding of dealing with Land rights, land value, and land use is the same, but the new vision is based on a holistic approach to LAS that aims to perform stated functions through delivery arrangements and systems. It develops holistic analysis of the functional relationship between the infrastructure of the LAS and the policy of sustainable development; it recognises land management as the policy imperative; and it parallels the development of a theory for spatial data infrastructures and demands for spatially specific information about government and private activities.

The model is based on the key understanding of land administration as an area dealing with rights, restrictions and responsibilities in land. This relates to the interaction of the three areas of land tenure, land value and land use. By including land development these four areas are called the Land Administration Functions. These functions are based on policies determining the overall objectives and they are managed on the basis of appropriate land information infrastructures providing complete and up to date in formation on the natural and built environment. This all sits within a country/state context of institutional arrangements that may change over time. The model is explained in more details below.

THE LAND MANAGEMENT PARADIGM

Land management is the process by which the resources of land are put into good effect (UN-ECE 1996). Land management encompasses all activities associated with the management of land and natural resources that are required to achieve sustainable development. The concept of land includes properties and natural resources and thereby encompasses the total natural and build environment.

The organisational structures for land management differ widely between countries and regions throughout the world, and reflect local cultural and judicial settings. The institutional arrangements may change over time to better support the implementation of land policies and good governance. Within this country context, the land management activities may be described by the three components: Land Policies, Land Information Infrastructures, and Land Administration Functions in support of Sustainable Development. This Land Management Paradigm is presented in Figure 1 below (Enemark et al., 2005):

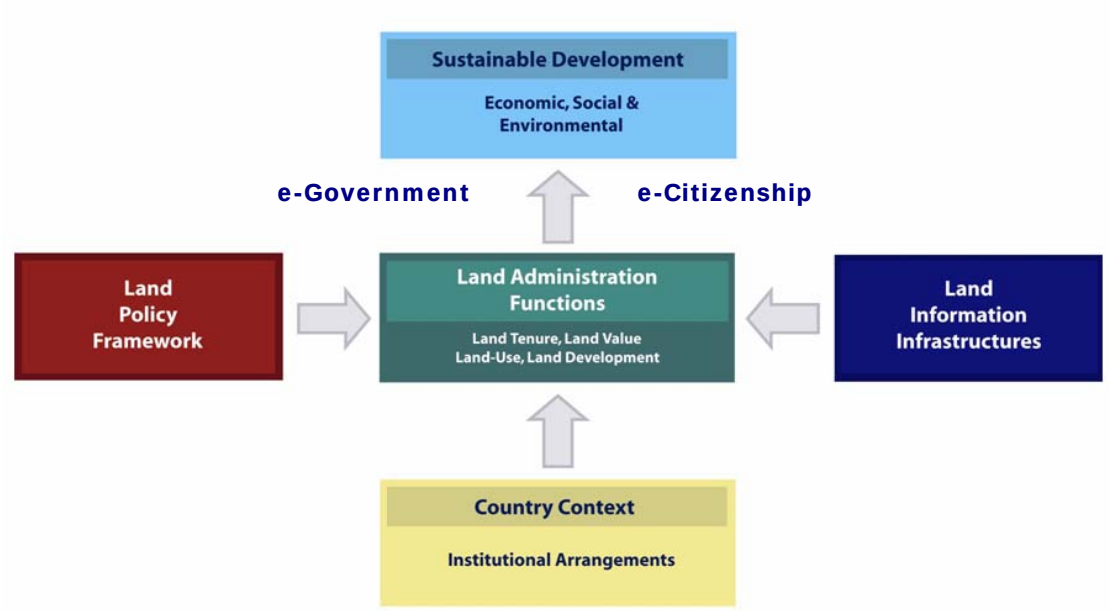


Figure 1 - The Land Management Paradigm

Land policy is part of the national policy on promoting objectives including economic development, social justice and equity, and political stability. Land policies may be associated with: security of tenure; land markets (particularly land transactions and access to credit); real property taxation; sustainable management and control of land use, natural resources and the environment; the provision of land for the poor, ethnic minorities and women; and measures to prevent land speculation and to manage land disputes.

The operational component of the land management paradigm is the range of land administration functions that ensure proper management of rights, restrictions, responsibilities and risks in relation to property, land and natural resources. These functions include the areas of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure and construction planning).

The land administration functions are based on and are facilitated by appropriate land information infrastructures that include cadastral and topographic datasets and provide access to complete and up-to-date information about the built and natural environment.

Sound land management is the operational processes of implementing land policies in comprehensive and sustainable ways. In many countries, however, there is a tendency to separate land tenure rights from land use rights. There is then no effective institutional mechanism for linking planning and land use controls with land values and the operation of the land market. These problems are often compounded by poor administrative and management procedures that fail to deliver required services. Investment in new technology will only go a small way towards solving a much deeper problem; the failure to treat land and its resources as a coherent whole.

Modern LAS in developed economies should facilitate sustainable development - the triple bottom line of economic, social and environmental sustainability - through public participation and informed and accountable government decision-making in relation to the built and natural environments. The interface between the LA infrastructure and professions and the public will increasingly be serviced by information communication technologies designed to implement e-government and e-citizenship. These processes will

be used to link systems and information to people who would then be involved in delivering sustainable development at the local level (Ting 2002). E-citizenship is mobilisation of society to engage in planning, use and allocation of resources, using technology to facilitate participatory democracy. E-government involves a government putting government information and processes on-line, and using digital systems to assist public access. E-governance is e-democracy – helping to govern society through the use of the Web.

CADASTRAL SYSTEMS

The basic building block in any land administration system is the land parcel as identified in the cadastre. The International Federation of Surveyors (FIG 1995) defined a cadastre as "a parcel based, and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection".

However, the concept of "cadastre" is difficult to identify. It may be designed in many different ways, depending on the origin, history and cultural development of the country or jurisdiction. Basically, a cadastre is just a record that identifies the individual land parcels/properties. The purpose of this identification may be taxation (as was the original reason for establishing the European cadastres) or it may be security of land rights (as was the case in Australia). Today, most cadastral registers around the world are linked to both land valuation/taxation and to the securing of legal rights in land.

Therefore it makes sense to talk about cadastral systems or cadastral infrastructures rather than just a cadastre. These systems or infrastructures include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the present and possible future use of land. The role and purpose of cadastral systems is shown in Figure 2 below.

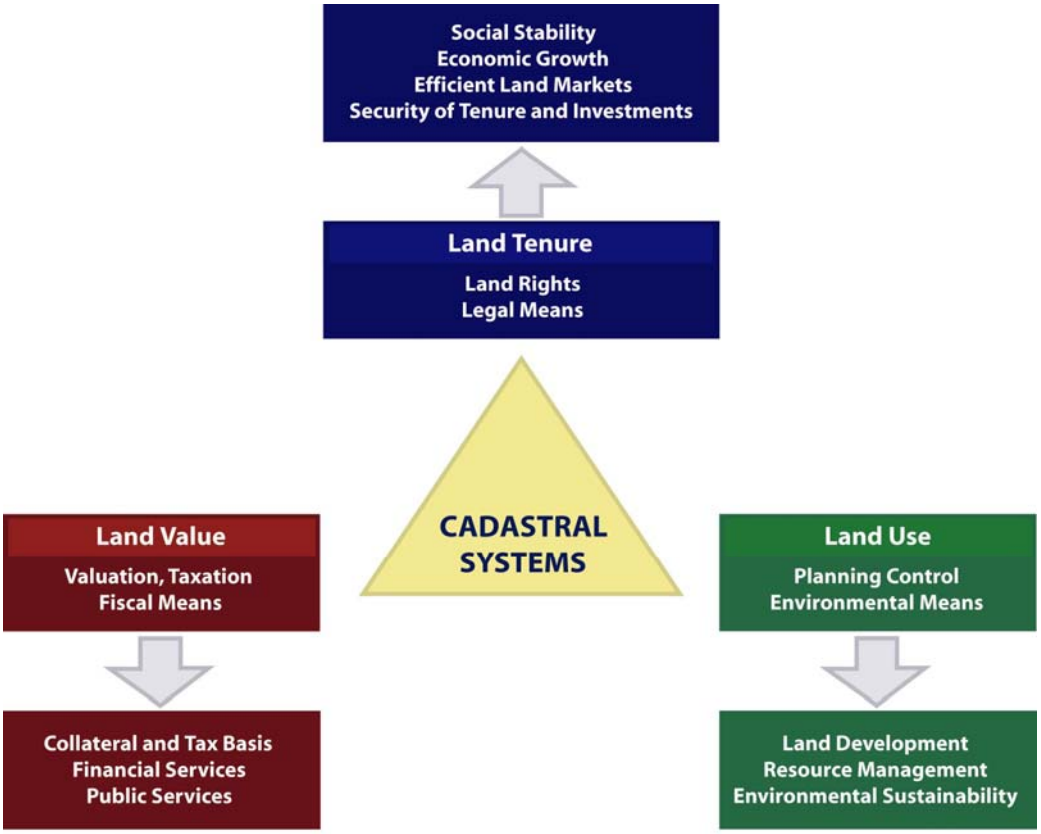


Figure 2 - Cadastral systems facilitate administration of three main areas: Land Tenure, Land Value and Land Use

Throughout the world different organisations of cadastral systems are apparent, especially with regard to the land registration component. Basically, two types of systems can be identified: the deeds system and the title system. The differences between the two concepts relate to the extent of involvement of the state, and to the cultural development and judicial setting of the country. The key difference is found in whether only the transaction is recorded (deeds systems) or the title itself is recorded and secured (title systems). Deeds systems provide a register of owners focusing on "who owns what" while title systems register properties presenting "what is owned by whom". The cultural and judicial aspects relate to whether a country is based on Roman law (deeds systems) or Germanic or common-Anglo law (title systems). This of course also relates to the history of colonization.

Deeds registration is rooted in Roman culture and is, therefore, common in Latin cultures in Europe (France, Spain, Italy, Benelux), in South America, and parts of Asia and Africa which were influenced by these cultures. The concept is also used in most of the United States. Deeds systems are found in different forms, with significant variations in the role of cadastral identification and surveyors.

Title registration originated in the German culture and is found in central European countries (Germany, Austria, Switzerland). Different versions of the German system are found in Eastern European and Nordic countries. The various versions relate to the use of the property concept and the organization of the cadastral process including the use and the role of private licensed surveyors. A special version of the title system is found in UK, where the concept of general boundaries is used to identify the land parcels on the large-scale topographic map series. A third variant, based on the original German concept (Raff

2003), is found in the Torrens system introduced in Australia during the mid 1800´s to serve the need of securing land rights in the New World.

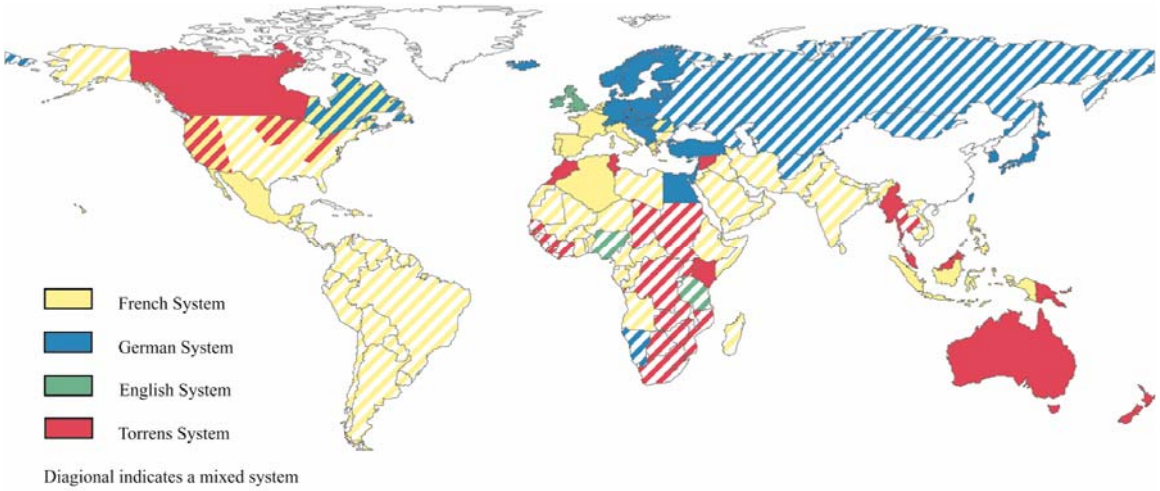


Figure 3 - General overview of land registration systems throughout the world (view in colours)

Even though cadastral systems around the world are clearly different in terms of structure, processes and actors, their design is increasingly influenced by globalisation and technology towards multipurpose cadastres (van der Molen 2003). The same influences push land rights and land use towards integrated, multifunctional information systems. Modern cadastres and land information systems also reflect urbanisation and micro-economic reform incorporating decentralisation, privatisation and quality assurance. The most significant driver is sustainable development with its demand for comprehensive information on the environmental conditions in combination with other land and property related data. As a result, the traditional surveying, mapping and land registration focus has moved away from being primarily provider-driven to now being clearly user-driven. The success of a cadastral system is a function of how well it internalizes these influences and achieves these broad social, economic and environmental objectives.

LAND ADMNISTRATION SYSTEMS

LAS, and particularly their core cadastral components, are important infrastructure, which facilitate the implementation of land policies in both developed and developing countries. LAS are concerned with the social, legal, economic and technical framework within which land managers and administrators must operate (UNECE 1996). These systems support efficient land markets and are, at the same time, concerned with the administration of land as a natural resource to ensure its sustainable development. This global approach to modern land administration systems is shown in Figure 4 below.

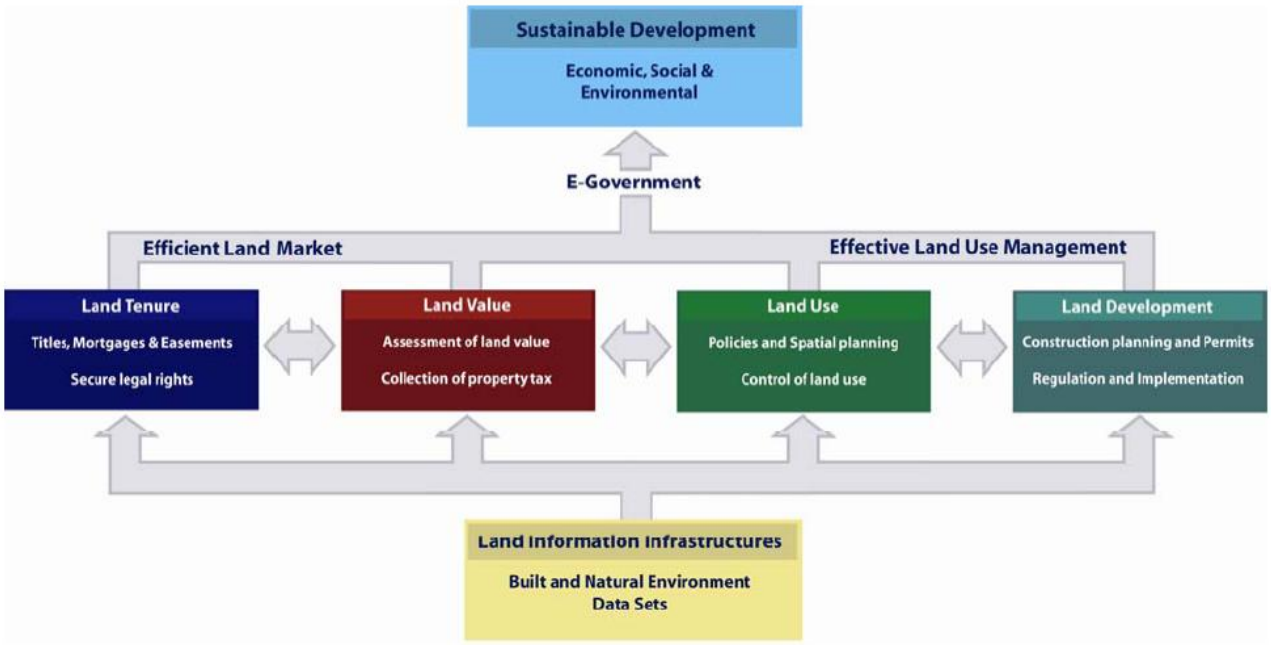


Figure 4 - A Global land Administration Perspective (Enemark, 2004)

As described above, land administration comprises an extensive range of systems and processes to manage:

- **Land Tenure:** the allocation and security of rights in lands; the legal surveys to determine parcel boundaries; the transfer of property or use from one party to another through sale or lease; and the management and adjudication of doubts and disputes regarding rights and parcel boundaries.
- **Land Value:** the assessment of the value of land and properties; the gathering of revenues through taxation; and the management and adjudication of land valuation and taxation disputes.
- **Land Use:** the control of land use through adoption of planning policies and land use regulations at national, regional and local levels; the enforcement of land use regulations; and the management and adjudication of land use conflicts.
- **Land Development:** the building of new physical infrastructure; the implementation of construction planning and change of land use through planning permission and granting of permits.

These systems are interrelated. The actual economic and physical use of land and properties influence land value. Land value is also influenced by the possible future use of land as determined through zoning, land use planning regulations and permit granting processes. And the land use planning and policies will, of course, determine and regulate future land development.

The information on land and properties permeates through the system and provides the basic infrastructure for running the interrelated systems within the four interrelated areas. The land information area should be organised to combine cadastral and topographic data and thereby link the built environment (including legal land rights) with the natural environment (including environmental and natural resource issues). Land information should, this way, be organised as a spatial data infrastructure at national, regional/federal

and local level based on relevant policies for data sharing, cost recovery, access to data, standards, etc.

The design of adequate systems in the area of land tenure and land value should lead to the establishment of an efficient land market capable of supporting trading in complex commodities. The design of adequate systems in the areas of land use control and land development should lead to effective land-use management. The combination of an efficient land market and effective land-use management should then form the basis for a sustainable approach to economic, social and environmental development.

A modern Land Administration System acts within the environment of adopted land policies that fulfill political objectives with regard to land issues. It also acts within an institutional framework that imposes mandates and responsibilities on the various agencies and organisations. The system is concerned with providing detailed information at the individual land parcel level. It should service the needs of both the individual and the community at large. Benefits arise through its application in guaranteeing of ownership, security of tenure and credit; facilitating efficient land transfers and land markets; supporting management of assets; and providing basic information in processes of physical planning, land development and environmental control. The system, this way, acts as a backbone for society.

These ambitious goals will not be achieved unless there is a commitment to designing and implementing effective land administration infrastructures. These may be described as the organisations, standards, processes, information and dissemination systems and technologies required to support the allocation, transfer, dealing and use of land (UN-FIG 1999). Information and communications technology (ICT) will play an increasingly important role both in constructing the necessary infrastructure and in providing effective citizen access to information. Also, there must be a total commitment to the maintenance and upgrading of the land administration infrastructure.

AN OVERALL CONCEPTUAL APPROACH

The conceptual understanding may take the form of a hierarchy of levels. The foundation stone is an overall national land policy. Appropriate cadastral systems support implementation of land policies by providing identification of the land parcels and a framework for security of tenure. Appropriate cadastral systems also support a wider land administration infrastructure within the areas of land tenure, land value, land use, and land development. Appropriate land administration systems form the basic for sound land management towards economic, social, and environmental sustainability. The land policies may be revised and adapted to meet the changing needs in society. This process of adjustment should be based on constant monitoring of the results of the land administration and land management activities. The conceptual approach is described in Table 1 as follows (Enemark, 2004).

- **Overall Land Policy**
  - Determine values, objectives and the legal framework in relation to management of land as a legal, economic, and physical object
  - Basis for building sound land administration infrastructures
- **Cadastral Systems**
  - Identification of land parcels and securing land rights
  - Facilitation of land registration, land valuation, and land-use control
  - Underpinning sound Land Administration
- **Land Administration Systems**
  - Administration of land tenure, land value, land-use, and land development
  - Facilitation of efficient land markets and effective land-use management
  - Underpinning sound Land Management
- **Land Management**
  - Management of processes by which land resources are put into good effect
  - Facilitation of economic, social, environmental sustainability
  - Underpinning and implementation of sound Land Policies

Table 1 – Overall Conceptual Approach

INTEGRATED LAND-USE MANAGEMENT

An integrated system of Land-Use Management for Sustainable Development is shown in figure 5 below:

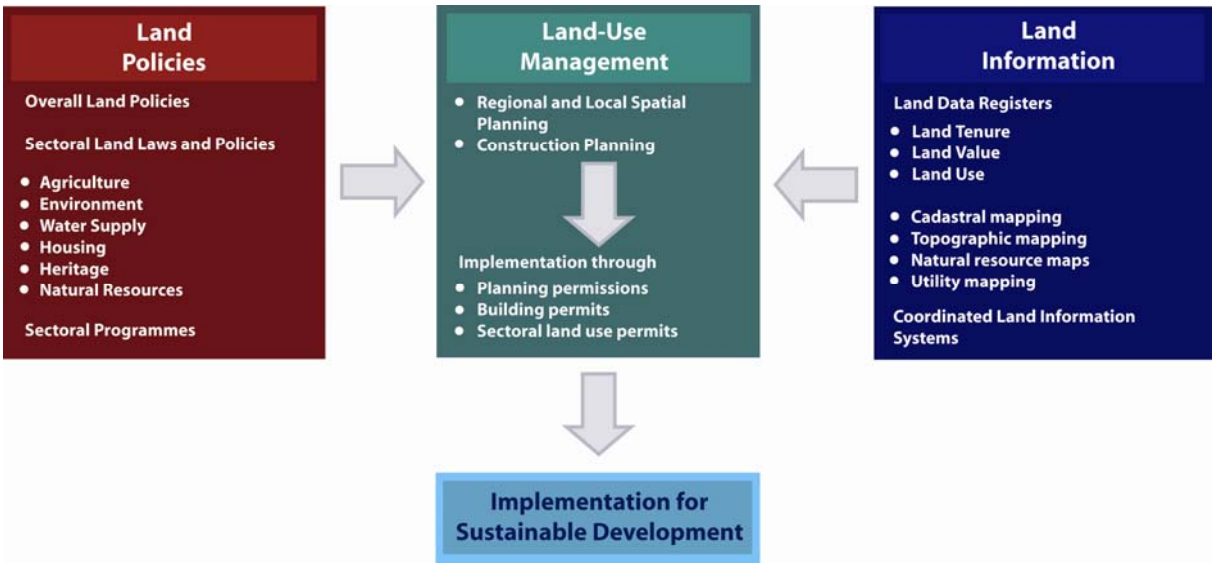


Figure 5 - Integrated Land-Use Management for Sustainable Development (Enemark, 2004)

Integrated land-use management is based on land policies laid down in the overall land policy laws such as the Cadastral/Land Registration Act; and The Planning/Building Act. These laws identify the institutional principles end procedures for the areas of land and property registration, land-use panning, and land development. More specific land policies

are laid down in the sectoral land laws within areas such as Agriculture, Forestry, Housing, Natural Resources, Environmental Protection, Water supply, Heritage, etc. These laws identify the objectives within the various areas and the institutional arrangement to achieve these objectives through permit procedures etc. The various areas produce sectoral program's that include the collection of relevant information for decision making within each area. These program's feed into the comprehensive spatial planning carried out at national/state, regional and local level.

Furthermore, the system of comprehensive planning control is based on appropriate and updated Land Use Data Systems, such as the Cadastral Register, the Land Book, the Property Valuation Register, the Building and Dwelling Register, etc. These registers are organized to form a network of integrated subsystems connected to the cadastral and topographic maps to form a spatial information infrastructure on the natural and built environment.

In the Land-Use Management System the various sectoral interests are balanced against the overall development objectives for a given location and thereby form the basis for regulation of future land-use through planning permissions, building permits and sectoral land use permits according to the various land-use laws. These decisions are based on the relevant land use data and thereby reflect the spatial consequences for the land as the people. In principle it can then be ensured that implementation will happen in support of sustainable development.

INSTITUTIONAL DEVELOPMENT IN LAND MANAGEMENT

The Land management activities rely on some form of land administration infrastructure that permits the complex range of rights, restrictions and responsibilities in land to be identified, mapped and managed as a basis for policy implementation. Institutional development in Land Management implies adoption of long-term strategic actions and capacity building activities. This includes the need to:

- Establish a strategic approach to donor projects and ensure that capacity building measures are addressed up front – not as an add-on.
- Develop in-country self assessment procedures to identify the capacity needs and thereby argue for establishing the necessary measures of capacity development in terms of policies, legal framework, institutional infrastructures, and human resources and skills.
- Promote the creation and adoption of a comprehensive policy on land development and establish a holistic approach to land management that combines the land administration/cadastre/land registration function with the topographic mapping function
- Establish a clear split of duties and responsibilities between national and local government (decentralisation). Ensure that the principles of good governance apply when dealing with rights, regulations and responsibilities with regard to land resources and land development.
- Promote the understanding of land management as highly interdisciplinary that includes a whole range of policy measures such as social, economic, environmental, judicial, and organisational.
- Promote the need for an interdisciplinary approach to 'surveying education' that combines both technical and social science and thereby links the areas of measurement science and land management through a strong emphasis on spatial information management.

- Establish strong professional bodies such as a national institution of surveyors who are responsible for the development and control of professional standards and ethics, enhancement of professional competence, and interaction with governmental agencies to develop the optimal conditions and services.
- Promote the need for CPD to maintain and develop professional skills and promote the interaction between education, research and professional practice.

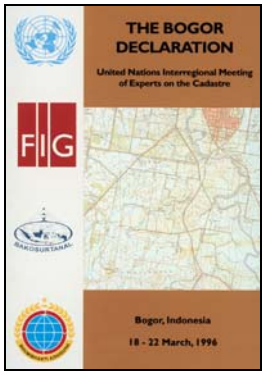
Adoption of a comprehensive policy on land management is crucial since this will drive the legislative reform which in turn results in institutional reform and finally implementation with all its technical and human resource requirements. A good overall approach is to look at the four steps that constitute good strategic management: where are we now; where do we want to be; how do we get there; and how do we stay there. This approach is in line with the broad capacity building concept which aims to assess, develop and sustain. This is shown in Table 2 below:

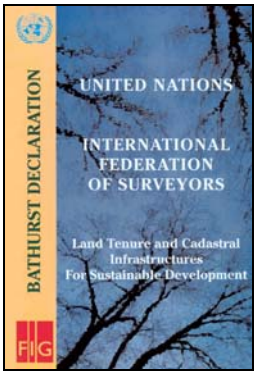
Capacity Assessment	Capacity Development	Sustainability
• Are the policies on land management clearly expressed? • Is the legal framework sufficient and adequate? • Are the institutions adequate and are the responsibilities clearly expressed? • Are the guiding principles for good management well expressed? • Are the human resources and skills adequate and are the relevant education and training opportunities available?	• Adoption of an overall land policy • Design of a legal framework addressing the rights, restrictions and responsibilities in land. • Implementation of an organisational framework with clearly expressed duties and responsibilities • Adoption of clearly expressed guiding principles for good governance. • Establishment of adequate and sufficient educational options at all levels.	• Instigation of a self-monitoring culture in which all parties, national and local government, NGOs, professionals and citizens, review and discuss progress and suggest any appropriate changes. • Lessons learnt need to be fed back into the process for continuous improvement. • Implementation of adequate requirements and options for activities of Continuing Professional Development (CPD).

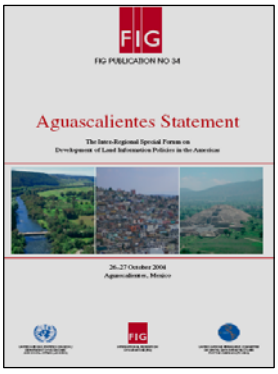
Table 2 – Capacity Building Process

GLOBAL TRENDS

Throughout the last 10-15 years FIG has taken a lead role in explaining the importance of sound land administration systems as a basis for achieving "the triple bottom line" in terms of economic, social and environmental sustainability. International organizations such as UN, FAO, HABITAT and especially the World Bank have been key actors in this process. A number of these key publications are shown below. The latest achievement entitled the Aguascalientes Statement on Development of Land Information Policies in the Americas is developed as a joint initiative of UN/FIG/PCIDEA with FIG taking the lead role. The publication is available in both English and Spanish.







The FIG publication Series also includes a number of publications addressing educational, professional, and institutional issues of global relevance, such as Continuing Professional Development, Ethical Principles, and Business Matters for Professionals, Standardisation, and Mutual Recognition of Professional Qualifications. The publications are available on-line at the FIG Home Page http://www.fig.net/pub/figpub/pubindex.htm

ECE-WPLA (Economic Commission for Europe - Working Party on Land Administration) has produced a number of relevant publications of which "Land Administration Guidelines (UN-ECE 1996) may be the most important one. Also the recent publication on "Guidelines on real Property Units and Identifies" is valuable contribution. WPLA (formerly known as MOLA – Meetings of Land Administrators) is also an example of a well-functioning professional forum for discussing and developing land administration issues. The activities of WPLA can be found at http://www.unece.org/env /hs/wpla/welcome.html

FINAL REMARKS

The objective of this paper is to build an overall understanding of the Land Management Paradigm and the need for institutional development to establish sustainable national concepts in this area. This includes creation and adoption of a comprehensive policy on land development, and a holistic approach to land management that combines the land administration/cadastre/land registration function with the topographic mapping function

The debate should be aware of the global trends in this area while still recognising that the design of such systems will always be unique due to the different geographic and cultural preconditions and needs of each respective country. This calls for increased international co-operation.

REFERENCES

Dale, P. and McLaughlin, J. D. (1999): Land Administration. Oxford University Press.

Enemark, S. (2004): Building Land Information Policies. Proceedings of Special Forum on Building Land Information Policies in the Americas. Aguascalientes, Mexico, 26-27 October 2004. http://www.fig.net/pub/mexico/papers_eng/ts2_enemark_eng.pdf

Enemark, S., Williamson, I., and Wallace, J. (2005): Building Modern Land Administration Systems in Developed Economies. Accepted for publication in the Journal of Spatial Science, Australia in the December Issue 2005.

UN-ECE (1996): Land Administration Guidelines, Geneva.

UN-ECE (2004): Guidelines on Real property Units and Identifiers, Geneva.

UN-FIG (1999) : The Bathurst Declaration on Land Administration for Sustainable Development. FIG Publication Series No 21, FIG Office, Copenhagen. http://www.fig.net/pub/figpub/pub21/figpub21.htm

UN-FIG-PCIDEA (2005): Aguascalientes Statement – The Interregional Special Forum on Development of Land Information Policies in the Americas. FIG Publication Series No 34, FIG Office, Copenhagen. http://www.fig.net/pub/figpub/pub34/figpub34.htm

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

BUILDING SUSTAINABILITY ACCOUNTING IN LAND ADMINISTRATION SYSTEMS IN AUSTRALIA

Jude Wallace and Ian Williamson
Senior Research Fellow, Centre for SDIs and Land Administration
and
Director, Centre for SDIs and Land Administration, and Head, Department of Geomatics,
The University of Melbourne,
Email: j.wallace@unimelb.edu.au

SUMMARY

Sustainability accounting shows how our land and resources (our major assets) are used to deliver measurable sustainable development outcomes. Land administration systems, LAS, are historical antecedents and essential infrastructure supporting land management systems. Sustainability accounting presupposes this infrastructure is already in place, then suggests ways in which institutions and businesses provide the supervisory and information framework for land management within complex, highly geared property markets. Pursuit of sustainable development goals while delivering high quality infrastructure requires the traditional tools of LAS to be used for new purposes. They can directly contribute the sustainability accounting for land management by providing the infrastructure for spatial enabled government agencies to define the positions and places involved in policies and decisions.

INTRODUCTION

Modern land administration systems, LAS, are the institutions and processes used by governments (with increasing involvement of the private sector) to manage land as the nation's significant asset – land (Enemark and others, 2006). An integrated vision of LAS was identified to help integrate management activities. For modern federated states, achievement of this integrated vision and its corollary of using land and resources for sustainable development, is particularly difficult unless all layers of government and the private sector understand the importance of the LAS. This paper therefore identifies "sustainability accounting" as a principal function for modern LAS in federated states. Sustainability accounting gives more significance to the ways governments manage land and produce and use land information. Additionally, the increasing engagement of private sector agencies and businesses in the generation of land information requires their activities to be included in any analysis. Sustainability accounting relies on modern technologies to overcome historical approaches to land information which focused on silo agencies collecting and organising data principally for their internal purposes. New demands by national governments are expected to generate greater demands for information access, integrity and multi-purpose uses. Advances in information communication, land information and geospatial technologies, and the growing significance of spatial information facilitate using these various types of information to deliver informed and holistic land management, better implementation of key policies of sustainable development, and underpinning of national monetary and budget goals.

This in turn can facilitate proactive implementation of land and resource policies. Comprehensive sustainability accounting relies principally on three building blocks. The first is the integrated land management vision of land administration (Enemark and others 2005). The second is the vision of how information generated by modern land administration systems will work in the next decade: *iLand* (Wallace and others, 2006). Spatial enablement of information is seen as the central component of sustainability accounting systems. The third is an evaluation and monitoring system.

In Australia, recent information problems centre around land taxation and restrictions over land, but these are not isolated. The trends suggest land registers will be reengineered to provide much greater community servicing, access and data entry through electronic systems. Greater congruity and interoperability of land and spatial information (mirroring the built and natural environments) will occur. The interrelationship between spatial and aspatial information will be interactive. However, a robust national vision of sustainability accounting through land administration requires much more, as indicated in Figure 1 below.

Figure 1 – National Vision for Australian Land Administration

Sustainability accounting is different from but builds on the existing processes associated with LAS. Traditional approaches to LAS examine the institutions associated with land and their individual purposes (Dale etc). The traditional focus is on land registration, valuation and use allocation processes and institutions that perform them. These institutions are an essential foundation for successful sustainability accounting. Without sound institutional structures servicing land tenures (particularly transaction systems and registration systems), land use (allocation of land to purposes) land development (delivery of land for social and economic needs) and land valuation (ensuring tax equity), sustainability accounting cannot be achieved.

Sustainability accounting suggests that the paramount task of managing land is achieved best in the context of land regions or areas, not administrative systems. The idea is borrowed from water management, where river systems, catchment areas, rainfall areas are now the administrative focus, instead of national and administrative jurisdictions, and separated functions of drainage management, water supply, irrigation and so on. Water management moved administrative focus to resource management, allowing water resources to be managed holistically.

The components of sustainability accounting are discussed below.

LAND MANAGEMENT PARADIGM

Development of Land Administration

Land administration is now a recognised discipline robust enough to generate different policy approaches, competent national models and a range of tools for performing the essential functions. Selection of tools and approaches involves a nation's history and politics. The skill of LAS professionals lies in choosing tools for appropriate a nation's needs at a particular moment in time. The changes in land administration over time are shown in Figure 2, Development of Land Administration Systems, below.

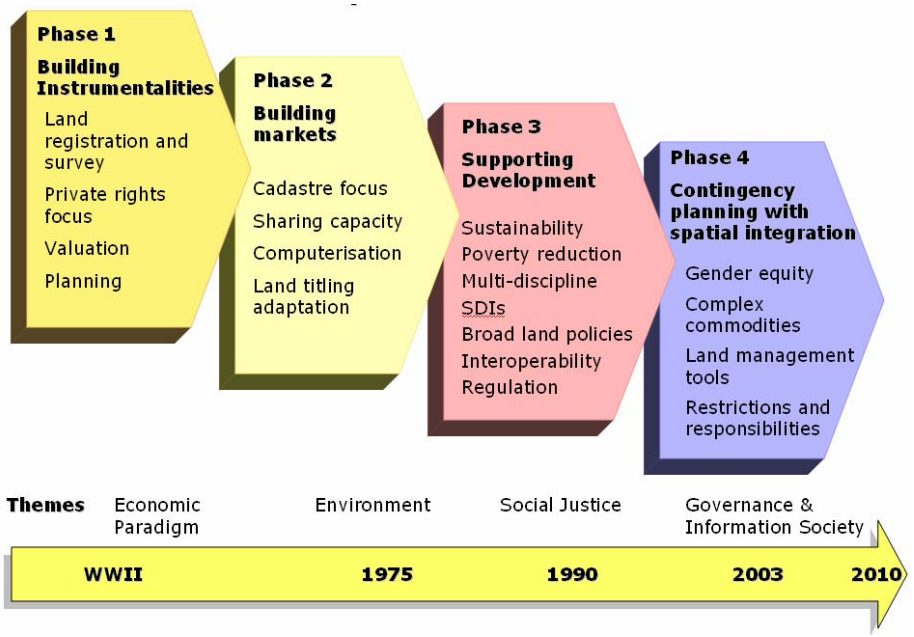


Figure 2 - Development of Land Administration Systems

The land management paradigm recognises the importance of historical development of national LAS, allowing various implementation models to be used. The concept of land in the vision is much broader than the traditional concept: land, resources, buildings and seamless integration of the terrestrial and marine environments are included.

Policies for sustainable development

Land policies

Land policy is articulated by governments and international agencies working in foreign aid and project delivery. Most governments articulate a land policy, typically in constitutional form. Some, including Australia, do not articulate national policies, but imply land policies through their decisions and actions, particularly by their support for actions of citizens and businesses. Australia's land policy relies on private ownership, effective land markets, and sustainable development. International land policy is now highly articulated and consistent. Early policy statements focused predominantly on economics, reflecting the use of markets as primary method of land distribution in Western democracies. Later, pressures on land from growing populations and environmental imperatives added multiple objectives reflected in the triple bottom line of sustainable social, economic and environmental development (Bathrust Declaration, UN FIG, 1999, Deininger, 2003). These goals, together with governance goals (for national governments and corporations) require new land management processes. With the advent of globalisation, governments and organisations must be responsive to demands of internal and external stakeholders for good governance, accountability and transparency, greater development effectiveness, and delivery of tangible results (Ting and Williamson, in preparation). Public engagement in the formation of specific national policies, their application and their evaluation is essential.

While sustainability is the clearly articulated land policy, a definitive connection between the policy objective and the activities of our LAS institutions is much more difficult to demonstrate. Land registration, especially the eConveyancing initiative, is clearly related to a healthy and efficient land market, but how do registration processes relate to other

sustainability objectives? How does surveying accuracy of a centimetre help deliver sustainable social development?

Economic sustainability

LAS and economics are comfortably related. Land administration developed in Europe to service land taxation. In Australia, the abbreviated 150 years history was driven by land markets, delivery of security of ownership, and creation of the world's most efficient and simple land transaction system, certainly in those jurisdictions where lawyers do not control conveyancing. Since it was first introduced in South Australia in 1857, the Torrens system has succeeded beyond its creators' hopes in meeting market goals. It is now being asked to address new needs.

Land administration has traditional components: land tenure, use, development and so on. A market focus analysis on these traditional elements is perhaps the most significant contribution (though not without critics) of Hernando de Soto (2000) who related the "passporting" or titling of land with the commodification of land and extraction of value through market processes. While de Soto identified the function of land titling, he saw it as related to the land itself. For property theorists, the passporting is much more significant: it allows commodities to be built out of the land which have no physical or visual components: these abstract constructs are "passported" sometimes by government, sometimes through private sector systems, and entered into markets. To understand the way land works in a modern market then analysis must recognise that the land itself is only a physical feature, and that the assets traded are really abstract socio/legal constructs of land rights, managed through a complex tenure system and administered (but only partly) through a land registration system.

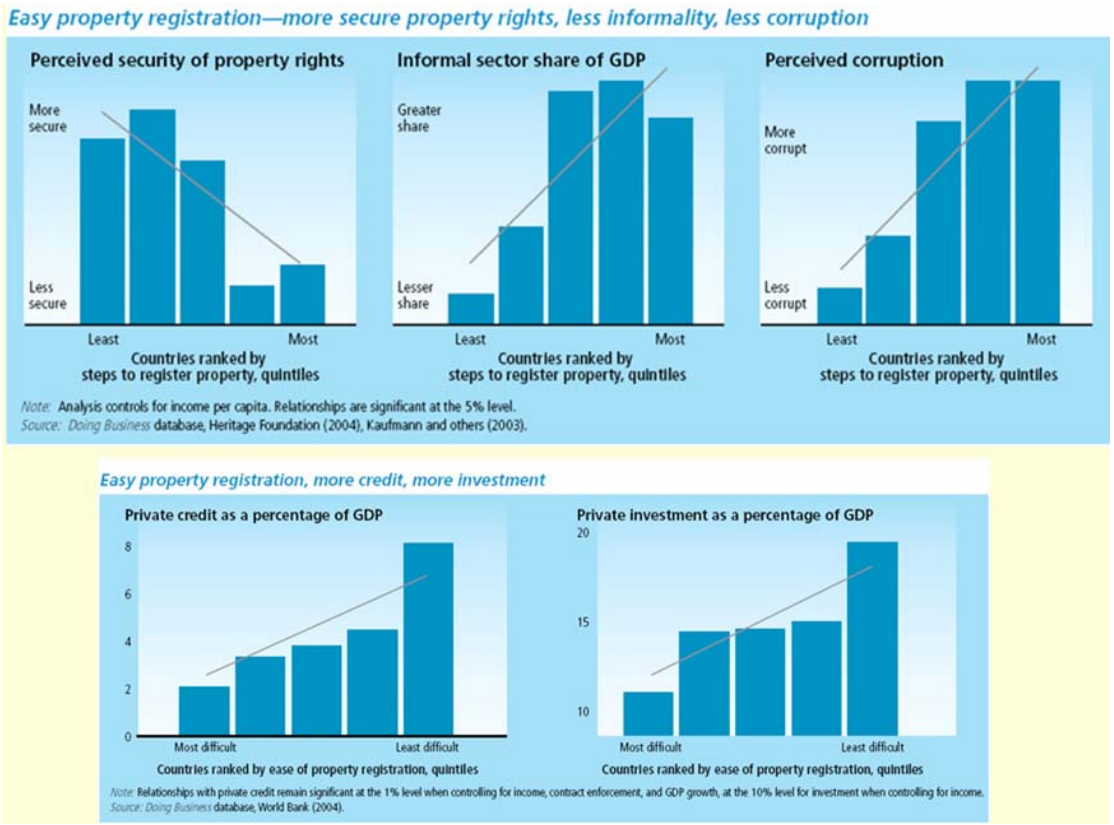
Recognition of the place of abstract concepts in property markets requires a broader analysis of LAS functions. The development of land markets in the modern economies depends on their delivery of five separate stages of development (Wallace and Williamson, 2005), shown in Figure 3, Stages of development of modern land markets, below.

Figure 3 - Stages of development of modern land markets

This analysis depends on understanding that Western economies transform land as a commodity into a myriad of abstract and complex commodities out of land: these can be ownership, temporal rights (leases, life estates), simultaneous mortgages and securities, corporate interests including corporate securities, and complicated arrangements for high value commercial land and securitisation in the banking and international money markets. It is this "pyramid" effect that enables these economies to accelerate production of wealth (not productive activities) out of their land. Land is no longer economically passive as the site where things happen: it is geared through sophisticated management systems facilitating trading in complicated rights, powers and opportunities. A nation with these capacities simultaneously recognises in the same land interests in land, mineral resources, land development, forestry, crop production, building and other activities. The systems spread risks and build capital. While many of these activities operate independently of land administration, no activity can operate confidently without a well organised, publicly trusted and administratively effective land administration system.

LAS relationship with simple land markets

Following de Soto, a strong trend in LAS policy, comparison and project activity lies in the realm of simple land markets and delivery of land titling tools to support these markets. These activities produced valuable information about how LAS work (provided general governance capacity is available) at the land market level of buying, selling, leasing and mortgaging land, illustrated by Figure 4, The influence of LAS on land markets, from the World Bank report (2005).



(World Bank, 2005), figures 3.7 and 5.8

Figure 4 - The influence of LAS on land markets.

The activities show a direct relationship between ease of operation of the land market and availability of well organised LAS, as the comparative analysis in Table 1, Registering property, below, shows.

	# Procedures	Time: # days	Cost: % of value
Australia	5	7	4.5
Denmark	6	42	0.6
Germany	4	4.1	4.2
Netherlands	4	5	6.4
Switzerland	4	16	1.4

(World Bank, 2005, pp 92-94)

Table 1 - Registering property

LAS are not yet extended into the complex markets of property derivatives, though in Australia they are adapted on a case by case basis as land registers absorb new commodities in biota, carbon credits and water titles. However this is not going far enough. These initiatives are driven by economic imperatives of extending the Torrens model, so loved in Australia, beyond land and into other commercial commodity spheres in the hope of extending the positive aspects of guarantee, security of tenure, and administrative confidence associated with the land register into new trading. This absorption does not involve adapting the Torrens model to meet the exciting opportunities expected from complex commodities trading, new technologies or challenges inherent in public restrictions on land.

Social and Environmental Policies

The great success of LAS in delivering measurable improvements in land markets (and hence sustainability) is not matched in the remaining "bottom line" items: social and environmental sustainability. Here some more thinking is required. Meanwhile developed economies in Europe are far ahead in these processes. The case studies from European countries in this collection of papers contains details of national approaches to LAS where social and environmental sustainability are both articulated and achieved priorities.

FLEXIBLE TENURE SYSTEMS

Analyses of the components of tenure system thus far concentrate on the commodification of land. The starting point saw tenures as organising rights in a physical object held by an owner and enforced by the state. (Kaufman and Steudler, 1998, p37). Property theory, following jurisprudential analysis of legal order, extended the model of private rights so that the private right is seen as a relationship between the owner and non-owners (including the state) in relation to a parcel of land. The familiar explanation of ownership as a bundle of sticks identifying the powers of owners therefore tells only half the story.

New tenure theory must account for the lost analytical half: the part that deals with articulation of the relationship between non-owners (including the state) and owner in relation to the land or parcel. This is essential for understanding how LAS might respond to actions of governments that impose restrictions and responsibilities on owners. New tenure theory must also account for the increasing number and significance of responsibilities and restrictions generated through private sector activities, the most important being the arrangements made by owners' corporations in relation to multi occupancy parcels and buildings, and through private provision of essential infrastructure

services. The limitations of any LAS capable of delineating only restrictions created by the government are now all too apparent.

With new technologies the complexities of the systems in modern tenure systems, shown in Figure 5, Functions of land and resource tenures in mature markets, can be better serviced.

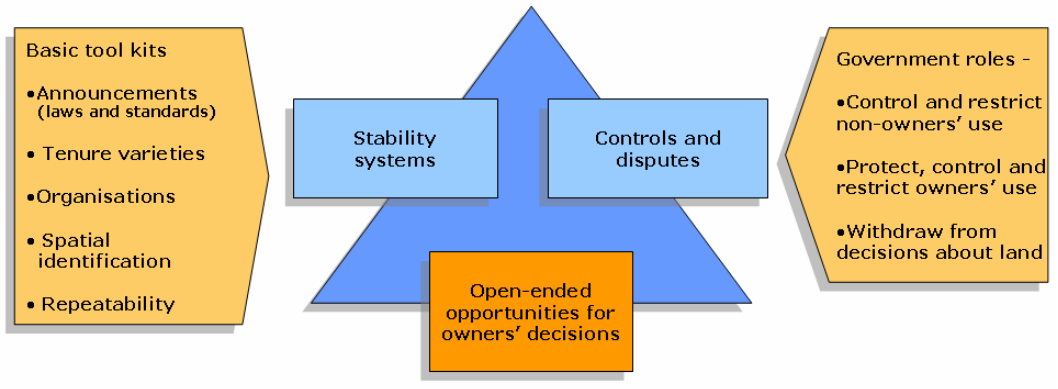


Figure 5 - Functions of land and resource tenures in mature markets

To deliver these functions, mature systems need tools to deliver the capacities identified in Figure 6, Tools needed by modern tenure systems. below.

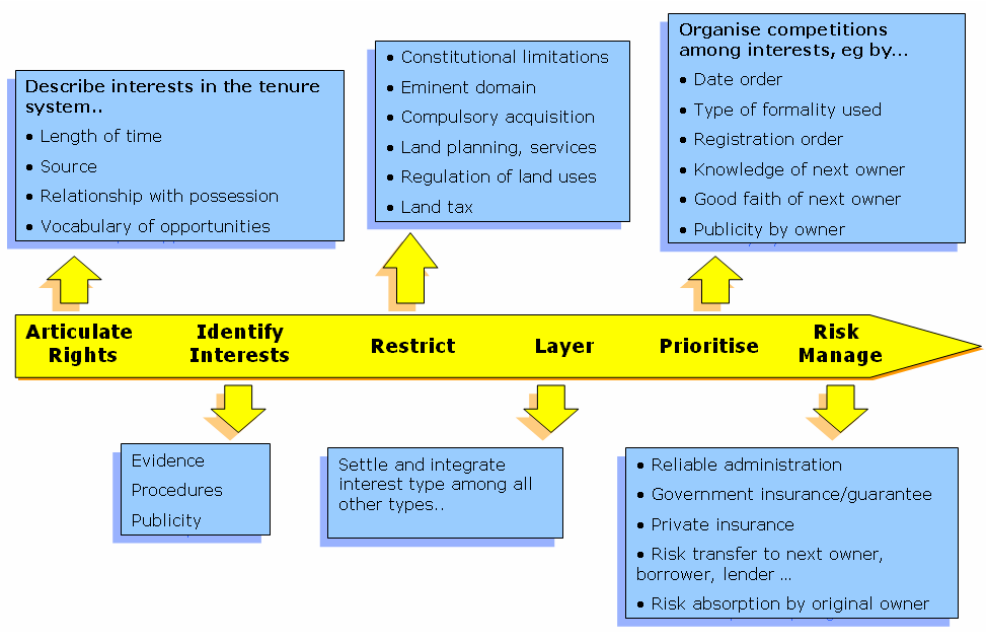


Figure 6 - Tools needed by modern tenure systems

Analysis of these functions and tools will remain underdeveloped while the dichotomous and separate approaches to rights and to restrictions persist. In the emerging future this dichotomy will be much more seamless, and the public/private sources of land information will shrink in significance. The segregation of tenures of private and public lands will no longer be coherent. Just as administrative boundaries are replaced by water catchment system boundaries for better water management, tenures will be reevaluated to comprehensively account for the social and environmental obligations of owners (Raff, 2003). Land management will no longer a parcel by parcel exercise, though the relationship

between capacities of owners and overarching management opportunities will undergo constant renegotiation.

The land registration model in this new environment will service land information needs of a modern economy, not the other way round. To achieve this, the concept of land registration will change. In this series, the paper by Rohan Bennett explores the issues related to multi-purpose registers and the implications of the information model in more detail.

The spatially enabled register/cadastre will form the basis of management of the private system, but will also provide the location basis for agencies both public (zoning, roads) and private (infrastructure of gas, electrical, sewerage, owners' corporations restrictions and responsibilities). Its new role in the Spatial Data Infrastructure (SDI) will be designed to respect two purposes. The first involves prioritising and identifying the private rights specifying what the owner can do, and the second, assisting organisation of limitations on the owner and the capacity of organisations to use the land or restrict its use. These information sets will be variously legally determinative. In case of owners' information, the legal determination will be absolute. In the case of agency information the effect will range through levels of comprehensiveness, completeness and enforceability, from guaranteed to "for information" or "for assistance" only.

The relationship between each nation's register/cadastre and the package of managed restrictions will develop to reflect the historical, political and technological capacity. The Netherlands, with its broad based land map, is in a position to move into a dramatically different solution based on comprehensive identification restrictions on parcel by parcel basis, than say, Denmark, where combinations of technical tools relying in GIS and land information tools will be used to make information available. In Australia, the capacity of the register relies on concepts of protected and guaranteed information (owner's information) and other information (below the line), could be increased. Meanwhile, generic databased indices requiring separate interrogation are proliferating: see for example the federal public notifications under the Environment Protection and Biodiversity Protection Act 1999 (Cth) in http://www.deh.gov.au/epbc/publicnotices/index.html and the others identified in analysis of the implications of spatially enabling governments (Wallace and others, 2006).

AUTHENTIC REGISTERS FOR VALUABLE COMMODITIES

Authentic registers

Registers of people, cars, securities, shares, land and so on are part of the machinery of democratic government. The idea of making a register "authentic" (to use the European term) or "official" is not new. It involves a national decision to use one source as the determinative information set, created once and used many times, and nationally (or even internationally in Europe) reliable. Basic spatial information including parcel information falls naturally into the concept of authentic registers - it is far too expensive for a nation to maintain separate data sets and impossible to manage modern government without it.

Registers of private rights in land and resources

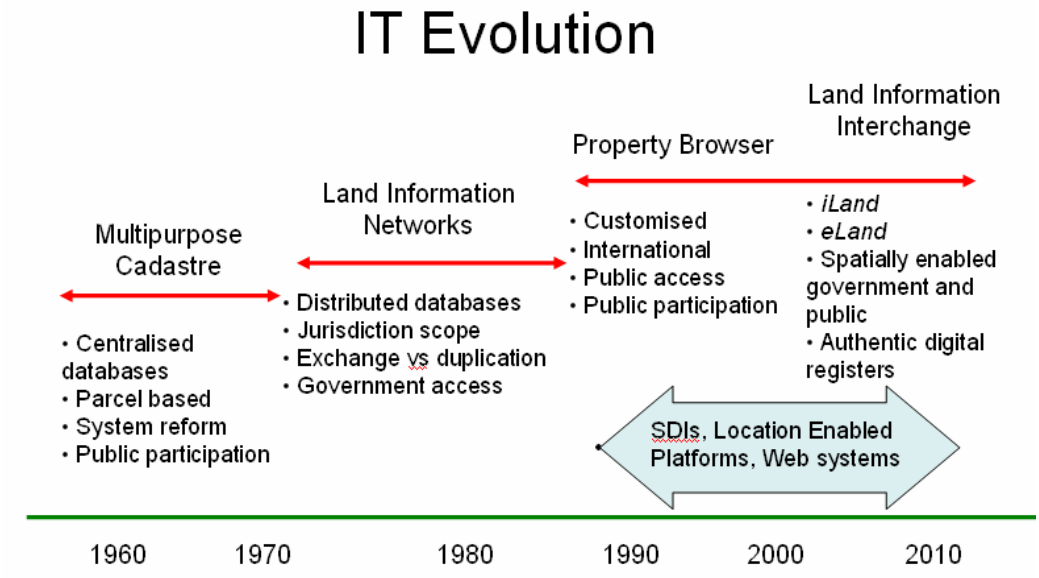
National practice involves generating many independent registers to manage land and resources. These include land registries, mining interest registries, road registries to name a few, and the operational data for owners' corporations. This latter category carries increasingly significant information related to management of buildings, including developments of up to 700 unit vertical villages. The larger building title systems require

more management than a small township because the density is far greater. Hence an approach to these registries needs to appreciate opportunities for seamless treatment of interests, restrictions and responsibilities.

A broad distinction can also be drawn between land and resource registries. The latter registries manage both commodification of interests in the resource and opportunities to work or extract the commodity. The policing of work activities is integrated into the management of the right to undertake the work. This approach is not possible with land registries because ownership is entrenched and constitutionally protected. Management of land based activities additionally creates positive opportunities through licensing and other forms of business regulation. These stand outside traditional analysis of LAS, though new technology does not recognise these classification barriers. In the technical environment, information about a permit to build, to operate a mine, to run a hospital or hotel, or a food retailing outlet and so on is no different from restrictions on land. While any LAS does not include them, it will fail to provide information desired by its public.

INFORMATION POLICIES

For successful sustainability accounting, land administration functions need to be multi-purpose, having a primary function of delivering information to support other government activities. Figure 7, IT evolution in LAS, below illustrates the change of focus.



Acknowledgement: John McLaughlin

Figure 7 - The IT evolution in LAS

The new opportunities in land information (such as timely information about transactions and land market behavior, occupancy rates, mortgage trends, building fabric and activities, risks and hazards) arise from visualisation (capacity to reflect existing and future states of affairs in computers), sharing (access and contribution to information sets via the Internet), and wireless technology (intelligent devices embedded in objects facilitating automated feature extraction). Some of these new opportunities are the central focus in development of a concept of Virtual Australia (Thompson and Chan, 2005). Others are central to the

spatial enablement of government in aspects of its administration beyond mere land administration. The centrality of the cadastre, and its computerised version, the DCDB in these developments is better understood (Wallace and others, 2006) and shown below in Figure 8, Adding the time dimension, below. The cadastre, by orienting information into a parcel by parcel configuration underpins the conversion of computer code and actions into humanly intelligible, useable information. It also allows configurations of parcel data into familiar properties and business areas to underpin land and productive management.

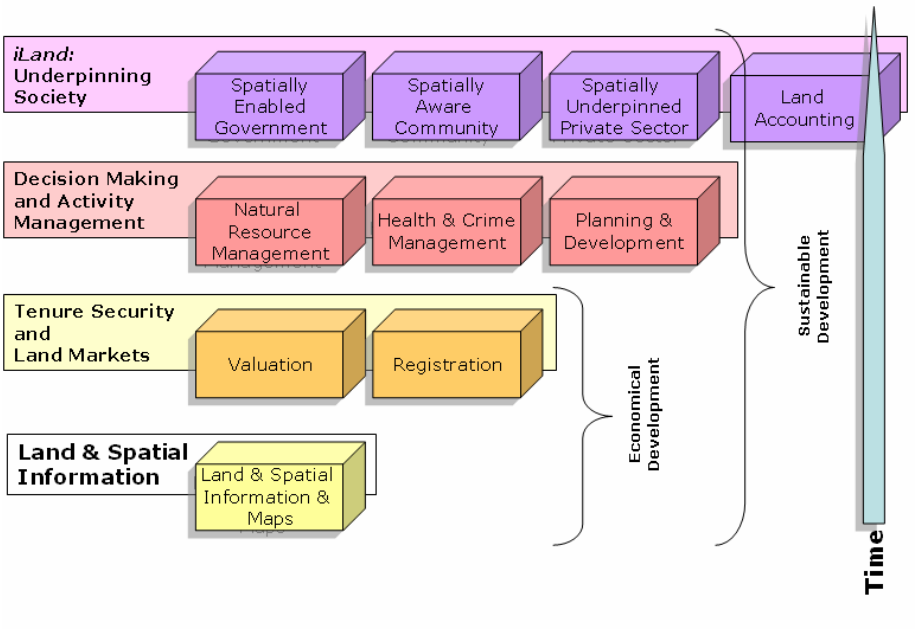


Figure 8 - Adding the time dimension - *iLAND*

Growth in well organised and multifunction data sets (the geocoded national address file is probably the best example) and in access opportunities through the Internet are only the beginning. Innovations in management of information are now common. Significant Australian achievements in information policies of significance to LAS include -

- *Mesh Blocks* of Australian Bureau of Statistics
- *GNAF* by PSMA
- *Smart Tag* of the Victorian government
- *Spatial data warehousing* of NSW and PSMA
- *Shared land information platform* of WA, especially the register of interests.

In future, geographic information systems, spatial data infrastructures, multi-purpose information, alignment of information about the built and natural environments, and layering of aspatial information with the stable framework of location data will create new opportunities.

In creating this dynamic new future, the previous concentration on institutions of government will be widened by engagement of utilities, spatial scientists, and other businesses in the construction of land information products. The transitions are shown in Figure 9, IT in LAS, below.

Figure 9 - IT in LAS

iLand involves a transition from *eLand* where land information is available electronically, and processes involved in land transactions, approvals, and businesses are electronically managed. The *iLand* stage involves transforming government use of information by spatially enabling information associated with location or place. Location information has a greater stability, even in a dynamic housing market, than other kinds of information. Much of this information is collected as part of the routine administration of essential LAS functions, particularly land registration and development. Once this is georeferenced (as for instance it is in GNAF, the national geocoded address file for Australia created by the Public Sector Mapping Agency, PSMA), a simple and easily understood method of converting computer information about X and Y coordinates into people-friendly addresses results.

The spatial enablement of government is necessary because of two trends:

Land regulation. *iLand* presupposes that governments are more and more interested in land, who owns what and how it is used. The explosion in land regulation reflects this interest.

Relative land information. Land information is traditionally thought of as objective, scientifically provable information about reality. However, much of the information government needs about land is "relative", that is changeable according to time, person, place, land use type, value, prices and so on, shown in Figure 10, Land information categories for modern government, below. Governments are presently managing this information with database technology, missing the opportunities offered by spatially enablement of key data sets (address, parcels, properties and so on).

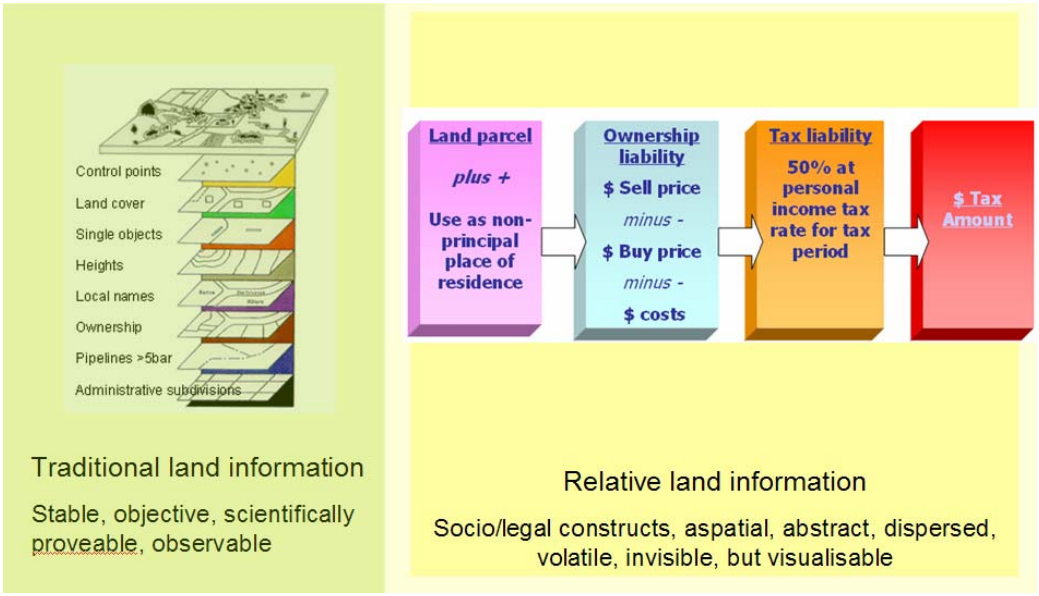


Figure 10 - Land information categories for modern government

SUSTAINABILITY ACCOUNTING

Continuous monitoring and evaluation

While "sustainability" is an agreed goal, governments must now show how their policies deliver results and justify their policy approaches. They must also be ready to manage their administrative institutions, and assist organisations within their jurisdiction, so that continuous monitoring and evaluation is implemented (Kusek and Rist, 2004). Sustainability is no longer the amorphous goal under which any government action could be subsumed. With the arrival of results-based approaches, government accountability in policy implementation is publicly measured by outcomes and impacts. Sustainability must therefore be broken down into independent and achievable components, supported by projects or administrative functions to deliver testable results.

In modern democracies, sustainability policies are now able to be implemented through transaction monitoring, regulation and compliance activities, planning and building activities, urban activity monitoring, environmental monitoring and risk monitoring. The policies require holistic approaches to land assets whether they are in private or public ownership.

Accounting traditionally links outcomes with assets, delivers capacity to interpret results of management according to resources in terms of assets and liabilities, and deals with externalities. To perform sustainability accounting capable of delivering sustainable outcomes, the system must be able to balance interests and establish a sensible framework for managing land based on its type and capacity, not institutional and agency boundaries. An essential role is dealing with uncertainties. One accounting system should be sued for many management systems and entitlement options. The accounting system should provide a ready reckoner for evaluation and monitoring of outcomes, including externalities.

Focus on individual title support with comprehensive listing of parcel based ownership and restrictions to assist transactions will not deliver sustainability accounting. Rather, what is required is a system of land management through effective administration in government, infrastructure and private layers that delivers answers to the bigger policy questions: allocation of land, management of use change, understanding the fabric of the built environment, expansion of use opportunities, providing instant information about values and transactions, permits and parcellations to inform government monetary policy and land delivery policy. Sustainability accounting will rely on *iLand* and SDIs, and release the capacity to service new institutions, including markets, and social and environmental needs. The outcomes from well run land administration need to be adapted: perhaps along the lines suggested in Table 2, Outcomes in LAS, below.

1996, UN ECE Land Admin outcomes	**2010, Sustainability accounting for sustainability outcomes**
Guarantee of ownership and security of tenure	Holistic environmental, social and economic sustainability through continuous monitoring and evaluation of results of projects
Support for land and property taxation	Support for flexible land and infrastructure delivery
Provision of security for credit	Delivery of timely information about land, buildings, uses, transactions
Development and monitoring of land	Location identification of key activities and

markets	information sets
Protection State lands	Integrated tenures with defined opportunities and public restrictions
Reduction of land disputes	Property registries for all valuable commodities with inbuilt capacity to service monitoring of work activities
Facilitation of land reform	Servicing for markets in complex commodities
Improvement of urban planning and infrastructure development	Process based opportunities for public engagement and feed-back
Support for environmental management	Services integrated land management for sustainable development
Production of statistical data.	Production of statistical and visualisable information

Table 2 - Outcomes in LAS

From the viewpoint of sustainability, the need to know, manage, verify and monitor through sustainability accounting must reflect global considerations. The global initiatives for sustainable accounting are well established and include the Global Reporting Initiatives <http://www.globalreporting.org/>http://www.globalreporting.org/ for measuring sustainability, from the EU Environment Programme, UNEP, an official collaborating centre of the UN. The Australian National Monitoring and Evaluation Framework (NMEF) of the national land and water resources audit (<http://www.nlwra.gov.au/about.asp?section=93> http://www.nlwra.gov.au/about.asp?section=93) provides a starting point in understanding the current situation, though one of the crucial pieces of the jigsaw puzzle, land use, is not a matter for target.

CONCLUSIONS

The *iLand* vision in Figure 11 below was built to express what might happen if national LAS in developed economies took up opportunities to spatially enable government and the private sector. It anticipates that technology will remove the negative impact of the silo nature of LAS agencies and permit land management capacity to reflect configurations of the land not institutional history. It hopefully will allow agencies to adopt multi functions, contributing to the quality of the spatial data infrastructure and taking up web-based opportunities, reinforcing their capacity to meet their responsibilities.

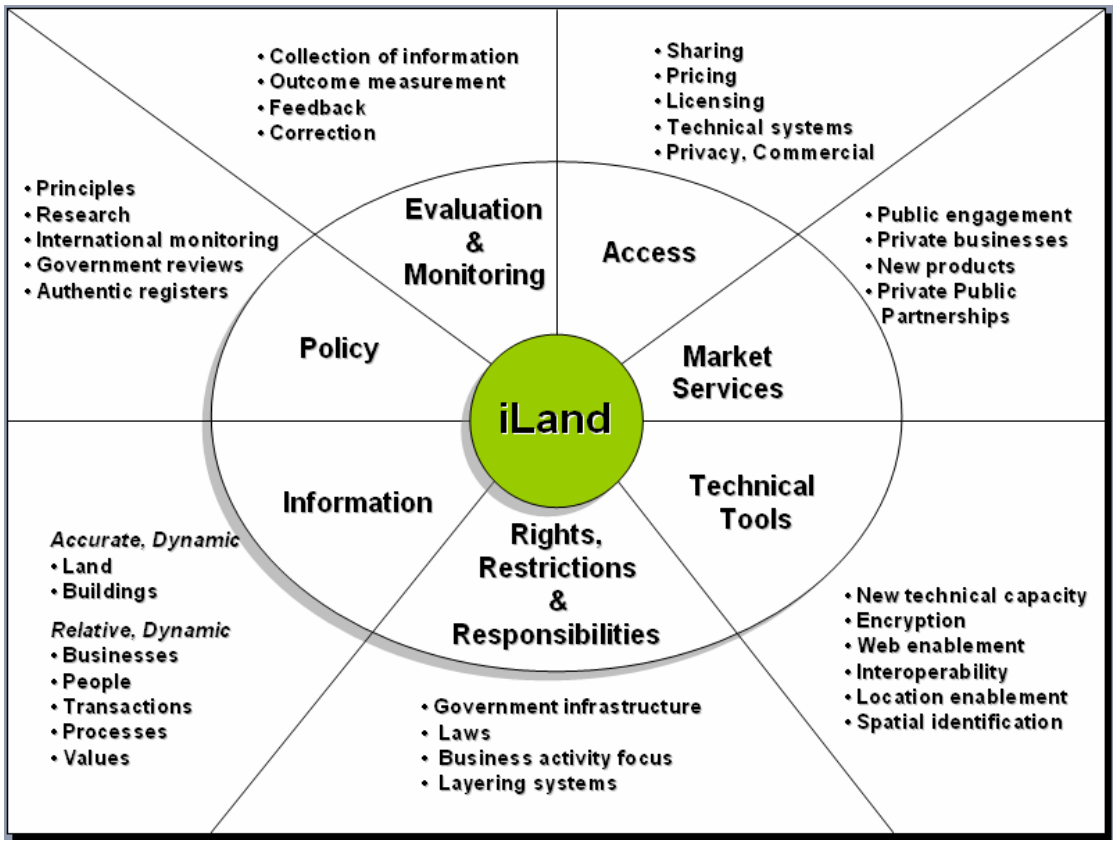


Figure 11 - The *iLand* vision

iLand has the potential to influence and even fundamentally change the way governments and businesses organise information about land, and as a corollary, information generally. The spatial enablement of government is only possible with forward planning and a shared vision of what is possible. To achieve this, a simple message about the importance of the very basic spatial information identifying parcels, properties and places of business must be widely disseminated.

ACKNOWLEDGEMENTS

This article is part of a large project called "Incorporating sustainable development objectives into ICT enabled land administration systems", and is supported by the International Science Linkages programme established under the Australian Government's Innovation statement Backing Australia's Ability. It draws on the collegiate creative efforts of staff, students and professionals engaged in and supporting the Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne. Any errors and infelicities are entirely the authors.

REFERENCES

Dale, Peter and John McLaughlin, 1999, *Land Administration*, Oxford University Press.

Deininger, Karl, 2003, *Land policies for growth and poverty reduction: A World Bank Policy Research Report*, The World Bank and Oxford University Press.

De Soto, Hernando, 2000, *The mystery of capital: why capitalism triumphs in the West and fails everywhere else*, Bantam Press, London.

Enemark, Stig, Ian Williamson and Jude Wallace, 2005, "Building Land Administration Systems in Developed Economies", accepted for publication in *Journal of Spatial Science*, December issue.

FIG UN, 1999, *Bathurst Declaration*, *Land administration for sustainable development*, FIG, www.fig.org.

Kusek, Jody Zall and Ray C Rist, 2004, *Ten Steps to a Results-Based Monitoring and Evaluation System,* The World Bank, Washington DC.

Raff, Murray, 2003, *Private property and environmental responsibility: A comparative study of German real property law*, Kluwer Law International, The Hague.

Thompson, Bruce and Dr Tai On Chan, 2005, "Know, think, communicate: key elements of Virtual Australia", discussion paper prepared for the Cooperative Research Centre for Spatial Information.

United Nations Economic Commission for Europe Land Administration Guidelines 1996 located at http://www.unece.org/env/hs/wpla/documentation/laguidelines.html

Wallace, Jude and Ian Williamson, 2006, "Spatial information opportunities for government", accepted for publication in *Journal of Spatial Science*, June issue.

Wallace, Jude and Ian Williamson, 2005, "Building land markets", *Journal of Land Use Policy*, accepted for publication.

World Bank, 2005, *Doing business in 2005, removing obstacles to growth*, http://www.doingbusiness.org/Default.aspx [Accessed 7 November 2005].

PART 2 – EUROPEAN PERSPECTIVE

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

EU REQUIREMENTS FOR LAND ADMINISTRATION INFORMATION

Bas Kok
Director Netherlands Council for Geographic Information (RAVI)
Professor Delft University of Technology
The Netherlands
Email: bas.kok@ravi.nl

SUMMARY

This paper analyses the development of spatial information policies and initiatives within the European Union in the field of institutional, legislative, administrative and information aspects of land management. It includes an analysis of the INSPIRE initiative to build a European wide regional Spatial Data Infrastructure (SDI) and the interaction between different national spatial information initiatives, especially the link between Dutch Geographic Information initiatives and the EU.

INSPIRE INITIATIVES ARE CRUCIAL EU REQUIREMENTS FOR NATIONAL EU SDI´S

The INSPIRE initiatives are of crucial importance for the geo sector in Europe. They are of leading importance for the development of Spatial Data Infrastructures in EU countries. The target of INSPIRE is the creation of a Spatial Data Infrastructure in Europe. This means in SDI terms the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data.

Basis principles are: the data should be collected once, to combine data from different sources, collect data at one level and share at all levels, and easy to discover which data are available and improve knowledge about the conditions for use of that data.

This INSPIRE initiative defines the main EU requirements for Land Administration Information in the EU countries. The proposed Directive creates regulation for the establishment and operation of an Infrastructure for Spatial Information in Europe, for the purpose of formulating, implementing, monitoring and evaluating Community policy-making and implementation of Community policies in the Member-States at all levels and providing public information. INSPIRE focuses on environmental policy, but is open for use by and future extension to other sectors such as agriculture, transport and energy. This infrastructure shall be based on infrastructures for spatial information established and operated by the EU Member States.

The component elements of those infrastructures include metadata, spatial data sets and spatial data services, network services and technologies, agreements on sharing, access and use and coordination and monitoring mechanism, processes and procedures.

This public spatial data in electronic format is related to the themes listed in three annexes. The first annex consists of geo-referenced data such as coordinate reference systems, geographical grid systems, geographical names, administrative units, transport networks, hydrography and protected sites. The member states create the meta data by three years. The second annex consists of elevation data, identifiers of properties, cadastral parcels, land cover and ortho imagery. The member states create the meta data by three years. The third themes are statistic units, buildings, soil, and geology, land use, human health and safety, utility and government service and environmental monitoring facilities, production and industrial facilities, agricultural and aquaculture facilities, population destribution and demography, area management etc, natural risk zones, atmospheric conditions, meteorological geographical features, sea regions, bio-geographical regions, habitats and biotopes and species distribution. The member states create the meta data by six years.

The European Commission will adopt implementing rules for harmonized data specifications and arrangements for the exchange of spatial data by 2 years for the first annex and 5 years for the second and third annex. Member States shall establish and operate upload services for making metadata and spatial data sets and services accessible through the services (network services). Discovery services and view services are available to the public free of charge. Download services are allowed not to be available free. Member States need to create the availability of e commerce facilities.

The Commission shall establish an EU Geo Portal. The Member States have an obligatory task to contribute in the establishment of the Portal. The Member States shall adopt measures for the sharing of spatial data sets and services between the authorities. Member states shall organize structures and mechanisms for the coordination of the contribution

with all the relevant stakeholders with an interest in the national SDI. They shall monitor the implementation and use of their infrastructures for spatial information.

In conclusion:

The EC institutes will design technical and organizational implementing rules in cooperation with the Member States The implementing rules for meta data, network services and monitoring and reporting need to be realized ultimately in 2008. Implementing rules for the use of spatial data will be realized ultimately in 2011. The implementation of the data sharing between public bodies will be completed at the end of the year 2011 as well. The Annex I datasets are available in 2011 the Annex II data in 2012 and the Annex III data in 2013. The European Infrastructure is expected to be operational at the end of 2014.

INSPIRE ACCELERATES SDI DEVELOPMENT ON EUROPEAN SCALE

INSPIRE works on two parallel lines. The legislative process and GI sector initiatives bottom up. These last initiatives had created a huge impact on the quick moving preparatory INSPIRE process.

In 2002 the INSPIRE working groups have produced Position Papers for the architecture & standards, implementing structures & funding position paper, reference data and meta data position paper, data policy & legal issues position paper and an environmental thematic user needs position paper.

The Internet Consultation was a success. This illustrates a huge involvement of the GI community. I total 185 organizations and individuals from the EU member states responded to the Internet consultation.

A large number of respondents agree with the need to establish a common data policy framework to share the spatial datasets between the public bodies and the majority of the respondents agree for the need of a general licensing framework. Some public data producers suggest a differentiating between different categories of users. It was not quite clear that the INSPIRE is complementary to Arhus Convention and the Proposal for a Directive on the re use and commercial exploitation of pubic sector information. It was generally stressed that all the spatial datasets that are required, as a reference need to be free for all.

Another observation is the ambitious time line for the INSPIRE implementation and the huge involvement of the GI sector in this process.

The INSPIRE initiative stimulates the involvement of the GI sector in the development and implementation of national SDI's. Reports are available with a description of the SDI's and the state of the art. SDI's are crucial building blocks.

The main European institutions are full in charge with the legislative process. The preparation of the INSPIRE initiative has created a huge amount of awareness on political level that an infrastructure on European scale needs to be set up in a short time. This is demonstrated in the relatively short legislative process. The Council reached a political agreement on an amended version of the INSPIRE proposal on June 24th 2005. The European Parliament had adopted the text in its first reading on June 7th 2005. The amendments were mainly focusing on technical clarifications and extra safeguards for public data providers in stimulating public access of spatial data and the sharing between public authorities. A second reading is necessary because the European Commission does not accept the data provider introduced intellectual property rights. These rights would

undermine the objective to stimulate the extensive use of spatial data. It will be expected that the second reading will take place in 2006.

POINTS OF ATTENTION

The legal and legislative framework is less clear than suggested than the framework regulation of the draft INSPIRE Directive appears to be. This framework needs to be worked out in a practical way. It is curious to find out in which way the access to data and services can be improved with the taking into account that Intellectual property rights takes derogates in relation to public access and sharing. General guidelines are needed on how these producer rights can be protected on the one hand and how the public access for citizens, private companies and public institutions can be improved at the other hand.

National Spatial Data Infrastructures play a vital role in the development and implementation of the Infrastructures of Spatial Information in Europe.

An analysis of an overview of the country reports learns that there are big differences in the status of the infrastructures in Europe. In my opinion the organizational component of National Spatial Data Infrastructures is of vital importance for the success of INSPIRE nationally and internationally. The weak point in the current situation in Europe is the enormous differences in the way in which infrastructures are developed. In Germany on a federal level the NSDI has legal status. In Belgium (Flanders) the implementation of the NSDI is regulated. In the Netherlands the NSDI has been defined and will be innovated. The Dutch government has provided the Ravi and the Dutch Geo Information sector with a grant of € 20 million. But a legal status of the NSDI is missing. This different approach is difficult for a quick implementation of European Spatial Data Infrastructure nation wide.

A third point of attention is the uncertainty what the relation is between the European Directive for the re use of public sector information and the INSPIRE directive. The PSI Directive is based on article 95 of the EC Treaty. This article handles harmonization measures in the internal EU market. Frequent misunderstandings on the PSI directive have been made, that this regulation would primarily handle freedom of information legislation. That's not the case. The PSI is based on fair competition and transparency principles. The objective of the Directive is the creation of the insight in the conditions and a clarification of the procedures for the provision of public sector information. The Directive creates a minimum set of rules to avoid the arrangements of exclusive agreements between government agencies and private companies and to calculate full recovery of costs for data producers with an unreasonable return of investment. It is a national responsibility of the member states to define a national data and access policy based on active accessibility of spatial data for citizens or a less active policy. The INSPIRE directive doesn't give clear guidance in which way e.g. the sustainable funding can be provided for the realization of the INSPIRE target and how harmonized licensing frameworks will be introduced and how the realization of improved access of the public data in the Annexes I, II and III can be improved and what the financial impact is for the citizens and private companies. The implementation of the data policy issues according to the INSPIRE Directive is very complex, because on the one hand there is the existing EU subsidiary principle and on the other hand the relationship with the existing Key Information Directives such as the Arhus Convention, the PSI Directive, the privacy and data protocol and the liability & fitness for purpose issue. Therefore it is necessary that an action list will be set up in the short term for enlarging the transparency of the current legal and organizational policy in providing Geo information to public sector stakeholders, citizens and private companies. This is a real

prerequisite for the success on the policy design of data sharing which will start in 2007 and 2008.

A fourth point is the fact that it is unclear which rules of the INSPIRE legislation will be obligatory at member state level in the future. The Directive gives a clear overview of the activities on standardization, harmonization, the development of network services and web services. But it is unclear how data sharing between the public GI suppliers in the national EU context gets form and substance.

INTERACTION BETWEEN THE NATIONAL INITIATIVES AND INSPIRE PROCESS NEEDED

National Spatial Data Infrastructures play a very important role in the implementation of the INSPIRE Directive. For the creation of National Spatial Data Infrastructures four conditions in organizational prospective are important, namely leadership, a vision, communication channels and the way in which the GI data providers are involved in the implementation of the NSDI.

I'm using these indicators in my research activities in measuring the maturity of SDI´s. These indicators are the four critical organizational components of a SDI. The SDI needs a problem owner, which coordinates the development of the SDI. A vision is necessary to be shared by the stakeholders and communication and interaction between the stakeholders and the leader is necessary. The ability of the self-organization of the community can be explained by the problem solving ability of the GI community. The maturity of SDI can be measured by the way in which the stages and the indicators are developed. Every EU country should define such a kind of analysis for developing the right organizational activities and interaction with the INSPIRE community.

In the Netherlands the National Spatial Information Infrastructure was defined almost ten years ago. The Dutch Cadastre is an important stakeholder in the implementation of our NSDI.

In the Netherlands Council for Land Information (Ravi) we have defined the structure plan and it has been approved by the Council of Ministers in 1993. Our recommendations were derived from a very complex inventory of Ravi in the beginning of the nineties. We facilitated the implementation of the Dutch NSDI and the exchange of the core data between the most important GI public data producers of our NSDI. The definition of organizational indicators is crucial in this process.

INITIATIVES FOR INTERACTION BETWEEN THE DUTCH GI SOCIETY AND INSPIRE COMMUNITY

Actions for the coming years

In my opinion an inventory should be created which lists the conditions under which the INSPIRE data sharing ambition can be fulfilled in each member state and also lists which stakeholders are the "driving forces".

The first step is that the public GI suppliers need to set up an action list in every EU country under which data policy conditions the public data in the three annexes will be provided to other public authorities regionally, nationally and on a pan European basis. For the realization of this step, every EU country needs to create a vision on how the GI data exchange should be approved.

A second parallel step is focused on the fast establishment of coordinating mechanisms in every EU member state. This is one of the obligations formulated in the draft INSPIRE Directive that I strongly support. In these national coordinating platforms the joint producers of the INSPIRE core datasets (Annexes 1, 2 and 3) should formulate a national legal framework vision on how the sharing between public bodies will be implemented. The INSPIRE directive doesn't give any direction on how this policy will be executed. Another urgent action is the creation of a common vision, which includes data policy steps that need to be taken for the development and establishment of the European Geo Portal.

A third parallel step on national level is the necessity for regulation of the coordination on national level and the regulation of the National Spatial Data Infrastructure in accordance to the INSPIRE ambition.

In my opinion these "bottom-up" national initiatives are of crucial importance for the realization of the INSPIRE process because of the EU subsidiary principle and a stimulus for an optimal involvement of the GI producers in the creation of a European Geo Information Infrastructure.

The current initiatives on standardization and metadata are necessary and the EC Staff are taking the right initiatives for making a quick start of the activities on a technical level.

But at the other hand national initiatives need to be taken improving public access, sharing and exchanging of data with other public stakeholders, taking into account existing rights of data producers and pricing and funding issues.

Challenging and active roles of the land information executives in this process are of vital importance and are underexposed in the current INSPIRE approach. National initiatives have to be taken. The current regulative status of INSPIRE is challenging for the sector to take initiatives on national level and stimulates an interaction between the member states and EC level in the short and longer term.

REFERENCES

Boonstra, J. (2004), Introduction – Dynamics of organizational Change and Learning, Chichester: John Wiley & Sons Inc.

Commission of the European Communities (2004), Proposal for a Directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE), Brussels

Council of the European Union (2005), Proposal for a Directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE) − Political agreement, Brussels

Dufourmont, H. (ESTAT), Alessandro, A. (JRC), de Groof, H. (ENV) (2004), INSPIRE - work programme Preparatory Phase 2005 - 2006, ESTAT-JRC-ENV

DPLI Working Group (2002), INSPIRE Data Policy & Legal Issues Working Group Position Paper, Environment Agency for England and Wales

Dufourmont, H. - ESTAT (2004), Inspire Results Task Force XIA, ESTAT

EC of the European Parliament and of the Council (2003), DIRECTIVE 2003/98/ of 17 November 2003 on there – use of public sector information, Brussels

European Parliament (2005), European Parliament legislative resolution on the proposal for a directive of the European Parliament and of the Council establishing an

infrastructure for spatial information in the Community (INSPIRE) (COM(2004)0516 – C6-0099/2004 – 2004/0175(COD)), Strasbourg http://www.europarl.eu.int/omk/sipade3?SAME_LEVEL=1&LEVEL=3&NAV=S&LSTDOC=Y&DETAIL=&PUBREF=-//EP//TEXT+TA+P6-TA-2005-0213+0+DOC+XML+V0//EN (viewed on 20 October 2005)

Inspire (2003), Consultation Paper on a Forthcoming EU Legal Initiative on Spatial Information for Community Policy-making and Implementation, Inspire

Inspire (2003), Report on the feedback of the Internet consultation on a forthcoming EU initiative establishing a framework for the creation of an Infrastructure for Spatial Information in Europe, Inspire

Kok, B. & van Loenen, B. (2004), Spatial data infrastructure and policy development in Europe and the United States, Delft University Press

Kok, B. & van Loenen, B., (2005), How to assess the success of National Spatial Data Infrastructures Computers, Environment and Urban Systems, Elsevier

The European Parliament and the Council of the European Union (2005), Proposal for a Directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE)− Recitals , Brussels

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

ICT ENABLED LAND ADMINISTRATION SYSTEMS FOR SUSTAINABLE DEVELOPMENT – THE DANISH WAY

Stig Enemark
Vice-President of International Federation of Surveyors
Head, School of Surveying and Planning
Aalborg University, Denmark
Email: enemark@land.aau.dk

SUMMARY

This paper analyses the current Land Administration System (LAS) in Denmark with a focus on institutional arrangements, land policies, land information infrastructure, and the four land administration functions: land tenure, land value, land-use, and land development.

The analysis, this way, builds on the land management paradigm. Some challenges and barriers are identified and the key initiatives for improvement are described.

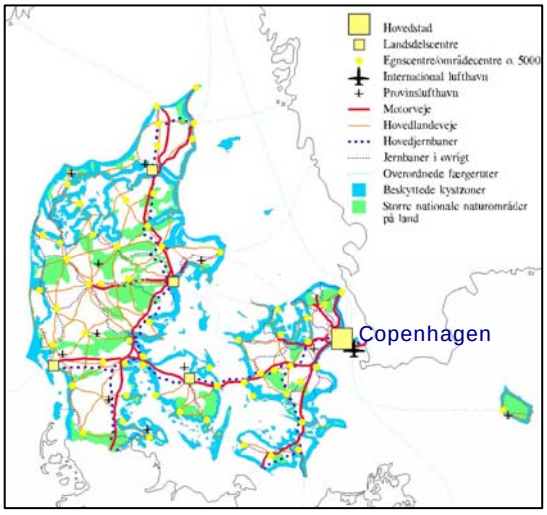
It is concluded that the system works well in the sense that it supports sustainable development through an efficient land market and effective land-use management. The property layer (the cadastre) is well integrated as the basis for a land information infrastructure in support of all four land administration functions. Furthermore, the LAS is well tailored for a decentralised approach to land-use management placing the decision-making power at regional and especially local level.

However, the land information infrastructure is complex and needs continuous attention to be adapted to ITC developments. Also, some institutional arrangements could be improved and, more generally, there is need for improving the awareness of the land management area as a coherent whole.

COUNTRY PROFILE

Denmark is a part of Scandinavia and a member of the European Union. The total area is 3,000 square kilometres, not including the Faeroe Islands and Greenland. The population covers around 5.3 million people with a density of 123 persons per square kilometre. About 85% of Denmark's population lives in cities and towns.

Denmark is low-lying country, its highest point rising 175 metres above the sea. Approximately 10% of the country is used for urban zones and transport installations, 67% is agricultural land, 12% is forests, and the rest is semi-natural areas such as hearths, lakes and streams. The total coastline stretches 7,300 kilometres. Copenhagen is the capital. Greater Copenhagen has 1.7 million inhabitants, one third of the Danish population. The next four largest cities are Aarhus (population 275,000), Odense (180,000), Aalborg (160,000) and Esbjerg (85,000). The total number of residential units is about 2.5 million. About 60% are owner occupied and 40 % are leased. About half of the leased units are private tenant housing, the other half is non-profit housing. The gross domestic product per capita is around 251,000 DKK (2001) equivalent to 33,000 USD. Agriculture and other primary production accounts for around 5%, industry and construction 25%, private services 50%, and the public sector around 20%.



Denmark is a constitutional monarchy governed by a representative democracy organized on three levels: at the national level there is a parliament with legislative power and ministries responsible for certain fields; at the regional level there are 14 county councils responsible for regional matters such as hospitals, upper secondary schools, major roads, rural planning and administration; at the local level there are 275 municipal councils responsible for all local public functions. On average a municipality has around 20,000 inhabitants. However, as per 1 January 2007 a new administrative structure will be in force consisting of only 5 counties and about 100 municipalities.

SHORT HISTORICAL PATH TOWARDS SUSTAINABLE LAND MANAGEMNT

The Danish cadastre, which derived from the enclosure movement, was established in 1844. The main purpose was the collection of land taxes from agricultural holdings based on a valuation of the yielding capacity of the soil. From the very beginning, the cadastre consisted of two parts: the cadastral register and the cadastral maps. Both these components have been updated continually ever since.

In the late 1800´s the cadastre changed from being a fiscal cadastre primarily as a basis for land valuation and taxation to a legal cadastre supporting a growing land market. This evolution was completed in the early part of the 1900´s when taxation became based on the market value. Simultaneously, in the 1920´s a new Land Book System was established. The new system was based on the cadastral identification and a close interaction between the two systems was established.

During the first half of the 1900´s land was increasingly seen as a commodity and the focus was on agricultural production and industrial revolution. Land use regulations were introduced to improve agricultural productivity and at the same time sustain the social conditions in the rural areas. These regulations were based on cadastral information. The 1960´s introduced a close interaction between the cadastral process (e.g. subdivision) and the relevant land-use regulations.

An administrative reform was adopted in the early 1970´s to reorganise regional and local administration. The reform reduced the number of counties from 25 to 14 and the number of local authorities from almost 1,400 to 275. The reorganisation created the basis for transferring a number of responsibilities and decision-making power to the counties and especially to the municipal councils by means of decentralisation

Land was increasingly seen as a community scarce resource and zoning and planning regulations were introduced to control land development. Environmental concerns appeared in the late 1970´s and developed into the major issue in recent years. Today, comprehensive planning and environmental protection are seen as the main tools to secure sustainable development. Cadastral information based on a modern IT platform evolved to support these processes towards sustainable land management (Enemark and Schoeler 2002).

THE CURRENT LAND ADMINISTRATION SYSTEM

The Land Administration System in Denmark is tailored for a decentralised approach to land-use management placing the decision-making power at regional and especially local level. The system works well in the sense that it supports sustainable development through an efficient land market and effective land-use management.

The analysis of the Danish LAS builds on the Land Management Paradigm in which land administration is seen as an area dealing with rights, restrictions and responsibilities in land. This relates to the interaction of the three areas of land tenure, land value and land use. By including land development these four areas are called the Land Administration Functions. These functions are based on policies determining the overall objectives and they are managed on the basis of appropriate land information infrastructures providing complete and up to date information on the natural and built environment. This all sits within a country/state context of institutional arrangements that may change over time. The Paradigm is presented in Figure 1 below (Enemark et al., 2005):

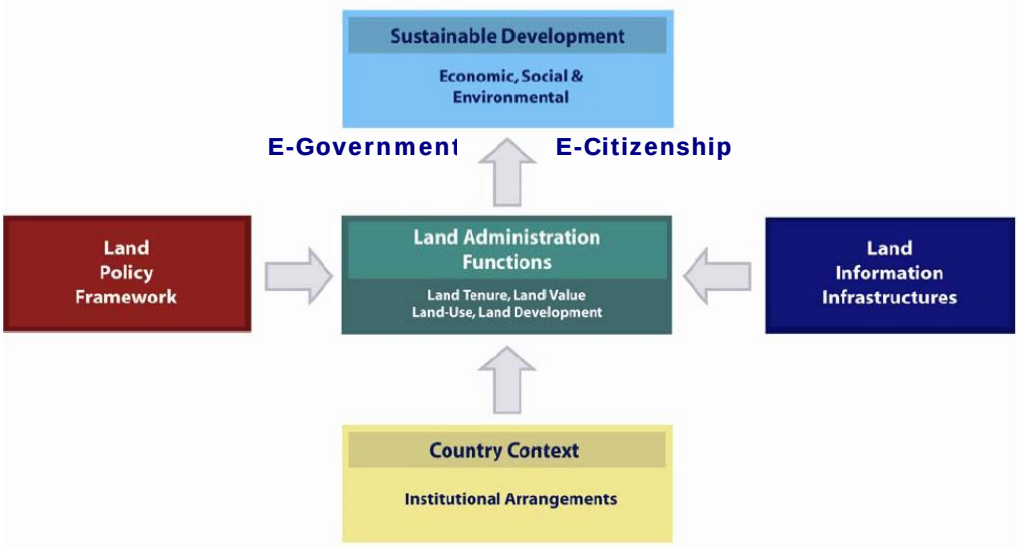


Figure 1 - The Land Management Paradigm

The Land Policy Component

Land policies are expressed partly through the constitution and other more general laws such as the Land Registry Act, The Subdivision Act, The Valuation Act, and the Planning Act, and partly through the sectoral land-use acts such as the Agricultural Holdings Act, the Environmental Protection Act, and the Nature Protection Act.

A key land policy is laid down in the Planning Act that establishes general zoning dividing the total country into urban, recreational and rural zones. This provides a low land value in rural areas, where no developments are allowed except for agricultural and forestry purposes. The provisions on rural zones, covering about 90% of the country, are intended to provide a clear delimitation between town and country, to prevent urban sprawl and uncontrolled land development in the countryside, and to preserve valuable landscapes. In urban areas, the land-use opportunities are determined by planning regulations at local level. The Planning Act also provides a planning zone within 3 km of the coastline, in which special attention is given to protection of valuable features of the landscape.

Sectoral land policies include the requirement that all agricultural properties be operated in accordance with agricultural and environmental considerations. This duty applies to two-thirds of Denmark's land. The protection of agricultural land can be abolished when land is transferred into an urban zone, which is based on planning considerations and with due regard for the quality of the agricultural land. Conservation provisions apply to ensure responsible management of forest areas, which comprise 12 per cent of Denmark's land. The Nature Protection Act provides the legal basis for protection and conservation of nature, landscape features and historic elements. In addition the Act gives protection to certain areas and elements in nature and landscape by establishing fixed protection zones along coasts, lakes, streams etc. Heritage buildings are protected through conservation orders and certain regulations.

The Land Information Component

The goal of the Danish Land Information Infrastructure is to reduce duplication and costs of spatial data/information, to improve quality, to encourage co-operation on common standards and data models, to make spatial data/information more accessible to all, and to facilitate e-government and participatory democracy. However, an “official infrastructure”

has not yet been created. A recent government analysis (The Digital Task Force, 2001) assessed that Denmark on the one hand is in a strong position for using geo-data in a digital management environment since all the basic registers and maps are now in place in a digital format. On the other hand, it stated that existing co-operation structures at the operational level are too informal and do not sufficiently support the most expeditious utilisation of spatial data. It was therefore recommended that a governmental body be established to ensure the drive runs in a more unified and holistic direction. The body was established 2002 and was named The Spatial Data Service Community.

The Spatial Data Service Community is led by a steering group in which in addition to representatives from Local Government Denmark and the Association of County Councils in Denmark, the Ministry of the Environment is represented by National Survey and Cadastre, the Ministry of Economics and Business Affairs by the National Agency for Enterprise and Housing, the Danish Ministry of Food, Fisheries and Agriculture by the Directorate for Food, Fisheries and Agricultural Business and the Ministry of Transport by the Road Directorate. Chair and Secretariat: The National Survey and Cadastre, the Ministry of the Environment.

The Spatial Data Service Community has published a vision stating that Geodata shall (i) constitute a natural tool for citizens, enterprises and the public administration, (ii) be harmonised, standardised, easily accessible and cheap; (iii) be a common basis for the digital administration, and (iv) create value growth for society. The strategic aims include areas such as Division of Data Responsibility; Pricing Structure; Basic Data; Data Descriptions; Distribution and Presentation (Accessibility); Dissemination and Deployment; and International Cooperation. The Spatial Data Service Community draws up an Annual Work Plan based on the seven strategic aims and other important geo-related issues in society. Committees are appointed to focus on investigation and analysis of important components in the establishment and development of spatial data. The work is carried out in cooperation with private and public partners (www.xyz-geodata.dk).

The Danish society is one of the most mapped and registered societies in the world. Over the past two decades analogue maps and geo-referenced registers have been converted to a digital form, and new data have been created to fill the gaps. The figure below shows the most important building blocks for a Danish Infrastructure for Spatial Information (Brande-Lavridsen 2003). For more details see http://www.ddl.org/thedanishway/spatial_09.pdf.

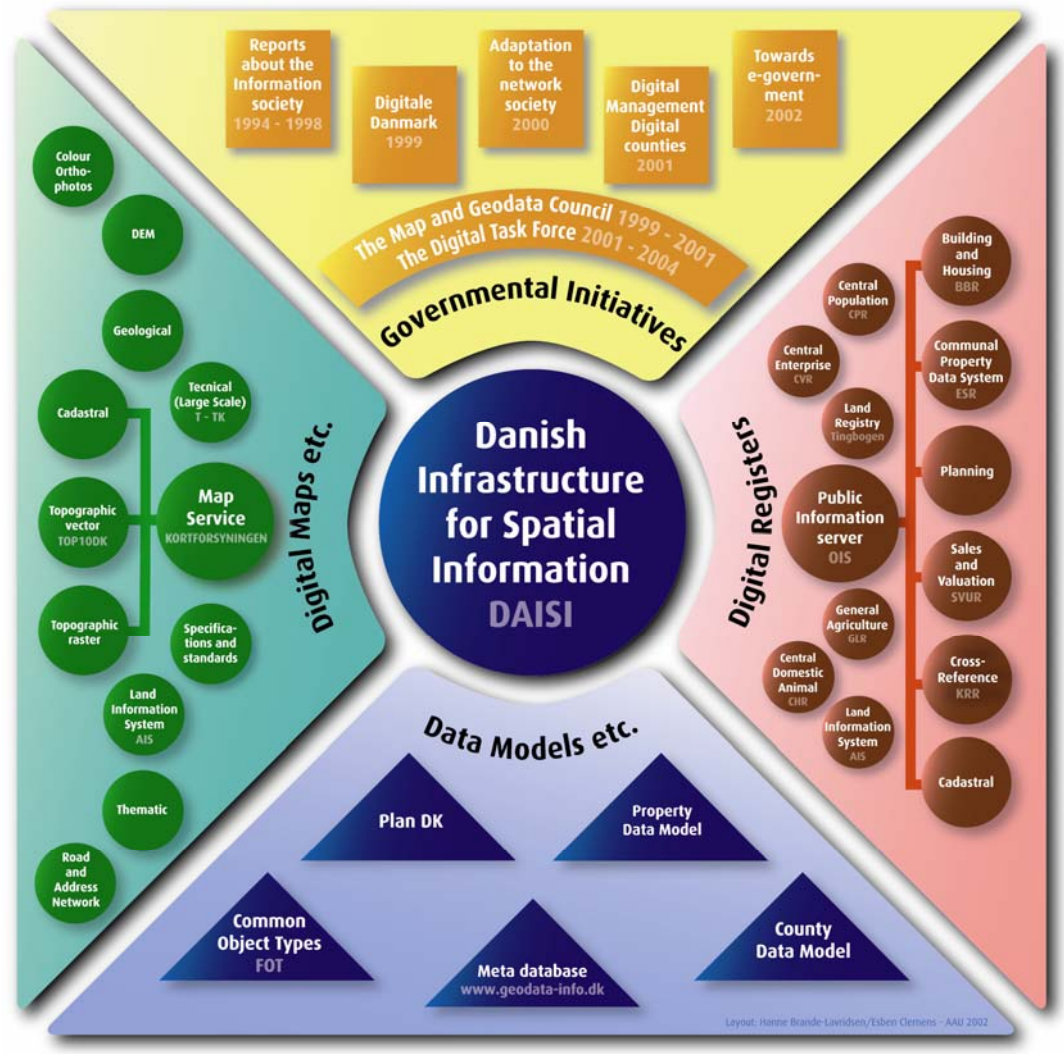


Figure 2 - The Danish Infrastructure for Spatial Information

Digital Registers. The Danish concept for integrated land information is organised as a network of interactive subsystems containing the most relevant information such as the Cadastral Register, the Land Book, the Building and Housing Register, the Communal Property Data System (property valuation and taxation), and the Central Population Register. The responsibility for the spatial information registers is distributed among different public authorities at the state, county and municipal level. The registers can be linked by common identifiers such as cadastral number, property identification, and geo-referenced addresses, which are maintained in the Cross-Reference Register. Fundamental to the registers was the standardisation of addresses in connection with the establishment of the Central Population Register. At a later stage it has been widely accepted that the address issue is of great importance when talking about spatial information because the address can link data from registers containing personal, property and enterprise data sets. As all addresses in Denmark have a coordinate relating to the front door, all register data can be geo-coded to the digital map series (Brande-Lavridsen, 2003).

The contents of the key registers are available to the public through the web-based Public Information Server launched in 2001 (www.ois.dk). The use is free of charge.

Digital Maps. In December 2000 the National Survey & Cadastre finished a nationwide vector-based map database (TOP10DK) in a scale of 1:10,000. This map series is very

important in connection with the integrated use of spatial data. The map database is designed to be used in GIS connections, and eventually the map will have different linking facilities e.g. to the property-related data. The map database includes a digital elevation model. Other topographic products in smaller scales (raster-based) are also available.

Large scale digital mapping in Denmark started seriously in the 1970s in connection with the introduction of natural gas. Large scale topographic maps cover Denmark in scales from 1:1000 (towns and built-up areas) to 1:10.000 (rural areas). As the maps are produced on demand from different users (municipalities, utility companies, etc.) and in different qualities, the maps do not form a homogenous nationwide product even if they follow the general technical specifications. Generally these maps are available through the map service of municipalities.

The computerisation of the old analogue cadastral maps (mainly in the scale of 1:4000) was completed at the end of a ten year program in 1997. The maps are designed for integrated use in a modern GIS environment.

The maps are available to the public through the web-based Map Service Launched 2002 (www.kortforsyningen.dk). The use is based on subscription and payment however, most of the maps are also available from the municipal and county services free of charge. Furthermore, the Plan Information Service was launched in 2003 (www.planforsyningen.dk) giving web-based access to various kind of planning information. Again most of this information is also available through the municipal services.

Data Models. An important condition of utilising spatial data across public institutions and sectors (and the whole geo-data business) is that the different data can "interact". Therefore, today we have data models for property data as well as planning and environmental data. However, the documentation and metadata is often a barrier for the wider utilisation of spatial data. Therefore, a meta-database was established, see www.geoinfo.dk. The meta-database gives a short overview of each data set and where to get further information about the data set.

Another initiative is the COT project (Common Object Types) that attempts to point out and describe common object types such as buildings, road centre lines, coastlines, etc. in topographic mapping. This way, the information can be shared by all kinds of end users. The project is a co-operation between the National Survey and Cadastre, the county and municipal authorities, the utility owners, and private mapping companies.

THE LAND ADMINISTRATION FUNCTIONS

Land tenure and cadastral systems.

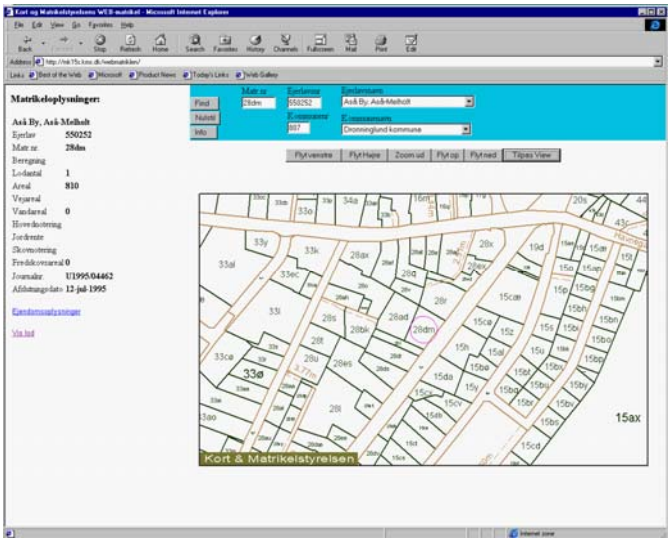
The National Survey and Cadastre under the Ministry of Environment is responsible for geodetic and small-scale topographic mapping, nautical charting, and for maintaining and updating the cadastral register and the cadastral maps. Cadastral surveying or surveying for legal purposes is the responsibility of licensed surveyors in private practice. As for the topographic maps these are no longer (since 2002) produced in an analogue format. Politically, this is considered to be a matter of private business based on the topographical datasets.

Legal rights to land including ownership, mortgage, easements and leases are recorded in the Land Book at the local districts courts under the authority of the Ministry of Justice. The land book is a positive title system based on the cadastral identification of the land

parcels. Land transfers can then be entered into the land book just by referring to the cadastral number in a deed; consequently there are no maps or cadastral surveys available at the land registry. The process of land transfer does not include the use of notaries. When transferring a part of a property, subdivision has to be carried out prior to entering the deed to the land book. When a subdivided area is transferred from one property to another the legal rights of ownership and mortgage must be arranged prior to cadastral registration in order to ensure consistency between the two systems. This is the duty of the private surveyor. They must also ensure that the intended future land use is consistent with the current land-use regulations. A system of digital lodgement of the cadastral data is in place to facilitate on-line management of the cadastral data in the interaction between the private surveyors and the National Cadastral Authority. At the same time the system works as an integrated quality control system.

Strata titles are registered in the Land Book and are not included in the cadastre. To subdivide a property into strata titles, all the building units on the property must be included. The land of the property is then owned by the strata titles holders in an ideal partnership reflecting their interest in terms of e.g. the size of the strata title units. The opportunity of subdividing a property into strata titles is subject to detailed political attention and regulations in order to ensure a proper supply of low cost housing in the urban areas.

Buildings are not included in the cadastre. This is due to the origin of the cadastre that was established for taxation purposes based on the yielding capacity of the soil, and there has never since been any attempt to include the building in the cadastre. Buildings are considered a matter of local government management based on the large scale topographic maps. Information on the buildings is maintained in the Building and Housing Register that includes all kinds of information on the year of construction, floor areas, building materials, technical installations, etc. This information is linked to the large scale topographic maps and is maintained by the local municipal authority in relation to the management of building permits and urban renewal.



The Web-Cadastre is an up-to-date raster version of the official cadastre. Information is easily accessible and useful for all kinds of purposes in government, business and privately.

There is, however, a need to also include to the land book information and relevant information on land-use restrictions. This common interface is till to be designed.

Figure 3 - The Web Cadastre

The cadastral system is well placed to serve multi-purpose needs by combining the datasets of the built and natural environments. It is generally agreed that the cadastral system should service all users, and their requirements for cadastral products should be carefully considered. The problem in this regard relates to the tension between the relative and

absolute accuracy of property boundaries. Where the cadastral process traditionally focused on the relative accuracy between parcel boundaries, today some users, particularly local authorities and utilities, focus on absolute accuracy in order to fully combine cadastral and topographic datasets (Enemark 1998).

LAND VALUE

Land and property valuation is controlled by the Ministry of Taxation and managed by the municipal authorities. When a property is transferred, information on the sale price must be recorded at the municipal valuation authority prior to entering the deed into the land book. Although values are automatically assessed on the basis of recorded sale prices and property information, there is a "human factor" present in the valuation process represented by local valuation committees that comprise typical laymen. The valuation is based on information from the cadastre, the land book, and zoning and planning regulations. However, the key element is the mandatory recording of property sales prices.

The property value is assessed as the full market value of the property including land and buildings but excluding machinery, furniture and animals. The valuation is assessed to reflect the average cash price paid by a sensible buyer. The value should also reflect the best possible economic use of the property. All public regulations such as zoning and planning regulations must be taken into consideration.

The land value is assessed as the full market value (assumed cash payment) of the land without the buildings or other construction facilities. Again, the value is assessed to reflect the best possible economic use of the land, disregarding any existing buildings and the present land use. The value includes improvements such as drainage, sewerage or roads.

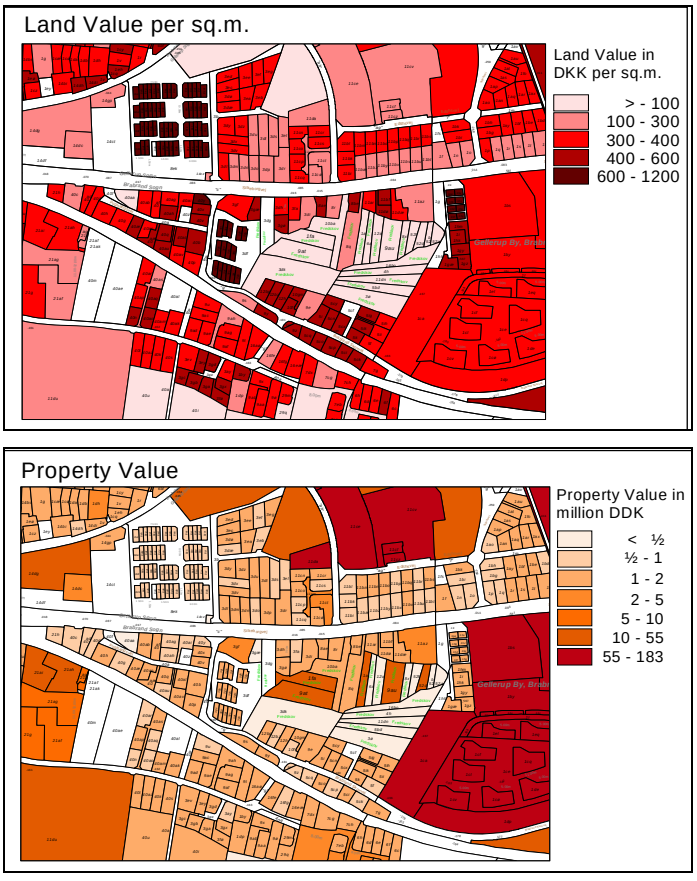


Figure 4 - Examples presenting the land and property values in combination with the cadastral data

Land tax is levied by the county and municipal authorities based on the assessed market value of the land for all kinds of private properties. Property and land taxes account for only about two percent of the total tax and duty revenue.

The organisation of the land valuation system is currently being revised due to the implementation of new administrative reform. The basic principles for land valuation and taxation will, however, remain the same.

LAND-USE AND LAND DEVELOPMENT

The system of planning control is based on the principle of framework control in which plans must not contradict the planning decisions at higher levels. The county councils carry out regional planning with emphasis on the regional infrastructure and the sectoral interests of the countryside. The municipal councils are responsible for municipal planning with emphasis on the local issues and the function and development of the urban areas. The municipal councils are also responsible for the legally binding detailed planning of their neighbourhood areas, and for the granting of building permits that serve as a final control in the system. The Minister for the Environment can influence the planning at regional and local levels through policies and national planning directives.

The system of planning control is supported by a number of the sectoral land use acts such as the Agricultural Holdings Act, the Environmental Protection Act, and the Nature Protection Act. The sectoral land use provisions are managed by the county and municipal authorities on the basis of sectoral land use programmes that also feed into the comprehensive planning at regional and local level. Furthermore, the system of planning control is supported by the land information infrastructure where the cadastre forms the basic layer for planning and administration. The system of integrated Land-Use Management is shown in the diagram below (Enemark, 2004).

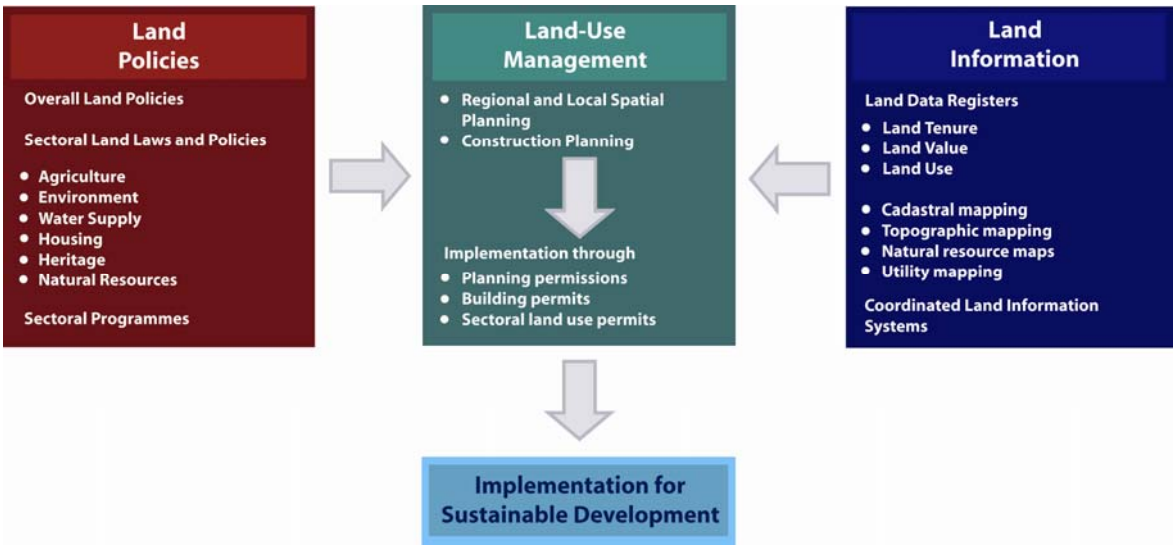


Figure 5 - The Danish Concept for Integrated Land-Use Management

The impact of central versus local government in support of sustainable development is a mix of vertical connections where each sectoral policy is implemented by a top- down approach; and horizontal connections where the different sectoral policy areas are balanced on the same level through comprehensive spatial planning.

The principle of framework control ensures that planning decisions at regional and local level - in principle - will be in conformity with overall national policies. National planning policies, however, are not formally linked together to form a general national plan or a "blue print". A National Spatial Development Perspective such "Denmark towards the Year 2018" (launched 1993) is not a plan, but a vision, serving the purpose as a reference framework. There are no requirements or stipulations binding the regional and local decisions. Instead, the system of framework control operates by using two means of control: dialogue and veto.

The process for revising the regional plans every four years is based on a comprehensive national report presenting the current preconditions for managing the national aims and objectives within specific and topical policy areas. The report is prepared by the Ministry for Environment and Energy and is based on negotiations with relevant ministries and national agencies. The report should thus prevent the use of veto against the proposed regional plans, because national interests are considered, discussed and dealt with in advance. The adopted regional plans have a binding effect on planning at municipal level. The preparation of the plans therefore also is based on dialogue and negotiations with the local authorities. To conclude the system of framework control, the Minister of Environment and Energy also may veto a proposed local plan when national interests are at stake. The power of veto based on national interest then leads to negotiations in order to achieve a balance between the three levels of administration.

In the Nordic setting, the decentralised model of land use control is based on a cultural tradition which strives for a broad political and social consensus. The concept of decentralisation comprises a precise and finely tuned relationship between a strong national authority and autonomous county and municipal councils. The purpose is to solve the tasks at the lowest possible level so as to combine responsibility for decision making with accountability for financial and environmental consequences. To put it simply: “planning is politics”.

CHALLENGES AND BARRIERS

Policy level. There is no overall comprehensive land policy in Denmark. On the other hand there is no need for such a policy since the system is already established and embedded in the cultural and institutional setting of the country. There is, however, a need for an overall policy with regard to the National Spatial Data Infrastructure. There is also a need for an overall policy with regard to the design and implementation of e-governance and e-citizenship in relation to land and property management.

Management level. Strategic aspects need to be considered with regard to the cadastral infrastructure and the institutional framework. For example, whether the Land Registries at the local district courts should be merged with the Cadastral Agency under the Ministry of Environment, and thereby increase the potential for access to and management of data related to land and property. The adequacy of the current cadastral infrastructure and procedures in relation to new ICT tools such as the provision of maps on-line from the relevant mapping database needs consideration. As does introduction of a 3D-cadastre to serve the registration of strata titles and some special construction works. Finally development of a marine cadastre to identify and secure rights and restrictions in the marine environment especially in the coastal zone should be considered.

Operational level. Fine-tuning of property concepts is needed in relation to the cadastre, the land book, and the valuation register. There is also a need to develop a user-friendly interface for access to land information in order to serve the needs of users in government,

business, and the public in general as a basis for implementing e-government as the overall approach to land administration. This interface could be based on the web-cadastre in combination with the topographic database, and should also include information on ownership, mortgage and easements, the land and property value, as well as restrictions and responsibilities related to individual properties. The information should be accessible by the postal address, cadastral identification, or the name of the landowner.

CURRENT INITIATIVES FOR IMPROVEMENT

A number of initiatives are currently discussed and considered for further improvement of the Land Administration System.

The ICT architecture. Technology development in recent years offers new opportunities for organising spatial information. The buzz word is service-oriented IT architecture that can improve the communication between administrative systems and also establish more reliable data due to the use of original data instead of copies. This is now adopted in the governmental guidelines for service-oriented architecture e-government. The key elements are: (i) Flexibility and accessibility which facilitates decision-making at all levels, (ii) Quality, authenticity and actuality due to direct access for reading and updating in the basic databases, and (iii) Standardisation through homogeneous selection of communications and exchange standards such as XML etc. This is currently being applied in the area of land administration through close cooperation between the agencies and stakeholders involved.

The Land Book. The project includes a digitalisation of the land book archives (the deeds, mortgage and easement document) and adjustment of procedures to better reflect the ITC opportunities. The latter includes implementation of the service-oriented IT-architecture mentioned above. It also includes the introduction of on-line registration based on standard registration forms. Finally, the total organisation of the land registry is discussed. It is suggested to close down the local land registries at district courts and, instead, to establish just one national land registry authority. It is not yet decided whether this new National authority will remain under Ministry of Justice or maybe be established in relation to the National Survey and Cadastre under the Ministry of the Environment. In this regard, a new model is introduced for consideration, where property ownership is registered in the cadastral register, easements are identified at the cadastral maps, while mortgage could be registered in relation to the financial sector (as an asset paper compared to shares, etc.). It is, however, not likely that such a radical solution will be agreed upon at this stage. This is due to a constant tension between the various ministries and agencies caused by the ongoing fight for power and resources.

The Property Concept. The property concept in Denmark is a legal term that is defined slightly differently in various laws (The Cadastral Act, The Land Registration Act, and the Valuation Act). There is a necessity to find a common term that should also accommodate various other types of properties and complex commodities. Such a common term should then form the basis for registration of all kind of property rights.

The Cadastral Map. There is a need to improve the accuracy of the digital cadastral maps in order to obtain better consistency with the large scale topographic maps. The project looks at ways and means to improve the accuracy and to make the maps more useful to the end users.

This problem derives from the process used for producing the digital maps. Accepting that the costs of computerisation of the old analogue cadastral maps had to be reasonable, the computerisation process was undertaken in two stages: (i) state control points and cadastral

surveys connected to the national grid form a "skeleton" cadastral map (about 40 % of the boundary points in urban areas and 20% in rural areas were entered this way); (ii) the remaining parcel areas were inserted in the map by digitising the analogue cadastral map and fitting in these to "skeleton map" by transformation. Identified elements in the digital map were also used to control the transformation of the analogue map. Metadata will indicate the way the boundary was established in the DCDB.

By using this approach the accuracy of the boundary coordinates will vary considerably, ranging from a few centimetres in some urban areas and up to several metres in some rural areas. Therefore, the digital cadastre may not totally compare to a digital topographic map. However, it must be considered that the nature and origin of those two kinds of maps are fundamentally different. It must also be noted that the digital cadastral map is a graphic map, not a numeric map. This means, that the co-ordinates for the boundary points only represent the boundary in the graphic map. The final determination of boundaries must be done according to the cadastral surveys and regulations. The parcel co-ordinates in the DCDB therefore must not be used for exact calculation of parcel areas and dimensions.

The real challenge in this regard is to make this advanced product (digital cadastre map) understandable and useful to the wide range of users: They should understand that the digital cadastral map in no way replaces or changes the legal boundaries; and they should understand the nature of this map and the origin of its features (Enemark, 1998).

The Multipurpose Cadastre. In 2005, the educated use of the cadastral map is still one of the major challenges. In recent years the cadastral authority has been imposed by the obligation of registration of new themes in the cadastre such as the coastal protection zone, the dunes protection zone, and soil contaminated areas. It has also been considered to include planning regulations and various land-use restrictions to be "hosted" by the cadastral map.

This concept of "hosting" land-use regulations in the cadastral map will now be replaced by the service-oriented IT architecture mentioned above. The focus will be on facilitating the use of the cadastral information as a basic layer for registering all kind land-use regulations and restrictions. The planning authorities and sectoral land-use authorities must then learn how to use the cadastral information within their area of responsibility including awareness of benefits and costs as well as legal and organisational impacts. The concept of the multipurpose cadastre therefore no longer means that all kind of regulations and responsibilities will be registered in the cadastre. It means that the cadastre represent the basic layer to be used by the relevant authorities for registering their information and presenting this information for decision making and to the citizens. This will require an educated use of the map to ensure consistency between cadastral changes and the connected land restrictions (Skrubbeltrang, 2005).

Implementation of the Administrative Reform. As mentioned above, a new administrative structure will be in place by 1 January 2007. The scope is to empower the local authorities by establishing larger municipalities of, in principle, more than 30,000 inhabitants. At the same time, the role of the regional level will change to include almost solely hospital management. Most of the responsibilities of the county authorities in terms of land administration are then transferred to the enlarged municipalities while some will be transferred to state level to be managed by the various state agencies.

The problems in this regard refer to the process for adopting this reform, where there was no time (or political will) to organise especially the environmental management responsibilities in a clear and structured way. The planning area is, however, well in place

even if there will be a major change in relation the current system when the whole level of regional planning disappears. Instead, the new regions will be responsible for preparing a whole new and strategic tool that covers general and overall aspects of relevance to the development of the region.

However, these structural and institutional issues will of course find a solution over the coming years. The concerns are more around the land information data and expertise established over the years at the county authorities within areas such as nature protection, environmental management, water catchments, agricultural management, etc. How is this information, knowledge and expertise to be divided and transferred to the various municipal authorities within each of the former county areas?

This problem may in fact jeopardise the whole land information infrastructure at least from a short term perspective. On the other hand the situation may also offer new opportunities such as to organise the land resource data on the basis of e.g. the water catchments areas rather than dividing the datasets into the various administrative jurisdictions.

CONCLUSIONS

The Danish Land Administration System works well in the sense that it supports sustainable development through an efficient land market and effective land use management. The property layer (the cadastre) is well integrated as the basis for land information infrastructure in support of all four land administration functions. This is continuously improved and adapted to new ICT opportunities. Furthermore, the LAS is well tailored for a decentralised approach to land-use management placing the decision-making power at regional and especially local level.

However, the land information infrastructure is complex and needs continuous attention to be adapted to ITC developments. Also, some institutional arrangements could be improved and, more generally, there is need for improving the awareness of the land management area as coherent whole.

REFERENCES

Brande-Lavridsen, H. (2003), Towards a Danish Spatial Data Infrastructure – What can the Danish Authorities off the citizens today? Proceedings of ICA congress, Durban, 2003.

Enemark, S. (1998), Updating Digital Cadastral Maps – the Danish Experience. Proceedings of Commission 7 sessions at the FIG XXI International Congress, Brighton, UK, 19-25 July 1998, pp 426-437.

Enemark, S. and Scoeler, K.L. (2002), The Danish Way. The Danish Association of Chartered Surveyors, Copenhagen http://www.ddl.org/thedanishway/

Enemark, S. (2004), Building Land Information Policies. Proceedings of Special Forum on Building Land Information Policies in the Americas. Aguascalientes, Mexico, 26-27 October 2004. http://www.fig.net/pub/mexico/papers_eng/ts2_enemark_eng.pdf

Enemark, S., Williamson, I., and Wallace, J. (2005), Building Modern Land Administration Systems in Developed Economies. Accepted for publication in the Journal of Spatial Science, Australia in the December Issue 2005.

Skrubbeltrang J. (2005), Multipurpose cadastre - a host for land use planning data? Proceedings of WPLA workshop, Helsinki, September, 2005.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

BUILDING MODERN LAND ADMINISTRATION SYSTEMS IN DEVELOPED ECONOMIES – ASPECTS AND EXPERIENCES FROM GERMANY

Holger Magel
President International Federation of Surveyors
Professor of Land Management
Technical University Munich, Germany
Email: magel@landentwicklung-muenchen.de

SUMMARY

The following presentation discusses the role of land administration as part of spatial information and land management, analyses the six components of an integrated land administration system and discusses trends in land management and land administration systems from a German viewpoint. The presentation lists positive as well as negative country experiences and suggests a list of things Germany needs to do to embrace spatial enablement of land administration systems. All of this is completed within the sphere of a critique of the Land Management Model.

Univ.-Prof. Dr.-Ing. Holger Magel
Director of Institute of Geodesy, GIS and Land Management, TU Munich
FIG-President
on:

Building Modern Land Administration Systems in Developed Economies – Aspects and Experiences from Germany*

at the Expert Group Meeting "Incorporating Sustainable Objectives into ICT Enabled Land Administration Systems" 9 – 11 November 2005 in Melbourne

A. General remarks

B. About the six components of integrated Land Administration Systems

C. Analysis and trends in general and from the German viewpoint

* Many thanks for valuable contributions to my colleagues G. Muggenhuber (FIG-Com. 3), Dr. W. Hawerk (FIG-Com. 7), Dr. R. Bauer, R. Ludwig and Dr. A. Donaubauer (TUM)

A. General remarks

I. Spatial information as economic good on the market: cost and access to be reasonable

Traditional markets are based on:

- goods (products and land),
- services,
- capital and
- labour.

Economic growth within traditional markets is stimulated by lowered productions costs + transaction costs (Douglass C. North (1990): "Institutions, Institutional Change and Economic Performance") – (Theory of institutional economics: 3 basic aspects of economic transactions)

Land Administration is a good example of market because it involves all four above mentioned components of a traditional market

Modern digitized Data Systems are cheaper than traditional ones.

II. Land Administration as part of Spatial information

- **Data level**

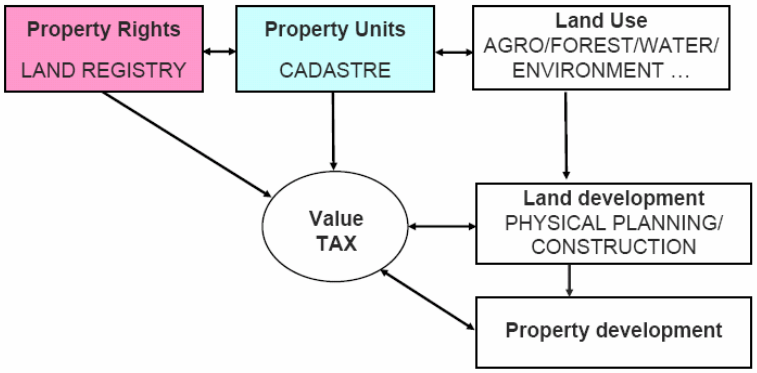
EU-Influences:
Land administration data is part of the Public sector information (PSI). The EU-PSI-directive as well as EU-INSPIRE-directive strongly support and intend to facilitate access and use of PSI for multiple purposes.

EU-INSPIRE (**In**frastructure for **Sp**atial **I**nformation in Europ**e**):
Spatial Information for EU and national level
- Metadata
- Data:
  cat.I = basic data (georeferencing, coord. Admin units…)
  cat.II = basic data (cadastre, addresses, land cover, orthophoto)
  catIII = environmental data (land use, buildings, risk zones
- Services

The development regarding ISO-based AFIS-ALKIS-ATKIS (AAA-model) in **Germany** fully refers to those developments on EU-level:
Cat. I = AFIS: Official Geodetic Control Station Information System
Cat. II= ALKIS: real estate cadastre + ATKIS: topographic survey
Cat. III= environmental data coming from multi-institutional sources
INSPIRE forces European countries to offer metadata **without charge**, also Geo basis Data.

II. Land Administration as part of Spatial information

- **Institutional level – cooperation through integration of function**

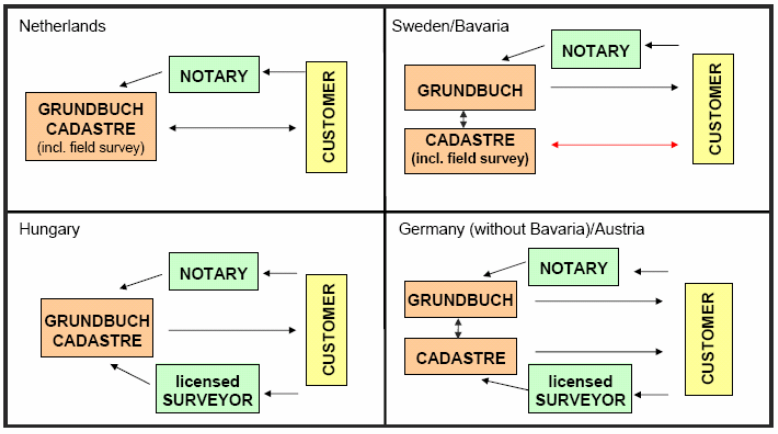


Core message: Central Europe has a long tradition in institutional cooperation, with similar results under different institutional settings

Graphic: Gerhard Muggenhuber

II. Land Administration as part of Spatial information

- **Institutional settings of Land Administration**

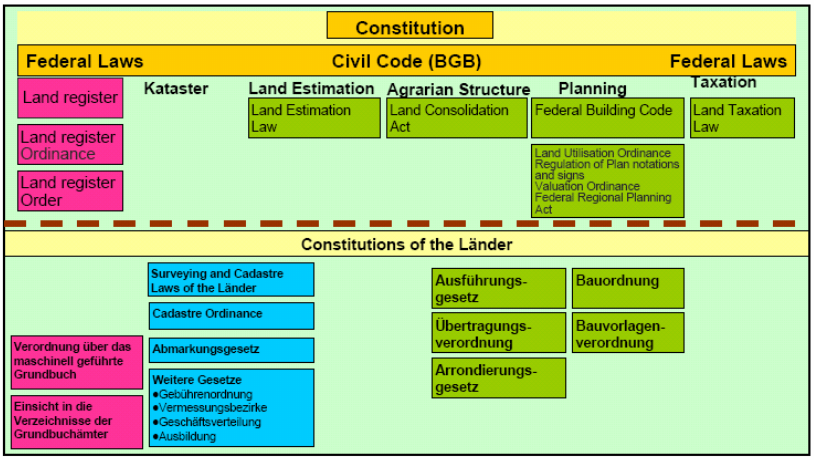


"It is the institutional settings of Land Administration"

Graphic: Gerhard Muggenhuber

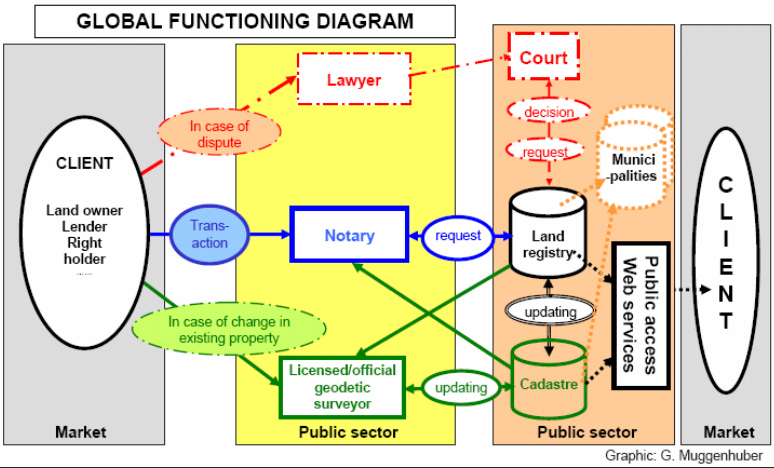
II. Land Administration as part of Spatial information

- Legal setting in the Federal State of Germany



II. Land Administration as part of Spatial information

- Process level



Graphic: G. Muggenhuber

III. Conclusion

Shaping the change:
from single office solutions to eGov with interoperability

We have to take a more holistic approach:

- efficient contribution to the markets
- collaborate on local / regional / international
- shape financially sustainable services
- create win-win-situations

CURRENT SITUATION	TRANSITION	TARGET SITUATION
Independent e-Service Delivery	⇨	**Integral part of e-Government Initiative**

B. About the six components of integrated Land Administration Systems from the special viewpoint of German/Austrian experiences

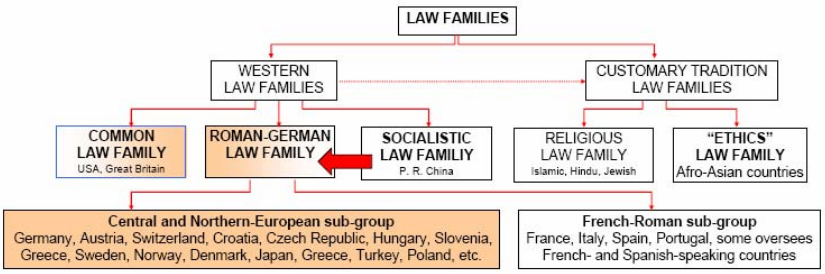
Component 1: Overall frame (legal frame)

How can we make a step forward? How to become more successful?

Any integration has to consider the legal setting in a country, which can be rather different due to the concept and tradition. The legal setting differs much more than cadastral processes or ICT. International cooperation is essential to overcome these legal limitations as part of EESSD. Europe experiences many aspects of harmonizing of legal settings like “European Contract Law" etc.

Legal setting: Approach to ownership rights changed significantly in Europe since “Communist System” transferred to “Social Market system”. Germany is an example for a way of “paradigm shift in concept of ownership” in the East. If the status of property rights is unclear, privatisation, investments and land markets are more problematic.

Component 1: Overall frame (legal frame)

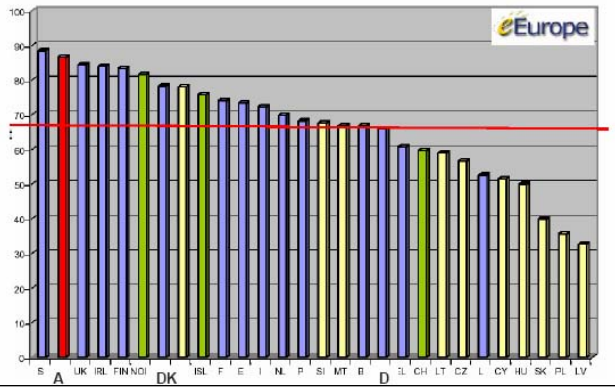


No other country in Europe than Germany had the challenge to integrate traditions of both systems at the same time in addition to restitution and privatization, which happened in many other countries too.

G. Muggenhuber

Component 2: e-Services/e-Governance

eGov is an additional challenge for developing countries in addition to their need to collect and maintain data digitally. In Europe however most of the data are already digitized, harmonized and cross-referenced. **eGov facilitates good governance, however the citizens also require benefit.**



Component 3: Built on country's capacity

Core message: The countries of EU have gone through similar steps of improving. 1. Digitizing data, 2. Improving our internal processes (quality management), 3. Improving our services (marketing, coop. with partners and customers), 4. Optimizing use of resources (staff reduction). In a multi-institutional setting it is important that these steps are tuned between institutions involved. EU facilitates cooperation with e-content program focusing on spatial information.

G. Muggenhuber

Component 4: ICT as a major driver

Core message: ICT is not a challenge any more (but standardisation). Even when we have to be aware that ICT is reflecting all our work processes. However interoperability of work process is still a challenge (in EU: eGov co-operation of public authorities in a country and among countries)

Projects with a sole technology driven approach often fail in many disciplines – not only within Land Administration. The World Bank learnt the lesson and is even reluctant to finance purely technology driven projects. Similar to that we observe that the sustainability of foreign aid programme is often not ensured at all.

Transfer of knowledge is more than just transfer of technology! It seems that in "technocratic" societies the processes correlate with the legal frame, organizations and responsibilities. However most of the societies of the world seem to have a severe impact from informal habits overruling official processes.

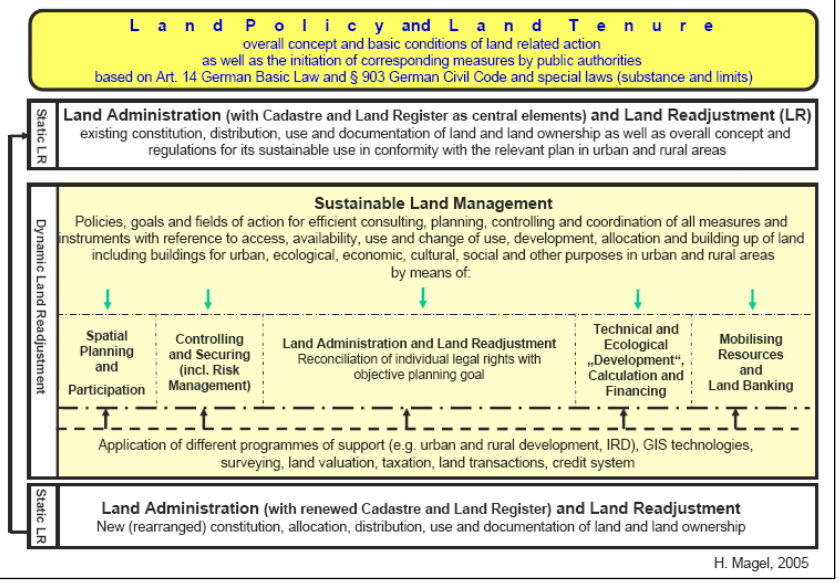
Component 5: covering essential areas of land management

Core message: a full package of land management with the wider perspective of a solid land market requires instruments from (1) land administration (2) valuation (3) land use planning and land development, (4) financial services.

Due to the fast development and changing use of land resources special attention has to be given to land use planning tools including land consolidation (rural), land readjustment (urban) and urban and rural land development! The interrelation of urban and rural is often ignored…

Bavaria developed successful models for urban rural interrelated improvements of infrastructure with land as a focus.

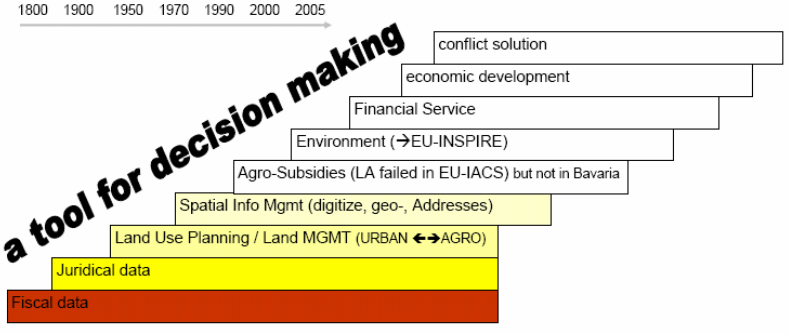
Relationships between Land Policy, Land Tenure and Land Management in Germany



H. Magel, 2005

Component 6: seamless information to support policy implementation

Cadastre serves for an increasing amount of customer groups. In Bavaria and some other countries, cadastre and orthophoto as well as e-services for access to this data were successfully used for EU-administration of agricultural subsidies (IACS). However, some other Cadastre Agencies in Europe lost this important customer group.



C. Analysis and trends in general and from the German viewpoint

Country description

Official Surveying and Mapping in Germany

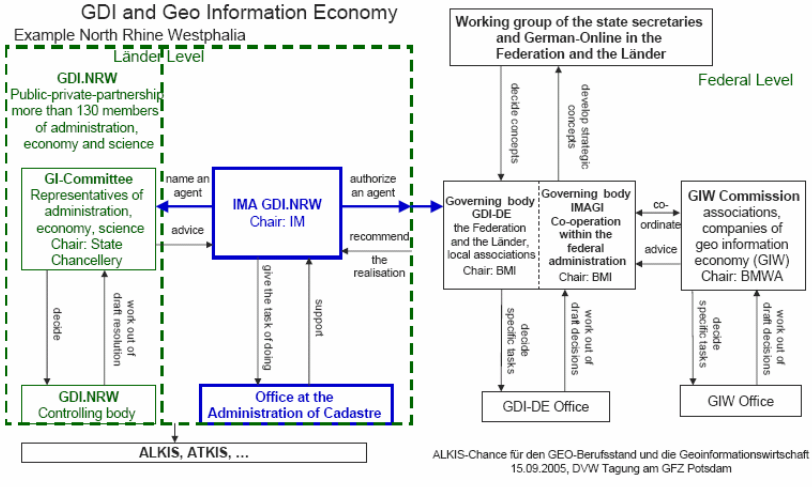
Part of a high class geodata infrastructure and a must for a modern state

Due to translation problems spatial data in Germany are called geo data.

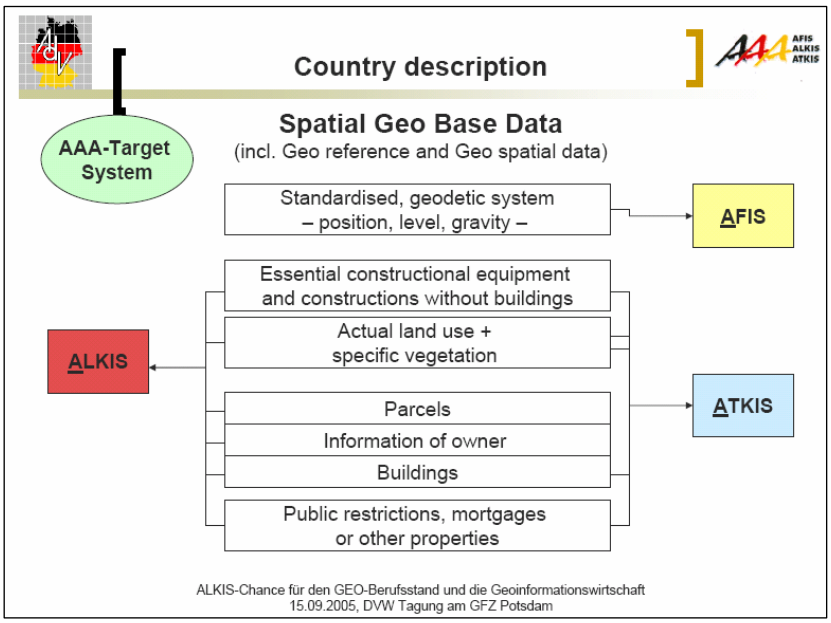
Country description

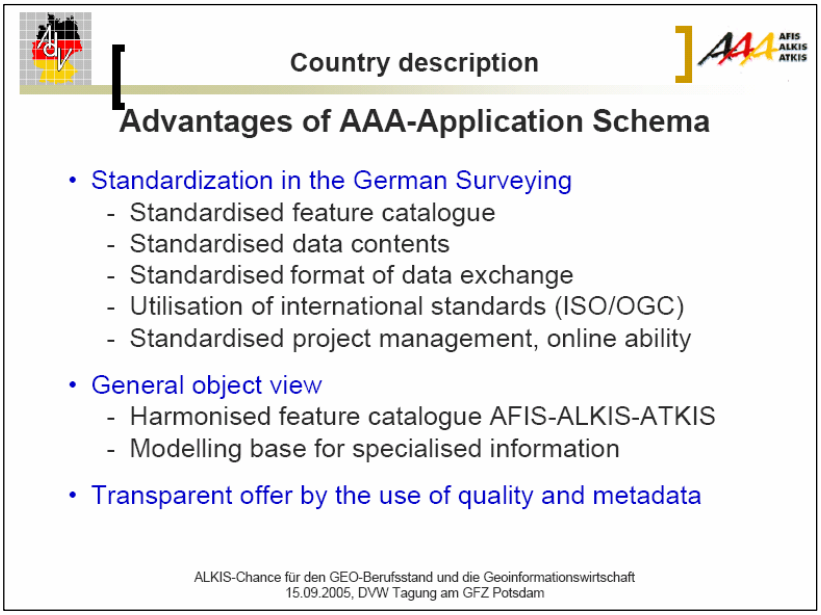
Common Development of Geo Data Infrastructure Germany – GDI-DE

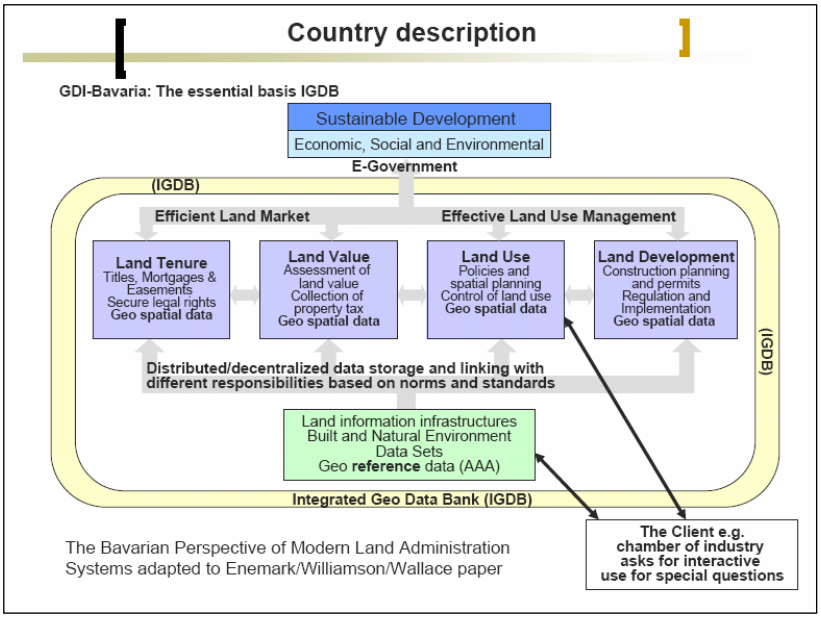
GDI and Geo Information Economy



ALKIS-Chance für den GEO-Berufsstand und die Geoinformationswirtschaft
15.09.2005, DVW Tagung am GFZ Potsdam


Country description
AFIS ALKIS ATKIS
AAA-Target System
Spatial Geo Base Data
(incl. Geo reference and Geo spatial data)
Standardised, geodetic system – position, level, gravity –
AFIS
Essential constructional equipment and constructions without buildings
Actual land use + specific vegetation
ALKIS
Parcels
Information of owner
Buildings
ATKIS
Public restrictions, mortgages or other properties
ALKIS-Chance für den GEO-Berufsstand und die Geoinformationswirtschaft
15.09.2005, DVW Tagung am GFZ Potsdam


Country description
AFIS ALKIS ATKIS
Advantages of AAA-Application Schema
• Standardization in the German Surveying
- Standardised feature catalogue
- Standardised data contents
- Standardised format of data exchange
- Utilisation of international standards (ISO/OGC)
- Standardised project management, online ability
• General object view
- Harmonised feature catalogue AFIS-ALKIS-ATKIS
- Modelling base for specialised information
• Transparent offer by the use of quality and metadata
ALKIS-Chance für den GEO-Berufsstand und die Geoinformationswirtschaft
15.09.2005, DVW Tagung am GFZ Potsdam


Country description
GDI-Bavaria: The essential basis IGDB
Sustainable Development
Economic, Social and Environmental
E-Government
(IGDB)
Efficient Land Market
Effective Land Use Management
Land Tenure
Titles, Mortgages & Easements
Secure legal rights
Geo spatial data
Land Value
Assessment of land value
Collection of property tax
Geo spatial data
Land Use
Policies and spatial planning
Control of land use
Geo spatial data
Land Development
Construction planning and permits
Regulation and Implementation
Geo spatial data
(IGDB)
Distributed/decentralized data storage and linking with different responsibilities based on norms and standards
Land information infrastructures
Built and Natural Environment
Data Sets
Geo reference data (AAA)
Integrated Geo Data Bank (IGDB)
The Client e.g. chamber of industry asks for interactive use for special questions
The Bavarian Perspective of Modern Land Administration Systems adapted to Enemark/Williamson/Wallace paper

Positive aspects of country experience

- cadastre becomes part of e-government and thus more important for business/industry (new clients!); it's not any more a matter of only securing property!
- reputation of surveyors services in politics, public, municipalities and in industry is growing
- more and quicker information is possible
- a more comprehensive view of environmental etc. situation and (possible) land (use) conflicts
- strengthening citizens interest in public planning (e-participation by e-governance/services)
- new jobs for private experts
- the more clients are asking for ICT and LAS-Data the lower the costs will be

Negative aspects of country experience

- German Land Administration Systems are not explicitly focussed on EESSD
- "black box" surveying and new ICT reduces state personal staff and jobs
- increasing clients and users demands can't be met in time enough or not at all
- emerging of ICT and surveying endangers surveyors influence and role
- too many clients ask for data and information without will to charge adequately

To do list for German (and other?) LAS experts

We should aim at

- recognition of the importance of spatial data infrastructure by politics and government
- local and Länder SDI initiatives as prerequisites for a national SDI
- user-orientation as the key to a successful and sustainable SDI

A. Donaubauer

Buildings in the (multi-purpose?) Cadastre

- parcel owner
- parcel number
- geometry
- buildings
- state soil type evaluation
- actual land use

modelled in, respective based on ALKIS/ATKIS/AFIS

- legal public restrictions (not private one)

to **be combined with**

- orthophotos
- …

Three key-improvements in the next decade

- GDI and IGDB is a daily tool in politics
- dynamics of land markets will be reflected in real time
- regular participatory approach for the need and the use of data

Criticism/questions to the model of 'Building Modern LAS in developed Economics'

- Can such a model really function everywhere?
- Does it respect enough individual/local habits, traditions and informal processes or isn't it too much technology – and business – driven/oriented?

First Conclusion:

Can we transfer success stories?

Yes, but only if we care about the whole bundle of interrelated work processes and improve these functions as well. These work processes are again linked with local traditions and habits.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS IN THE NETHERLANDS

Paul van der Molen
Director of Kadastre International
Professor in Cadastre and Land Management,
International Institute for Geoinformation Science and Earth Observation (ICT)
The Netherlands
Email: Paul.VanderMolen@kadastre.nl

SUMMARY

This paper analyses the development in the Netherlands in the field of institutional, legislative, administrative and information aspects of land management, and comes to the conclusion that an integrated approach to land administration systems is prominently at stake.

INTRODUCTION

Land as an economic factor is getting less and less important in the Netherlands. In terms of macro economic added value, the agricultural sector decreased from 2.8% in 2000 to 2.3% in 2004, while the financial, business & health service sector in the same period increased from 37.6% to 41.2 % (total added value 432 billion euros). The number of farms decreased from 97,000 to 85,000. The amount of agricultural land decreased slowly (30,000 ha), so the average farm size grows.

In a country with 16,3 million inhabitants on 41,528 square km (81% land, 9% inland water, 10 % sea) built areas cover 11% which area is growing (351 mln ha in 1996, 367 mln ha in 2000). In 1997 40% of the population lived in urbanized areas, in 2000 this increased to 42%. (increase of 549,000 people). This equals the growth of the population as a whole in that period. The GDP is 466 billion euro in 2004 (+1.2%)

POLICY FRAMEWORK FOR LAND MANAGEMENT

Land Policy

Land policy, described as the 'whole complex of socio-economic and legal prescriptions that dictate how the land and the benefits of the land are to be allocated' (UN, 1996) , does not exist in the Netherlands in the form of a dedicated policy of the government. A complex set of existing legislation and policy statements constitute what one could indicate as a 'land policy'. There exists an official memo Policy on Land (Nota Grondbeleid 2001), this concerns however the division between stakeholders of the financial aspects of planning, acquisition, development and distribution of land within town developments.

Land tenure

Land tenure, as 'the mode in which rights to land are held', is regulated in the Civil Code (1992). The Code provides for a closed system of real rights (numerous clauses of rights in rem), including rules for the establishment, transfer and abolishment of these rights. Government is considered as a private owner, and has to behave like any private person, so there is not a special category of state lands with its own rules. Registration is compulsory to acquire legal ownership. There are currently no policy objectives by the government on land tenure issues.

Land market

Through the Civil Code and additional laws and regulations the procedures in the land market are transparent and without debate. There are 4 requirements for legal transfer:

- right to dispose by the seller
- agreement between seller and buyer about the object of sale
- obligatory agreement and notarial deed of transfer
- registration

Transaction costs are about 10% of the value of the transferred property, of which 6% is transfer tax. This percentage is from time to time highly under debate because experts consider this tax as a obstacle for a volatile market .

Apart from the right of the government to allocate pre-emptive rights and to apply the expropriation, the government does not interfere directly in the land market. Purchase power is generated by frequent use by citizens of loans secured by a mortgage

(total amount of loans estimated at 557 billion euro, more then the GDP). Apart from the fiscal treatment of mortgage interests, the government does not interfere.

There are currently no policy objectives by the government on land and real estate market issues.

Land Taxation

Taxes on economic transactions of real estate and shares form 4% of the total revenue from taxation of the central government in 2003 (4 of 102 billion euro). Lower governments generate 47% of their total tax revenue out of land taxation (2.8 of 6.1 billion euro), water boards 39% (678 of 1757 million euro).

The policy objective of the government is to diminish the land tax revenue for the municipalities and replace this with a payment by the central government, which is a policy that is highly opposed.

Spatial Planning

There is a tradition of decentralisation of spatial planning competences. However, the growing density of population and economic functions leads to growing tensions between central and local government regarding the incorporation of national interests that are not desired by local authorities (high speed railroads, cargo railroad to Germany, expansion of Amsterdam airport, conservation of landscape, all versus local wishes for town development, nimby attitude, agricultural and industrial business development).

Policy objective of the government is to gain a balance between national, regional and local interests.

Protection of the environment

This is a major concern of the government. Also here is the policy objective of the government to balance between economic and environmental requirements. This often gives rise to heavy disputes (e.g. construction of roads and town developments delay because of protection of rare species)

CONCLUSION FOR THIS SECTION

In a highly populated country such as the Netherlands, there is continuous tension between general interests and private interests. On one hand citizens increasingly make an appeal to the government authorities to regulate society, on the other hand citizens experience the vast amount of regulations and policy measures as an unpleasant burden and they do not fear to contest the government, which is easy because the democratic tradition is materialized through all kinds of appeal procedures. This frustrates the government, which considers possibilities to reduce these possibilities by adaptation of laws.

Also the impact of government decisions are not always expected. For example the huge demand for land for construction, development and nature conservation, gives rise to impressive speculation in rural lands, causing a price level for agricultural lands that make farmers face high costs and marginal return on investments (Needham, 2005).

Another example is the policy of the government to privatise telecom-companies, and to auction network permits. Because of this policy, the country is snowed under with transmitting masts.

Moreover the legislation and additional rules are considered by citizens and the business sector as a major administrative and financial burden (estimated at 3.5 % of the GDP),

reason why the government launched a program to diminish this burden with 4 billion euro by 2008 (speech Minister of Finance, 25-10-2004).

Policy aspects are increasingly complex. This reflects on the legal framework, the public administration, and the land-information requirements.

INSTITUTIONAL FRAMEWORK FOR LAND MANAGEMENT

Transfer of immovable properties

One of the positive legacies of the French occupation (1794-1813) was the introduction of a cadastre, based on Napoleon Bonaparte's decision in 1811 to bring the Netherlands (from 1810-1813 annexed by France) under the application of the 'Recueil Méthodique des Lois, Décrets, Réglements, Instructions et Décisions sur le Cadastre de la France' (Bulletin des Lois no. 397/7340). The work started in 1812. After the defeat of the French, the monarchy was restored and King William I decided to continue the development of a cadastre. In 1832 the cadastre was completed. As the cadastre served fiscal purposes, the system consisted of registers of owners and users as taxable subjects, cadastral parcels as taxable objects, and the rental value of the property as the taxable value. Already in 1825 the cadastre was unified with the so called mortgage register, that was positioned in the Civil Code as what we now would indicate as the 'legal property register'.

As the first post-Napoleonic Civil Code (1825, in power 1838) was a copy of the French 'Code Civil', the characteristics of the land administration system are:

- deed registration
- negative system
- causal system of delivery
- unified system of land registry and cadastre (different from France)
- obligatory notarial deed for mortgages (since 1838) and transfers (since 1956)
- transfer of legal ownership requires registration (different from France, since 1838)

These characteristics still remain today, although at various moments discussion in the Parliament took place whether it would not be better to shift to a positive title system. The last discussion took place after World War II during the preparation of a new Civil Code. The Parliament decided to continue with the current system, because the Parliament was satisfied by its functioning. The new Civil Code came into force in 1992, providing some new rules to repair some elements in the system that were experienced by the Parliament as undesirable. Some examples are:

- when the seller is unauthorized to sell, this cannot have effect towards the buyer in good faith, when this incompetence has other causes then a lack of right to dispose (art 3:88)
- when an owner refrains from registration of a certain fact concerning the property, this cannot work against somebody who consulted the registers in good faith (art 3:24)

By consequence the protection of buyers in good faith is quite strong, and this is the reason that the Netherlands' land administration system today is considered as a de facto semi-positive system.

Taxation of land and real estate

Taxation of land and buildings goes back to the middle ages. With the introduction of the cadastre (1832) tax was levied as a state tax. This remained until 1980, after the

Parliaments' decision that taxation of land and buildings was an appropriate tax to fund the budget of Municipalities (Law on Municipalities 1970). Tax was still levied based on the cadastral value. Because of the understanding that taxation based on market values would constitute a more fair taxation, the Parliament decided to give municipalities the exclusive mandate to assess the value of land and real estate based on the market sales comparison method (Law on the Assessment of Real Estate 1992). This law came into effect in 1996. Since then every 4 years all real estate is assessed against market values at a certain reference date (e.g. the value for the period 2005-2009 is fixed on 1-1-2005 and refers to the market value on 1-1-2003). The assessed value must be used by all government bodies for their own activities. The tax is levied for both ownership and use of real estate. As part of political negotiations, the Parliament decided in 2005 to abolish the taxation of the user-part of real estate (tax on ownership remains), which was a decision that was highly criticized.

Urban and Rural Land Use Planning

Within a whole complex of laws, the Law on Spatial Planning 1965 provides the basic framework for the system of land use planning. Within national and regional plans, the local zoning plan is the plan that is binding for government and citizens. To enforce national interests the Law empowers the central government to compulsorily include regional and national interests in the local zoning plan. This remains however a cumbersome procedure, as local governments often resist these instructions. To avoid long bickering, the Parliament decided on various laws to realise projects of national interests more quickly, like the so called Track-Law 1993 (called the 'nimby-law').

The nature of the Law on Spatial Planning is that is allows the municipalities to forbid a certain use, not to force the owner to realise planned land use. If owners do not intend to comply, the municipalities have to acquire the land by themselves. If this is not possible through the willing buyer-willing seller concept, the Law on Pre-emptive Rights 1996 provides for the allocation of pre-emptive rights and ultimately the Law on Expropriation 1851 provides for taking by force.

Land Consolidation

Land consolidation was first applied under the Law on Land Consolidation 1924, since then many times improved and finally developed into the Law on Rural Development 1985. A main characteristic of this law is the choice it offers between different types of rural land development, depending on the pre-dominant destination of the area concerned. Still the traditional land consolidation by voting is possible, however also land development projects where the government decides. The Law is currently under debate, in order to provide development instruments that can cope with the rapidly changing physical appearance of the country, namely a 'metropolitan landscape'.

Protection of the environment

The Law on the Protection of the Environment 1993 constitutes a framework for various laws on water, waste treatment, soil sanitation, noise nuisance etc. With the introduction of this legal framework, the need for coordination and integration with the above mentioned laws became manifest. This integration is mainly established by budget. Development of urban areas is done through a so called 'integrated budget urban development', and the discussion mentioned on the land consolidation legislation also aims at the development of the rural area through an 'integrated budget rural development'.

CONCLUSION FOR THIS SECTION

As governance of the described society is getting more and more complex, the legal framework suffers increasing complexity. As policies require an integrated view, the integration of legislation is a growing issue. Also this impacts on how the public administration is organised. A derivative effect is the demand for integrated (land)-information.

PUBLIC ADMINISTRATION AND (LAND)-INFORMATION SUPPLY

The public administration involved in the administration of the above mentioned public functions is not simple. All three levels of government and moreover water boards as a separate public body (functional decentralisation) and their division into many departments, sets high requirements for cooperation to achieve integrated policy formulation and implementation. Apart from that, the country exploits in all fields of governance about 500 independent public agencies, which all have a certain independent mandate, although all report to a political responsible minister. Failures in coordination and cooperation become manifest in crisis situations in general, like animal diseases, petty crime, organised crime, fraud, major accidents like airplane crash, and in spatial planning specifically: demand for land for infrastructure, houses, nature and recreation vs. agriculture, road construction and town development vs. environment, industrial development vs. town development, airport developments vs. housing, preservation of green belts vs. demand for low density houses, port development vs. nature etc. The fact that ministries and departments at regional and local level feel the need to represent a certain interest makes integrated decision making cumbersome. Moreover there is a democratic tradition to discuss issues until everybody agrees (sometimes referred to as Dutch ’polder-model’) which has a compromising effect.

In many cases the result of governance is an interference in private property rights through the establishment of a public interest in land. Today about 100 different public encumbrances are possible on a single land parcel, from which about 80 have power against third parties. With other words, they have power against new buyers of real estate and have the same characteristics as real rights (namely ’droit de suite’). The government bodies that are mandated to impose such restrictions are many. Apart from this, many government bodies collect information for their own purposes, not necessarily coordinated with other government bodies.

This results in a myriad of suppliers of relevant land-information. Hereafter we mention some examples.

• private rights to land:	Land Registry, Cadastre and Mapping Agency
• mortgages:	idem
• 60 public rights to land:	450 municipalities, 12 provinces, 40 water boards
• taxable land values:	450 municipalities
• land use data:	Alterra Institute
• land use planning data:	ministry, 12 provinces, 450 municipalities
• environment data:	ministry, 12 provinces, 450 municipalities, 40 water boards
• land consolidation data:	Land Registry, Cadastre and Mapping Agency, ministry

• EU agricultural data:	ministry
• large scale topography	12 PPP's, coordinated by a national board

In addition we mention the datasets needed for a transaction in the land market:

• Popular census:	450 municipalities
• Verification Information System:	Ministry Economic Affairs
• Guardianship of Minors Register	courts
• Tutelage Register	courts
• Commercial Register	Chamber of Commerce
• Matrimonial Property Register	Notaries
• Bankruptcy Register	Private supplier
• Register of Suspension of Payments	courts
• Central Register of Wills	courts
• Register of Estates (inheritances)	courts
• Register of Super levies	independent public agency

CONCLUSION FOR THIS SECTION

So, the whole range of policy, legislation, administration and information shows a certain complexity. Unlike Denmark (Enemark at al, 2005) there is not something like a cross reference register, although the cadastral parcel number is used in many registers, and might act as a de facto cross reference. Addresses however, also prominently represented in many registers, are not standardized, and form a source for confusion. The awareness of the need for coordination of government information has now penetrated political circles, resulting in a strong government program for the restructuring of the government information infrastructure, that started in 2000.

POSITIVE ASPECTS OF COUNTRY EXPERIENCE

Within this complex situation, there are certainly positive experiences. Three are described.

Firstly the quality of the above mentioned datasets is good. There is a need for more coordination and cooperation, but the datasets as such are country covering, well maintained, and in digital format. If this would not be the case, a policy of evolutionary integration would not be an easy option. The basic material is thus available for a leap forward.

Secondly, the gaining of the status of independent public agency for the Land Registry, Cadastre and Mapping Agency has resulted in widely used and easy accessible digital datasets, e-conveyancing (amendments Cadastre Act endorsed 2005), quick data search, innovative product development and at a modest cost level, and by consequence low transaction costs for the property and mortgage-market (Abroad, 2005). Independent customer surveys show good customer satisfaction.

Thirdly, practical coordination already has been realised between the Cadastre and the Popular Census, the Cadastre and Registers of Legal Entities of the Chambres of Commerce, and the Cadastral Map and the Large Scale Topographic Map ('GBKN').

CONCLUSION FOR THIS SECTION

Although a fundamental restructuring of the government information architecture is necessary, the building blocks are readily available.

NEGATIVE ASPECTS OF COUNTRY EXPERIENCE

The allocation of mandates to the public administration, the required consultation 'circus', the parliamentary procedures make the decision making process remarkably slow compared with the need for a quick response to urgent societal and technological developments. The Law on the Registration of Public Encumbrances 2005, took 6 years to process, even more for the amendments to the Cadastre Act (2005) making electronic lodging of deeds legally possible. Where sometimes IT-projects tend to overrun the planned time (don't cynics say that IT projects takes twice the money and the time?), all technical facilities for accomodating e-lodging were already in place since 2003, while legislation caused serious delay (e-lodiging is in place since 25st of October this year). A clever solution however was applied: since 2003: all submitted analogue deeds were scanned, and followed subsequently the new electronic process.

Secondly the attitude of many government bodies still is to prioritize their own interests, and to optimize their own information requirements, with disregard of efficiency of the overall government information infrastructure.

An example is the creation in the '90-ties of a countrycovering land-information system under the Ministry of Agriculture of agricultural land-use, as a response to the EU for the Integrated Administration and Control System IACS (EU regulations 1765/92 and 3508/92) where according to Annex E and F one option was to combine this IACS with existing cadastral databases.

Another example is the Law on Assessment of Real Estate 1992 that obliged the municipalities to establish and maintain a municipal land tax administration.

In both examples the cadastral parcel is integrated in the dataset, in the first case a reference of agricultural use-parcels to the cadastral parcel, in the second case a reference of the taxable object to the cadastral parcel.

A new development is the Law on Registration of Public Encumbrances 2005 that obliges all municipalities to establish and maintain a public register of all public restrictions they impose on real estate. Of course this is related to the cadastral parcel as unit for private property.

So already 4 country covering registers are maintained which are based or at least related to the cadastral parcel. One could easily imagine a situation where all these datasets were combined and integrated in the existing cadastral databases. Other countries, like Scotland and Lithuania, are more keen and have paid attention to the efficiency of the information architecture by the creation of 'centres of registers', where several registers are maintained by a single agency (Registers of Scotland, State Centre of Registers in Lithuania).

CONCLUSIONS FOR THIS SECTION

Decision making processes and attitude within the public administration do not always allow for a quick response to the information supply for societal and technological needs.

BUILDINGS IN THE CADASTRE

The development of a large scale topographic base map of the Netherlands ('GBKN') (scale 1:1000) is a nice example of a private-public partnership. In the 70's awareness amongst users of large scale topography (municipalities, utilities, waterboards, cadastre) grew that it could be a wise policy to combine efforts in the establishment and maintenance

of such a large scale topographic map, instead of multiple data acquisition and storage which was the case until then. The map, ready since 2001, is maintained by 12 provincial legal partnerships (foundation), coordinated by a national body. The technical base of the map is aerial photography and restitution. It is estimated that the partners invested about 250 million euro for the creation of the database. The datastructure is spaghetti and discussions are going on about how to upgrade the database to objectmodels.

The existence of the large scale topographic base map brought about the question of coordination of geometry between the base map and the cadeastral map, as both were at the same scale. Overlay showed differences that caused confusion for the public; the citizens were faced with lines on the cadastral map representing the boundary and lines on the base map representing topographic boundaries: what to conclude about the relation between the two? The reason for these differences is on one hand the stochastic nature of geometry, and the difference in source (source for the base map aerial images, source for the cadastral map terrestial observations cumulated since 1832). To tackle this problem, a reconciliation project was implemented, to adjust all cadastral boundary lines with the topographic lines, and to share the geometry of the buildings. This was a major project, taking 10 years with 50 milllion euro investment, that was completed in 2004. Since then the cadastral database and the topographic database share the buildings sub-dataset. As the buildings for the base map are updated every three months, the representation of buildings on the cadastral map is better then ever before.

CONCLUSION FOR THIS SECTION

The arrangements for geometry of buildings in the cadaster are well established through datasharing with the large scale topographic base map.

EU INFLUENCES

Already some aspects of the EU came across in the above chapters. In addition, the EU directives on electronic signatures, privacy, public key information (3/98) influence the legal framework for the cadastre. Questions are asked whether the EU should harmonize the property arrangements, land registration and cadastre of the member states. This would currently be in conflict with the Treaty of Rome (property regimes remain the competence of the member states, art 222 = art 295 since 2002) , although the EU endorsed a directive on time sharing property (directive 94/47), and a judgement of the EU court regarded intellectual property (13 July 1995 C350/92). Free movement of people, capital and goods in the member states is a main objective of the EU. On the long term the matter is whether protection of citizens is in conflict with the existence of various property regimes, and different legal meaning of registration and cadastre (van der Molen, 2002). Moreover the 2nd banking directive (89/646) aims at improving an easy mortgage service throughout all member sates, which is hampered by the various regulation of mortgages (e.g. foreclosure arrangements).

Also relevant are the directive on public procurement (93/96), and various projects like Galileo (to be ready 2008) and e-content (EULIS prototype).

CONCLUSION FOR THIS SECTION

The European Union undoubtly influences the institutional environment, strategy and operations of the Cadastre, Land Registry and Mapping Agency.

THREE KEY IMPROVEMENTS IN THE NEXT DECADE

At national scale major improvements are expected regarding the restructuring of the government information architecture.

The basic idea behind data infrastructures is that it provides for tools giving easy access to distributed databases by people who need those data for their own decision making process. Although data infrastructures have a substantial component of information technology, the most fundamental asset is the data itself, because without data there is nothing to have access to, to be shared or integrated. Last decade it was understood that the development of data infrastructure not only provided easy access to databases elsewhere, but also good opportunities for re-thinking the role of information for the performance of governments. Based on this starting point, the 'Streamlining Key Data' Programme of the Netherlands government took the lead in developing and implementing a strategy for restructuring government information in such a way that an electronic government might evolve that:

- inconveniences the public and the business community with request for data only when this is absolutely necessary
- offers them a rapid and good service
- can not be misled
- instills the public and the industrial community with confidence
- is provided at a cost that is not higher than strictly necessary

Jointly with 5 other government registers, the property registers, cadastral and topographic maps of the Dutch Cadastre, Land Registry and Mapping Agency are formally appointed as 'base registers' of the governmental information infrastructure. The base-registers will be the core of a system of so-called authentic registers, which might be any register that is maintained by a single government body and used by many others as the authentic source of certain data. If a register is formally designated as an authentic register, all other government organizations are strictly forbidden to collect the same data by themselves. In their budget allocation they will not find any money for data collection at this point.

Secondly, the implementation of the Law on the Registration of Public Encumbrances 2005 provides for registration of all public restrictions on land that are imposed by various government bodies. This regards the set of restrictions that have power against third parties; as such these restrictions have characteristics of a real right (about 80 public rights to land). This should solve the problem, that acquiring knowledge about the complete legal status according to both private and public law is quite an effort for real estate brokers, notaries and citizens. Although the solution offered is complex, technology should make it work. The concept is that national, provincial governments and waterboards register the encumbrances imposed by them in the databases of the cadastre, while municipalities record the rights they impose in a new official municipal public register of public restrictions. The legal nature of registration is that is does not form a constitutive requirement, but power against third parties can be enforced after registration only. A complex technical infrastructure should make it possible to have on-line communication, such that inquiries at cadastre level guarantees direct access to the municipal registers and vise versa.

A third key improvement is provided by the IT renewal program of the Cadastre, Land Registry and Mapping Agency. This program brings new functionality.

First: improvements are introduced regarding the internet-access to property information. In addition to the existing on line service to the cadastral databases, now also the public register (the files with the paper deeds, stored as they come in) is digitally accessible. Since 2004, deeds and other registered documents from 1999 onwards are accessible on line. Older deeds are scanned and sent by e-mail as soon as somebody has a request. This reduces the inquiry time to a few minutes.

Second: relevant selections of the cadastral maps are now available on line in A4 format (A4 is enough to show the property) replacing the e-mail system. This e-mailservice was a reasonably quick service, the new solution offers maps in seconds.

Third: from September 2005 its possible to submit a notarial deed through internet to our Agency. Thus submission by mail or delivery at the desk is not necessary anymore. An adaptation of the Cadastre Act making this official is endorsed by the Parliament per 1 February 2005. This brings back the time needed for lodging a deed and receiving the official receipt providing the evidence of a legally valid registration to a few minutes. In the near future it is intended to update the databases automatically, based on these electronically lodged deeds. The processing time goes back from a few days to a few minutes.
Fourth: after the deed has been registered at the office, the notary must carry out the post registration check in order to detect any potential change between the execution and the registration of the deed. As the evidence of registration is sent by internet, just after the electronic submission following the execution of the transfer deed, this check can be done immediately, reducing the time to some minutes.

Fifth: the time needed to solve mistakes is minimized through a rigid quality management system for which the ISO 9000:2000 certificate was awarded in 2001. Besides using the computer to check and cross check the consistency and quality of data stored in the databases, each month 5% of processed notarial transfer deeds are monitored on correctness by manual inspection. As an example: the completeness of the public registers should be and is currently 100%, the standards for full-correctness of the databases is 99.6 % while 99% is realized.

Sixth: in order to manage delivery times, a quality charter was published in 2004, to be committed to the customers about what they may expect. The extent to which these standards are met, is published. For example: in 2004 99.7 % of the registrations were done within 4 days (quite good), 84% of appeals were met within 2-60 days (less) , and 97.6 % inquiries were realized with an average of 0.9 second for on line inquiries (the standard is 80% within 2.5 second).

Seventh: the use of GPS for cadastral boundary surveys is getting common, many field parties are now equipped with GPS instruments, and almost 100% use is expected when the European Galileo satellite system is operational, likely in 2008.

Eigthth: tailor made products are expanded. The last ten years property market statistics are published, market shares of mortgage banks, idem for notary offices. For the car-navigation industry and distribution- and retail research databases are sold that link addresses to co-ordinates. Recently a national residential housing-value index was introduced, and information services providing the value of selected reference objects for property assessment. Also combination of products with governmental and commercial data

suppliers are also developed, like fish eye pictures, retail statistics, and topographic information.

Ninth: the organizational structure can not remain untouched while introducing new technologies and new work processes. Through the use of data communication both for input to and output, there is no need for maintaining 15 regional offices any more. Already now workflow management systems direct the submitted deeds for mutation of the databases to the office where the workload is less. Small public desks might be placed in house of townhalls or alike, and field survey parties might work from home. The policy is to shift to 1 office in the long run, via a stepwise approach over the next 10 years. Also the internal structure is under drastic review. The number of directors is currently reduced from 14 to 4.

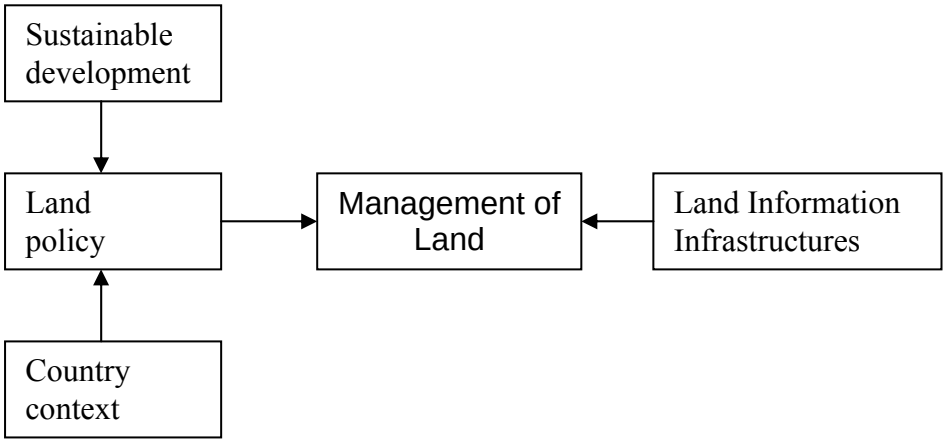
Tenth: all these technological innovation, will require less staff. A reduction of about 20-30% (of 2200 staff currently) is estimated, realizing that re-skilling is necessary for many of us

CONCLUSIONS FOR THIS SECTION

The next decade will show major improvements in the structure of the government information architecture, in which the developments at organizational level are well embedded.

THE INTEGRATED MODEL TO IMPROVE LAND ADMINISTRATION

The above chapters illustrate that the proposed integrated land administration model should be fully supported. Developments in the Netherlands aim at the realisation of such an integrated model. At the same time this report represents my opinion that land administration systems are to be considered as a tool that facilitates the implementation of government activities on land. The land management paradigm (figure 1 in Enemark et al, 2005) could then also be depicted as follows.



It might be that the structure of this diagram shows in a more genuine way the differences between the policy, management and tool level, while at the same time the relationship between the institutional and operational level is better addressed.

CONCLUSIONS

Although in the Netherlands land policy and land management exist as a composition of a myriad of laws, policy decisions, and regulations, the overall objective is definitely to govern the country in a sustainable way. The requirements of coordination and cooperaton are by consequence high and form a major challenge for the decision making processes and the functioning of the public administration. The supporting information architecture is also complex and deserves continuous attention. The response to the societal and technological needs demand integrated governance, it means that the structure of the government information architecture is also at stake. The development of a system of authentic registers is a step forward, and is promising. The role of land-information within this system is dominant, as the core of 6 datasets consists of 4 geographical datasets, namely cadastre, topography, addresses and buildings. Meanwhile the IT-renewal and organisational re-engineering of the Cadastre, Land Registry and Mapping Agency comply with this approach.

REFERENCES

Abroad, September (2005), Special Edition, Apeldoorn NL

Central Bureau of Statistics (2005), Statistical Yearbook of the Netherlands 2005, Voorburg/Heerlen NL .

Enemark, S., Williamson I.P, Wallace, J. (2005), Building Modern Land Administration Systems, to be published.

Needham, B., et al. (2005), An institutional analysis of land markets in the Netherlands (in dutch), NAI Publishers NL

UN/ECE, 1996, Land Administration Guidelines, New York Gevena

Van der Molen, P. (2002), Property rights, Land Registration and Cadastre in the European Union, Granada

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS - CASE STUDY SWITZERLAND

Daniel Steudler
SwissTopo
Federal Office of Topography,
Swiss Federal Directorate of Cadastral Surveying
Switzerland
Email: daniel.steudler@swisstopo.ch

SUMMARY

This article presents the current land administration system (LAS) in Switzerland including the land information component, the land policy component, and the land administration functions within the areas of land tenure, land value, land-use, and land development. It further identifies the challenges and problems at a policy level, managerial level, and operational level.

COUNTRY CONTEXT AND A SHORT HISTORICAL PATH TOWARDS SUSTAINABLE LAND MANAGEMENT

Switzerland

Location: In the center of Western Europe.
Population: 7.3 million people with roughly 70% living in urban areas.
Area: 41,290 km2, with 4 million land parcels, dominated by mountain ranges with a central plateau and several lakes.
History: The confederation dates back to 1848 through a constitutional arrangement for mutual cooperation between cantons and communities of various sizes, histories, languages and cultures.
Government: a federated state with a national government in Berne, 26 cantons and 2903 local municipalities. The cantons maintain their local land administration systems. National intervention in the LAS is limited.

The Swiss Federal Constitution supports a confederation of cantons and their respective communities. The modern state dates back to 1848. Switzerland's administration is characterised by a high level of autonomy in the cantons and municipalities. Cantons have their own constitutions, parliaments, governments and courts. Additionally some 2900 municipalities exercise local autonomy according to the subsidiarity principle.

Switzerland's neutrality is perhaps its strongest characteristic. It became a member of the United Nations only in 2002, and cooperates with the European Union without being a member. The role of Switzerland in the activities of the United Nations and international organisations, particularly the Working Party on Land Administration, Eurogeographics and the International Federation of Surveyors has strengthened its international role.

The severance of land administration has encouraged Switzerland into an international leadership role in new GIS and cadastral technologies which supply synergies and efficiencies amid varying data sources and types. As early as 1987, a specific data description language defining the cadastral core data model has been developed: INTERLIS, a forerunner of the international GML/XML concepts.

The influence of Napoleon is evident both in the design of the cadastres and their establishment in cantons rather than in the national sphere (Steudler and Williamson, 2005). Professional density in Switzerland is high with about 3,100 persons involved in cadastral surveying and approx. 2,000 lawyers and administrative staff in the land registry.

The long history of the cadastral system and the principle of subsidiarity have ensured wide social acceptance and understanding.

CURRENT LAS INSTITUTIONAL ARRANGEMENTS

Land Information

"To fund his conquests, Napoleon had all French properties accurately mapped and registered for taxation, saying "a good cadastre [property map] of the parcels will complement my civil code." Once annexed, Belgium, the Netherlands and Switzerland received the same system (World Bank, 2005, p 33). Thus during the early 19th century, cadastres were established in many of the cantons for fiscal purposes. The legal cadastre came later to secure land ownership and facilitate land transactions. The Civil Law of 1912 was the basis for the Federal Land Registry System defined in more detail in the Instructions for Monumentation and Cadastral Surveying in 1919 and the Ordinance for

Land Registration in 1910. The basic principles in these remain cornerstones of the land information system today:

- Definition of the five parts of the land register, based on a cadastral map;
- Basis of cadastral map is cadastral surveying;
- Operational control of cadastral surveying and land registration is with the Cantons;
- Cadastral surveying can be – and to a high degree is – contracted out to private sector land surveyors; and
- Surveyors carrying out cadastral surveying need to hold a federal licence.

The precision of cadastral surveying and the degree of detail vary according to five different levels reflecting the economic value of the land: city centres, settlement areas, intensively used agricultural areas, extensively used agriculture areas and mountain areas. The surveying data are based on a national control system organised in a hierarchy of three orders (Steudler, 2003). At the end of 2004, about 39% of the cadastral survey was digitized, with another 29% in progress. About 16% is maintained in conventional records, 13% is not surveyed or lakes (3%). Cadastral data is captured predominantly by field survey using a total station or electronic theodolite which measures angles and distances to provide a basis for calculating the coordinates of boundary points and house corners. Photogrammetry (using both terrestrial and aerial photogrammetry) is used. Since 1998 a high accuracy satellite-based control point network has been established. An automatic GPS network with 29 permanently operating GPS stations enables accurate determination of planimetric coordinates and heights in real time and is assisting compilation both of the cadastre and geographical information which is both location based and spatially referenced. A growing use of GIS applications is assisting policy makers and administrators dealing with issues such as emergency management, tourism, traffic management, road information systems and aircraft noise analysis.

The Federal Directorate for Cadastral Surveying supervises the cantonal surveying agencies. The cantons are responsible for implementing surveying. Some use internal administrative units, but most contract out the field work and maintenance of surveying data and maps to private land survey offices who act as public agents. The Federal Directorate has about 15 employees working in cadastral surveying, with some 300 at the cantonal level, and approximately 3,000 mostly in private surveying offices. Land regulations, set-up of offices and districts, appointment and compensation of land registrars are the responsibility of the cantons.

In land registration, federal supervision is carried out by approximately five employees at the Federal Office of Land Registration and Land Law. Some of the smaller cantons have a single land registry office. In others offices exist in several districts and municipalities, making up approximately 350 land registry offices.

The cadastral surveying system was renovated in 1993 to introduce a digital data format, allowing the surveying data – which mainly serve the land register – to also underpin land information systems of any kind. The invention of the independent data description language INTERLIS was a crucial element in this flexibility.

Cadastral data is structured in eight information layers, each of which can be acquired independently: control points, land cover, single objects, heights, local names, ownership, pipelines, and administrative subdivisions. The land cover (including buildings) and

ownership layers cover the whole territory without overlaps or gaps, while other layers have various definitions.

Each of the eight information layers is defined by an object-oriented entity-relationship diagram, providing a basis for translation of the data into an interoperable INTERLIS data exchange format.

Land registry information is not available to the public and is restricted to those determined by information protection officers to "have an interest" in the information.

Land Policy

The localization of administration is counteracted by the efforts of the federal agencies, and by organised meetings of the cantonal agencies (at least twice a year in the Conference of Cantonal Cadastral Surveying Agencies). Introduction in technology has resulted in more coordination, especially to retrieve the benefits available from modeling and GIS.

Between 1912 and 1993, the cadastral system was mainly used for legal purposes to secure land ownership. Survey data was also used for utility mapping and municipal planning and management. Conversion of the data to digital form in 1993 has extended its use. By contrast, the land registries are variously digitized with some fully computerized and others remaining manual. The federal office is carrying out a project for a central data base for land registration data (eGRIS).

In contrast to the land registries which did not require complete coverage for spatial data, land information systems need complete data over the whole territory to be operational and useful. However, some cadastral data is still in old data formats; conversion is planned to be finished by the end of 2007.

In common with many countries, public restrictions and responsibilities are increasing but without sufficient transparency yet. A new law on geoinformation prepares the field to also deal with this issue in the not too distant future.

The declared objective of the cadastral system is to support land market activities and provide security of ownership. Digitisation extended the capacity of spatial data to service land information systems. There is a weak relationship between the academic and administrative sectors, limiting the opportunities for cross-fertilisation.

Land Administration

Land tenure

The land registry manages registration of properties – real estate being land parcels and their buildings, condominiums, servitudes and easements, and mines. The titling system is derived from the French Napoleonic code with standard features of ownership, leaseholds, mortgages and servitudes. Transactions require notarised documents that are registered in the land registry.

The cadastral map is based on a folio principle, with each land parcel on the ground related to one ownership title registered in the land registry. Every land parcel has a unique parcel identifier to which all parcel relevant information is linked. Buildings are integral parts of land parcels and cannot cross parcel boundaries. Land parcels are sold as complete entitles. While the land registry deals with private owners, the cadastre covers every parcel and identifies each owner. Roads and public areas are owned either by the municipalities, cantons or federal organisations.

The federal system in cadastral surveying and its reliance on individual cantons led to the introduction of a data modeling concept in description of cadastral surveying data in 1993. The basic building block is the data description language INTERLIS which allows spatial data to be defined, modeled and exchanged without information loss, independent of system restrictions. The system encouraged the definition of more than 100 other spatial data domains so far using the same data exchange mechanisms. Cadastral surveying is the forerunner for SDI development in Switzerland.

In 2000 a new agency (COSIG) was established to foster coordination, acquisition and use of spatial data within the federal administration. COSIG also based its coordination activities on the INTERLIS concept, nowadays assisted by the world wide interest in modeling languages, particularly XML and GML.

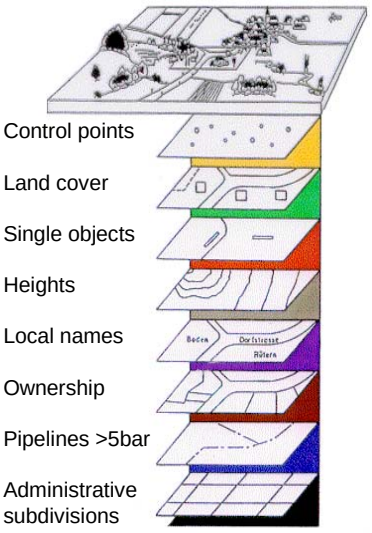


Figure 1 - The 8 information layers of Swiss cadastral surveying

Land value

Land ownership is taxed at the canton level according to various conditions and amounts. Land valuation data are kept to support tax collection.

Land use

Land use management and records are required for both taxation and agricultural subsidies which depend on size of areas and identification of transitional zones between forest and agricultural uses.

Land development

If part of a parcel is sold, a subdivision process is required to create the new parcel and the new boundaries defined by survey.

STANDARD OF SURVEYING

The digital cadastral map is based on eight layers of information with land cover and ownership covering the whole territory without overlaps or gaps (Figure 1). Each information layer is object-oriented and defined by an entity-relationship diagram which is the data model and the basis for translation of the data into an INTERLIS data exchange format (Steudler, 2004b).

The introduction of the new data-modeling concept for the description of cadastral surveying data in 1993 triggered the development of SDI in Switzerland. The data description language INTERLIS was the basic building block for that, with which spatial data can be defined, modeled, and exchanged without information loss and independent from any system restrictions. The object-oriented approach and the separation of the data into logically independent information layers offers two substantial benefits: the data models became considerably less complex and the data can be queried by objects (compare Figures 2 and 3).

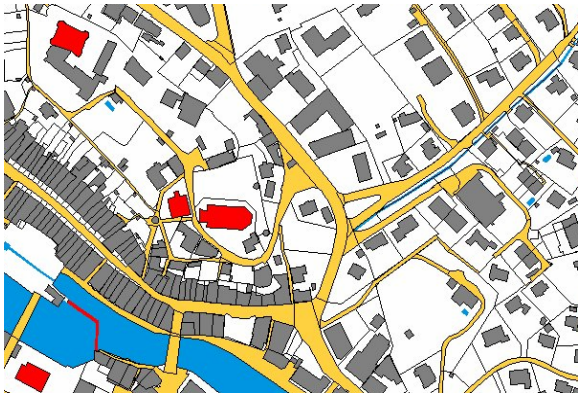


Figure 2 - (above). Example of new digital Swiss cadastral map with object-oriented approach

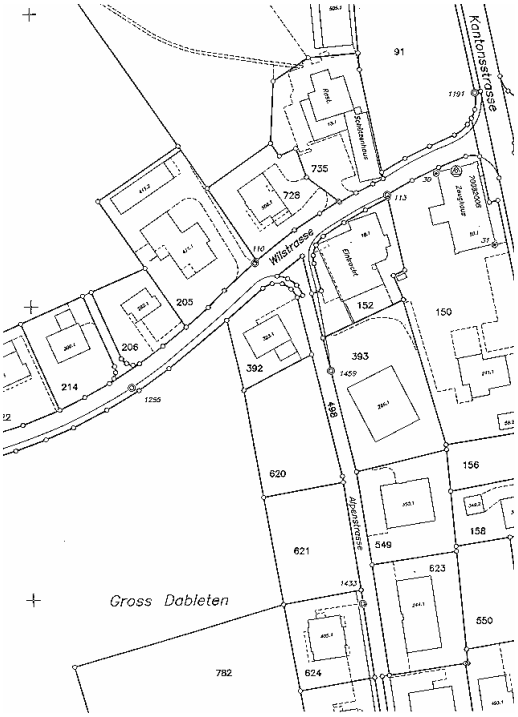


Figure 3 - (left). Example of a traditional Swiss cadastral map

Cadastral surveying data are based on a national control point system organised in a hierarchy of three orders. Like the majority of geographic data in Switzerland, they are based on a national geodetic reference framework (oblique Merkator projection) which is in the process of being adapted to modern GPS requirements.

INSTITUTIONAL ARRANGEMENTS AND LAND INFORMATION

Competency in the private sector surveyors is essential. Traditional surveying methods need to change to incorporate the move to GPS, and to address the new uses of digital land and spatial information available through geographic information systems (GIS), new modeling languages and the capacity of the web to facilitate highly sophisticated use of spatial information. The training of surveyors can no longer afford to concentrate only on cadastral surveying. The two campuses of the Federal Institute of Technology (ETH) in Zurich and Lausanne offer programs equivalent to Masters degrees focusing on rural and environmental engineering with optional courses in geomatics. Two technical schools offer bachelor degrees in surveying.

CHALLENGES AND BARRIERS

Federal agencies include Swisstopo – the Federal Office of Topography including the Directorate of Cadastral Surveying, which undertakes licensing – in the Department for Defence, Civil Protection and Sports, and the Interdepartmental GIS Coordination Group (COSIG, www.cogis.ch). In the Department of Justice and Police lies the Federal Office for Justice including the Office for Land Registry and Real Estate Law.

The cantonal level is the most significant, with each canton organizing its activities according to its needs, without a universal model. There are 21 Cantonal Surveying Offices among the 26 Cantonal Governments running up to 350 Cantonal and Regional Land Registry Offices. The result is a highly decentralized land administration system,

with the cadastral surveying system separated from the registry functions, while topographic surveying is done centrally on the federal level by Swisstopo.

Policy level

The predominant political principle is the principle of subsidiarity that requires problems to be solved at the level closest to the local level. While this principle services Swiss society, and is set aside to provide national infrastructure of roads, defence, water supply, sewerage and so on, in the context of land administration it is an impediment. Along with other federal systems, the constitutional structures were devised before a national LAS became feasible or needed. Now the creation of the political opportunities and the will to develop a land administration infrastructure is a major difficulty involving creating and developing means for accessing information through nationally devised metadata and modeling standards. Without a clear, funded and supported political will to create a national land administration infrastructure, Switzerland risks to end up with subordinate technical and cooperative solutions. If they are well implemented, these may work; certainly the achievements to date are remarkable.

Organisational structure impedes informational flows necessary for government information about land in general. Accumulation of cross canton, broad scale and generic information about land (for example, average parcel size according to activities, ownership patterns, cross canton ownership) is difficult and in some cases impossible. While data sharing is greatly assisted by digitization and improved interoperability, data levels remain inadequate to fully inform government policy making.

In the context of introducing a new funding scheme for tasks between the federal and cantonal levels, the federal parliament proposed an amendment to the federal constitution. One of the amended articles refers to national surveying giving cadastral surveying a national character and providing the basis for introducing regulations for the harmonization of official land information with legal character.

Management level

Decentralised administration occurs in all federated states. The capacity of the national agencies to work in this context needs to be negotiated in the context of constitutional silence. Switzerland is improving coverage of digital data. However for purposes of a land information system, large-scale data coverage is still not available in all areas, and there are few coherent user-driven web enabled applications.

Operational level

Switzerland's administrations are working on solutions, and are assisted by a well-suited system design and neutral software within which land objects can be identified and information relating to them shared.

Compared with international trends and developments, it is felt that more attention would need to be given to the creation of land and spatial information commodities, especially access to data and information itself and sale price information.

Funding for cadastral surveying follows the administrative structures: involvement of all three administrative levels can lead to difficulties in initiating projects. However, once established, results of projects are available to all levels. Though the land market transaction duties and land taxes produce high revenues for the cantons, generic statistics are not available, nor is funding for cadastral surveying infrastructure (dependent on the non-earning federal level) easily attracted.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the work of the research staff at the Centre for Spatial Data Infrastructures and Land Administration at the University of Melbourne. This research is proudly sponsored by the Department of EST under the building linkages project etc. The case study is based on the work of Daniel Steudler in his PhD, and papers indicated in the references.

REFERENCES

Steudler, D. (2003), *Cadastral Template, Country Report*, www.cadastraltemplate.org.

Steudler, D. (2004a), *A Framework for the Evaluation of Land Administration Systems*. PhD thesis, University of Melbourne, Australia, 177 p. (www.geom.unimelb.edu.au/research/publications/PhDThesisDanielS.pdf, accessed: 26 Oct. 2005).

Steudler, D. (2004b), *Swiss Cadastral Core Data Model: Experiences of the last 15 years*. Paper presented to joint FIG Commission 7 and COST Action G9 Workshop on Standardization in the Cadastral Domain, Bamberg, Germany, 9-10 December.

Steudler, D. and I.P. Williamson (2005), Evaluation of National Land Administration System in Switzerland, *Survey Review*, publication pending.

World Bank (2005), *Doing Business in 2005, Removing Obstacles to Growth*. Co-published by World Bank, International Finance Corporation and Oxford University Press,

PART 2 – EUROPEAN APPROACH - SUMMARY OF DISCUSSION

Social/Environmental Dimension

- European nations embraced the ideas of land stewardship much earlier than Australia: sustainability principles are far more embedded into their laws and cultures.
    - Environment was the key political driver for INSPIRE.
    - Swiss civil code, German constitution and agricultural subsidies are examples.
- European approach to land regulation is that no activity is allowed unless it has been approved
- Key component in building capacity has been education at universities, CPD and research activity.

Political Dimension

- European trend is to legislate spatial enablement and codify self regulation.
- Local government is more empowered in Europe.
- The European Union is delivering a top-down approach to land management and also enabling more cross country initiatives.
- Institutional issues tend to be the major stumbling block in relation to achieving change.

Economic Dimension

- Traditional economic drivers are still evident in Europe.
- Public private partnerships are increasing in Europe.

Technology Dimension

- Good governance in a complex world now requires integrated data approach. To achieve this, a unique, integrated and coordinated cadastre and land registry is required.
- European cadastres are complete and highly accurate allowing their utilization in a range of management and planning activities.
- Europeans have developed authoritative, government administered registers to manage people, location and activities.
- A common data model in the cadastral domain, especially in federated systems, is essential for interoperability.
- European jurisdictions tend to include buildings in the cadastre, however, they tend to do it for different reasons.

Further Questions

- Is the parcel approach limited? Geo-coding and addressing offers far more opportunities.
- How do we approach the problem of administering all the rights, restrictions and responsibilities that relate to land?

PART 3 – AUSTRALIAN PERSPECTIVE

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

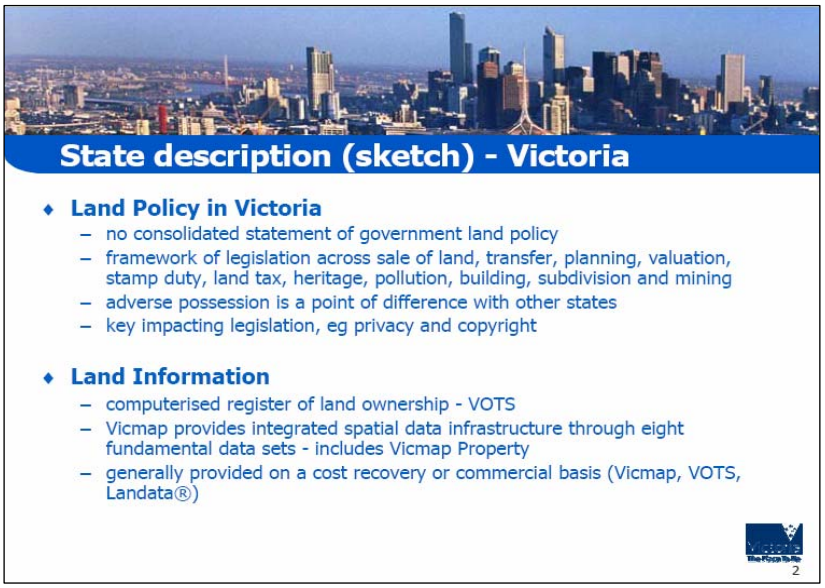
A VICTORIAN PERSPECTIVE IN THE CONTEXT OF THE LAS MODEL

John Rickard and Barbara Flett
Executive Director, Land Victoria
and
Registrar General, Land Victoria
Department of Sustainability and Environment, Victoria
Email: barbara.flett@dse.vic.gov.au

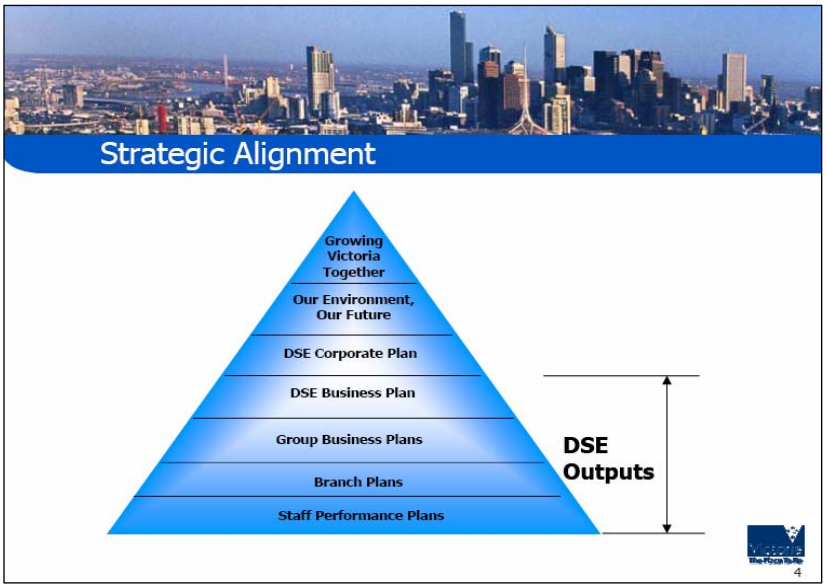
SUMMARY

The following presentation outlines and describes the land administration system components of the state of Victoria including land information, land administration, land value, land use and land development followed by a Vision for the state, Growing Victoria Together. Positive aspects of the state LAS experience are then discussed, as well as a description of some historical issues. Four key improvements for the next decade are been described and finally the integrated model is critiqued from a Victorian context.

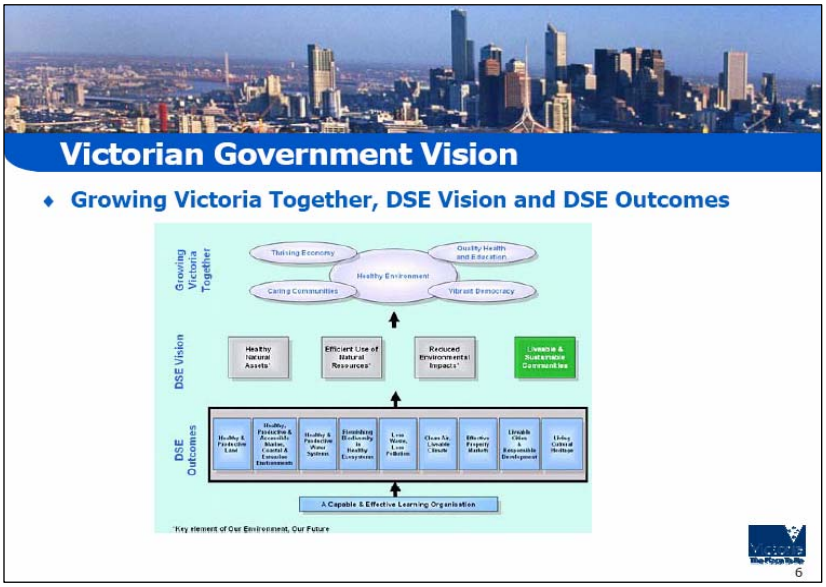

Land Victoria - Expert Group Meeting - Incorporating Sustainable Development Objectives into ICT Enabled Land Administration Systems
Department of Sustainability and Environment
Department of Geomatics, The University of Melbourne
9-11 November 2005
John Rickard, Executive Director Land Victoria
Barbara Flett, Director Land Registry


State description (sketch) - Victoria
Land Policy in Victoria
– no consolidated statement of government land policy
– framework of legislation across sale of land, transfer, planning, valuation, stamp duty, land tax, heritage, pollution, building, subdivision and mining
– adverse possession is a point of difference with other states
– key impacting legislation, eg privacy and copyright
Land Information
– computerised register of land ownership - VOTS
– Vicmap provides integrated spatial data infrastructure through eight fundamental data sets - includes Vicmap Property
– generally provided on a cost recovery or commercial basis (Vicmap, VOTS, Landata®)
2


State description (sketch) - Victoria (cont'd)
Land Administration
– Torrens System from 1862
– General Law land closed in 1999
– Role of Surveyor General underpins accuracy of the cadastre
Land Value
– Valuer General supervises municipal valuation system which flows through to rates and land tax
– Impact on Valuations of unbundling of water from land in irrigation areas from 1 July 2008
Land Use and Development
– planning system
– Melbourne 2030 provides for sustainable development
3


Strategic Alignment
Growing Victoria Together
Our Environment, Our Future
DSE Corporate Plan
DSE Business Plan
Group Business Plans
Branch Plans
Staff Performance Plans
DSE Outputs
4


Our Environment Our Future - 3 Key Directions
1. Maintaining and restoring our natural assets.
2. Using our resources more efficiently.
3. Reducing our everyday environmental impacts.
The core argument is that what is good for the environment is good for the economy
5


Victorian Government Vision
Growing Victoria Together, DSE Vision and DSE Outcomes
Growing Victoria Together
DSE Vision
DSE Outcomes
Healthy Environment
Healthy Natural Assets
Efficient Use of Natural Resources
Reduced Environmental Impacts
A Capable & Effective Learning Organisation
6

Victorian Government Vision (cont'd)

- **Effective Property Markets Sub-Outcomes**
  - confidence in integrity and efficiency of property system
  - accessible and transparent property markets
  - established and accepted natural resource markets
  - comprehensive and accessible spatial information

7

Positive aspects of state experience - Victoria

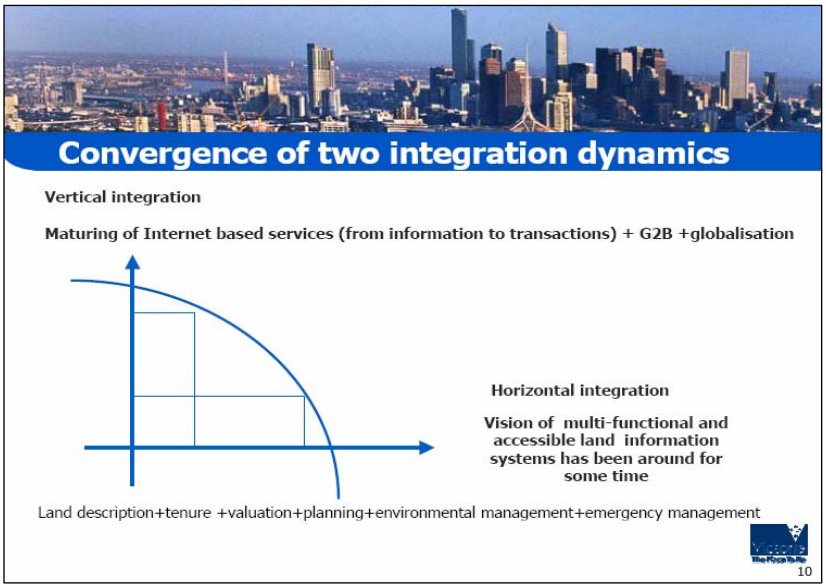
- Extensive modern ICT systems for land administration - VOTS (fully automated titles system) and VICMAP (state digital map base)
- Developing advanced Internet based transaction services (Electronic Conveyancing and Streamlined Planning Applications)
- Beginning to use this technology/expertise for other natural resource registers eg
  - Water Register
  - Future registers (carbon tender, bush broker/native vegetation)
- Victorian Spatial Information Strategy (VSIS) and VSC/VGSC leadership drives policy framework and implementation use
  - on demand topographic maps
  - co-ordinated aerial photography and satellite imagery
  - smart tags to provide spatial information hotlinks in text data
- statistical/GIS techniques in quality control for municipal valuations
- investigating common spatial architecture across Government and community

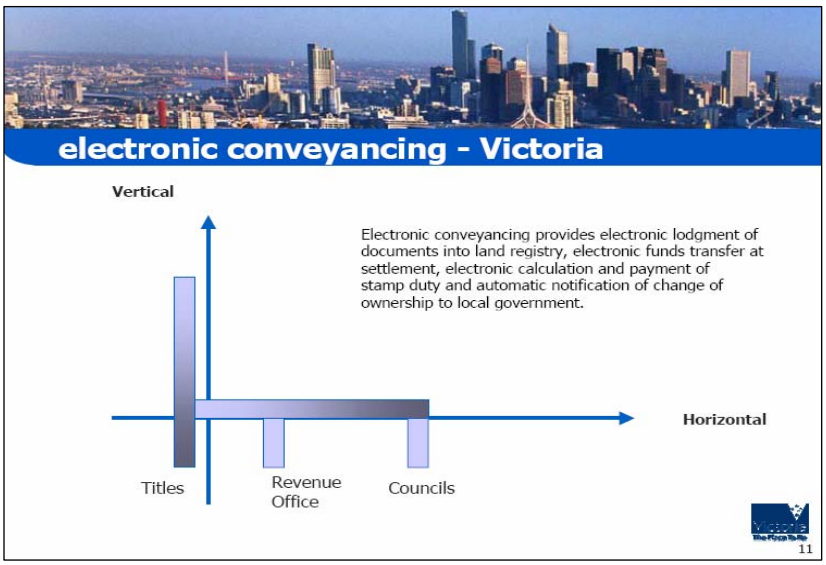
8

Historical Issues in Victorian Experience

- silo structures traditionally led to sub-optimal data co-ordination
- duplication in collection and management of some spatial information, eg aerial and satellite imagery
- *Survey Co-ordination Act 1958* oriented to paper systems
- lack of strong data custodianship responsibility outside primary LAS agencies
- transactional orientation has led to sub-optimal information management, eg
  - Bodies Corporate reform focus on registration rather than information management
- needs Crown land title and register of Government owned land
- limited marine cadastre
- buildings in the cadastre not current priority - uncertain business case

9


Convergence of two integration dynamics
Vertical integration
Maturing of Internet based services (from information to transactions) + G2B +globalisation
Horizontal integration
Vision of multi-functional and accessible land information systems has been around for some time
Land description+tenure +valuation+planning+environmental management+emergency management
10

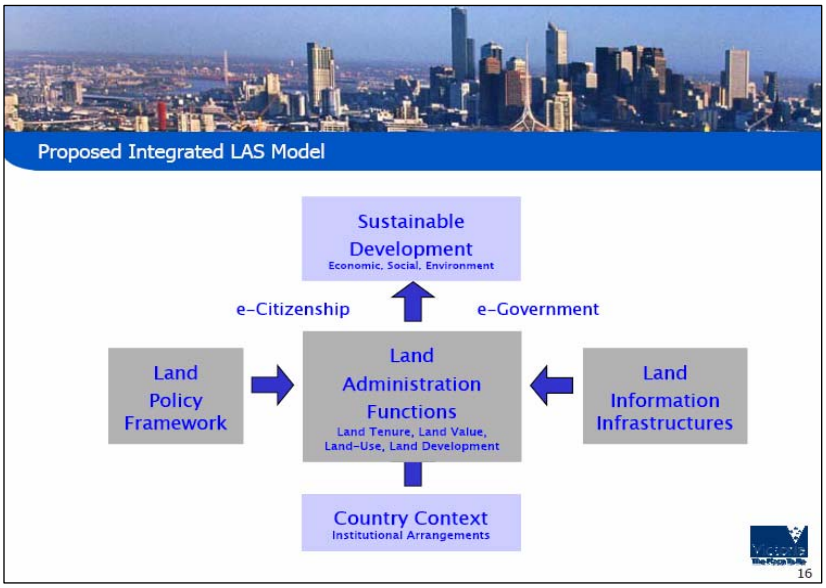

electronic conveyancing - Victoria
Vertical
Electronic conveyancing provides electronic lodgment of documents into land registry, electronic funds transfer at settlement, electronic calculation and payment of stamp duty and automatic notification of change of ownership to local government.
Horizontal
Titles
Revenue Office
Councils
11


Four key improvements in the next decade
national electronic conveyancing system
national harmonisation of Torrens legislation
consistent interstate water trading system
streamlined e-plans
12


Critique of the Integrated Model in Victorian Context
Victorian framework of land legislation effectively supports transactions but not strategic information management
Need to add to that conceptual framework - from:
– transactions in land/property rights to
– information management to
– policy development, via
– holistic, long term, politically neutral information framework
Need to shift community thinking from:
– we own land and we have rights to exploit it, to
– what are the planning constraints? And
– what are our responsibilities?
– what are the sustainable uses for our land?
13


e land administration impact
Working on the Vertical
Blurs boundaries (of organisations, technology, services) between public and private sector, between jurisdictions and between countries
Working on the Horizontal
Entails dramatic reduction in transaction and information access costs
Transforms land administration organisations from hierarchies into networks with decentralised control of dispersed functions
Stimulates/forces land administration out of traditional silos into co-operation within Government
14


"Working on the vertical" Challenges
Technical interoperability -
More and different participants equals more risk
Limited ability to exercise control over private sector partners
Traditional Government investment processes not suited to evaluating benefits of vertical integration
Semantic interoperability - standardisation of words, definitions, processes
Not only Land XML and National data transfer standards
but also Harmonisation of land titles legislation
EULIS project(European land information)
Organisational interoperability
ANZLIC, PSMA, VSC, NECO,
Service and price differentials more transparent and less palatable
15


Proposed Integrated LAS Model
Sustainable Development
Economic, Social, Environment
e-Citizenship
e-Government
Land Policy Framework
Land Administration Functions
Land Tenure, Land Value, Land-Use, Land Development
Land Information Infrastructures
Country Context
Institutional Arrangements
16


Critique of the Proposed Integrated LAS Model
Lacks trading component
commercial
dynamic
built on sound information
Lacks reference to human skills and capacity building
Extensive focus on Government, lacks reference to private sector roles
Focuses largely on land, requires reference to wider natural resources
How can it address issue of encouraging change in community thinking from rights of exploitation towards acceptance of responsibilities and appreciation of the benefits of sustainable development?
17

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

THE WESTERN AUSTRALIAN SHARED LAND INFORMATION PLATFORM AND MODERN LAND ADMINISTRATION SYSTEMS

Grahame Searle and D Britton
Chief Executive Officer
and
Shared Land Information Platform Program Support
Department of Land Information, Western Australia
Email: grahame.searle@dli.wa.gov.au

SUMMARY

Administrative and cultural barriers have traditionally hampered cross-government initiatives and partnerships. Multiple government agencies are responsible for different geospatial and land related information. As noted by Enemark et al., the historical development of Australian data models "still limits their ability to reach their full potential to integrate a wide range of land related data like their European counterparts" (Enemark et al. 2005). Furthermore, as Wallace, Williamson et al. have pointed out, from the viewpoint of land administration efficiency, Australia's federal system is characterised by an outmoded constitution, ill-equipped for modern circumstance due to its distribution of powers: ideally, a national government would be responsible for the organisation of basic standards for the capture of detailed spatial information (Wallace et al. 2005).

Within the state of Western Australia, the Shared Land Information Platform can be seen as representing one of the key building blocks within the Global Land Management Paradigm (Enemark et al., 2005 – see Fig 1, below). The broader Western Australian political and social context has provided the local drivers and conditions that have allowed the concept of inter-agency collaboration and a sharing paradigm to take root. These conditions are hierarchical and follow a specific chronology, and can also be seen as presenting the "wrappers" of the global model which drive the implementation of the conceptual framework (see Fig. 2, below). Broadly speaking, these drivers and conditions are:

- A State Strategic Framework (Better Planning, Better Services);
- The establishment of a whole-of-government Strategic Management Council (SMC);
- Machinery of Government Functional Review Taskforce;
- Creation of the Department of Land Information, with a consolidation of statutory functions;
- Creation of an SMC e-Government Sub-Committee and the Office of e-Government;
- An e-Government Strategy, foregrounding internal efficiency, streamlined service delivery, and increased community participation (Office of e-Government, 2004);
- A "Citizen-Centric" approach; and
- An early, conceptual Federated Enterprise Architecture model for the Public Sector in which a shared land information platform has a logical place.

By focusing on business outcomes that support land information markets, land use and development, and emergency response management, the Shared Land Information Platform will contribute to economic, social and environmental sustainability and lays the foundation for future opportunities for national approaches.

INTRODUCTION

Immediately following the Western Australian state election in 2001, the incoming Labor government instituted the Machinery-of-Government Reform and commissioned the Functional Review Taskforce to deliver a report based on a terms-of-reference that sought inter-agency and whole-of-government paradigms. The approach was geared toward the delivery of the government's strategic policies that were outlined in its strategic planning framework, Better Planning, Better Services.

This saw a new approach to cross-functional government, whole-of-government collaboration and a citizen-centric approach, as was evident in the creation of the Strategic Management Council, a whole-of-government committee comprised of all departmental heads, reporting directly to the Premier and Cabinet. It also highlighted the potential for new technologies to deliver efficiency, as was evident in the proposed Shared Corporate Services Reform. Subsequently, the e-Government sub-Committee was formed from a cross-section of the Strategic Management Council; this committee was to be informed and supported by the newly created Office of e-Government.

The resultant Machinery of Government Report recommended that a new Department of Land Information be formed that would also comprise the statutory function of the Valuer General and would see the former department's land administration function transferred to the newly formed Department for Planning and Infrastructure. This flagged a new approach to land information as a distinct opportunity, with the recommendation that the newly formed Department of Land Information should progress toward becoming a Statutory Authority with broader commercial powers.

Concurrently, the development of a Shared Land Information Platform Implementation Plan followed work undertaken by the Functional Review Taskforce which identified possible costs and other efficiencies from the establishment of a single point of access to fundamental land information (including operational cost savings and long term capital benefits to the State). Consequently, the Department of Treasury and Finance, on behalf of the Department of the Premier and Cabinet, commissioned an investigation of the costs and benefits of establishing a Shared Land Information Platform for use across State Government in Western Australia. In assessing the merits of such, the subsequent report in July 2003 suggested that the Shared Land Information Platform:

- would offer significant strategic benefits to government and the broader community;
- was technically feasible and could be implemented since international interoperability standards exist, and agencies have the technical foundations that would facilitate implementation; and
- could realise financial benefits subject to effective stakeholder management and implementation (SLIP Implementation Plan, 2004).

The report also identified that the mechanisms by which agencies share land and geographic data were cumbersome, resource intensive, and the data was prone to becoming out-of-date. The existing approach, which generally involved the replication of data via customised bulk exchanges, limited the potential to capitalise on the true value of the State's land information asset.

The resultant Shared Land Information Platform Implementation Plan was completed after extensive consultation across government, involving more than 200 people from operational levels, through to middle and senior management. The completion of this

process coincided happily with the launch by the Western Australian Premier of the e-Government Strategy for the Western Australian Public Sector, produced by the Office of e-Government. The e-Government Strategy formalised an approach that would be focussed on achieving internal efficiency within government, streamlined service delivery, and increased community participation within a context that would be citizen-centric and based on interoperability standards; goals which the Shared Land Information Platform would be committed to deliver. The Shared Land Information Platform would further both inform and be supported by a federated model of enterprise architecture that was in its early conceptual development within the Office of e-Government.

The Shared Land Information Platform Implementation Plan was subsequently endorsed by the Strategic Management Council e-Government sub-Committee and submitted to Cabinet's Expenditure Review Committee for final approval and funding. In November, 2004 the Expenditure Review Committee approved the deliverables and costing as outlined in the plan and authorised the disbursement of funds for the program to commence.

THE SHARED LAND INFORMATION PLATFORM IMPLEMENTATION PLAN

Governments at all levels experience financial and social pressures to deliver improved services more efficiently. Information technology can be a vital tool in redesigning the way in which government agencies work together in order to deliver better services to the public. When combined with the commitment from public sector agencies to collaborate and consider alternative ways of business, the potential for improvements to service provision can be significant.

Recognising that success was more about engaging people than overcoming technological challenges, development of the Implementation Plan was based on a process which emphasised consultation. Key steps included:

- Endorsement of approach
- Project Establishment
- Consultation with stakeholder agencies
- Development of the Implementation Plan
- Stakeholder endorsement
- Stakeholder survey.

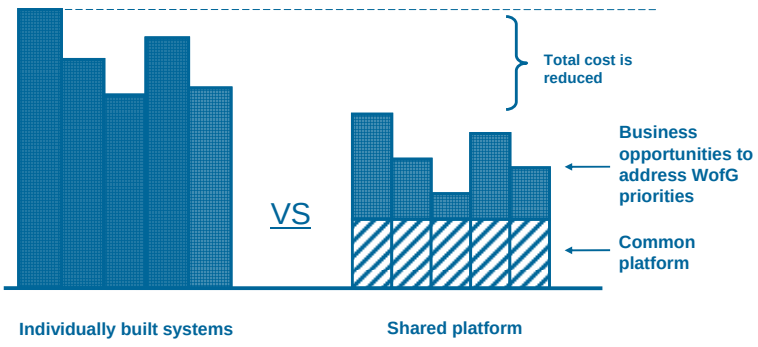


Figure1 - Cost comparison.

The Shared Land Information Platform was aiming to streamline the Government's land and property information by providing the infrastructure and services necessary to link individual agencies together so customers could better access the range of information

available. A key consequence of adopting a shared approach would be that agencies could build information systems which integrate land information at a reduced cost when a shared foundation is in place.

Objectives

The objectives in developing a platform for sharing land information were to:

- *simplify* access to the Government's land and geographic information by providing on-line access using common infrastructure and services to link individual agencies systems and data stores together;
- provide a basis *to improve the efficiency* of the Government's business processes involving land and geographic information, particularly those which span several agencies;
- *'bring to life' the e-Government strategy* for Western Australia by seizing the opportunity for building on the progress already made in drawing agencies closer together, recognising the need to nurture a continuous process of integration across government.

Whole-of-Government Approach

The Shared Land Information Platform forms the foundation of an information connection service, which will allow development of cross-government solutions to meet specific information needs; it is likely to mature into a significant strategic system over a number of years, and as such needs to be managed as a 'whole-of-government' program of work in order to optimise common infrastructure, information and cross-cutting business reform opportunities. In March 2004, the Strategic Management Council (SMC) confirmed that Shared Land Information Platform implementation planning be approached on a whole-of-government basis. The approach recognised that a shared platform is driven by cross-cutting priorities and opportunities for more efficient and effective service delivery.

Benefits of the Shared Land Information Platform

The utilisation of a Shared Land Information Platform to open up access to the Government's land and geographic information is a significant opportunity to improve service delivery and the transition towards joined-up government. The benefits can be summarised as:

Improved information access for agencies and citizens, resulting in -

- Better sharing and integration of land information across government, industry and the community;
- Improved quality of decision-making and reaction times;
- Improved management of community-supplied information;
- Reduced errors and subsequent rework at an agency level; and
- Value-adding to an agency's data by combining it with other "like" datasets in order to provide context.

Improved government processes, resulting in -

- Reduced government administrative effort and resources;
- Greater responsiveness in land-related processes and more timely land supply thereby promoting a competitive economy;
- Reduced paperwork and run around between agencies; and
- More streamlined government services and reduced transaction times.

Better government, through -

- Improvement in data integrity, by accessing data directly and ensuring errors are corrected in the source data;
- Opportunities for revenue growth;
- Improved communication with the public and easier access for citizens to participate in government decision-making; and
- Increased inter-agency collaboration.

Implementation Approach

The Shared Land Information Platform would aim to deliver early results so that the concepts of shared land information could be made visible, benefits would accrue early, and momentum would be maintained towards the longer-term vision of access to land information to underpin a more efficient public sector that could deliver integrated services and improved opportunities for community participation. One of the notable aspects about the Shared Land Information Platform's implementation approach has been its organisation into four key business scenarios or outcomes, which represent strategic opportunities for the state. Each of these "focus areas" is lead by a government agency and has been directed toward a collaborative delivery. The four focus areas will be underpinned by the technological platform that is the Enabling Framework. Significant work has been completed on the technical architecture and overall design of the Enabling Framework. Further detailed design will incorporate opportunities for agencies to connect their land information systems to the platform. Work in the four focus areas has identified and scoped solutions to meet specific needs. The development of the associated solutions will deliver key business benefits to each of the four focus areas.

Adoption of this approach incorporates:

- delivery of the core elements of shared platform as soon as possible to allow solutions to be implemented for the Focus Areas in a short timeframe;
- provision for Focus Areas to develop solutions at a rate which is appropriate for each Focus Area, including opportunities to develop interim solutions which can subsequently be incorporated into the program;
- provision for early demonstration of capabilities, allowing for minor adjustments to technology to ensure the program delivers the required results; and
- Opportunities for cross-agency collaboration, and adoption of a whole-of-government approach.

THE SHARED LAND INFORMATION PLATFORM AND THE GLOBAL LAND MANAGEMENT PARADIGM

The Global Land Management Paradigm

The Global Land Management Paradigm identifies an ideal and historically neutral model for the development of integrated land administration systems within developed economies (Enemark, et al., 2005). In fact, "land management activities may be described by the three components: land policies, land information infrastructures, and land administration infrastructures in support of sustainable development (ibid).

Enemark (et al. 2005) points out that modern land administration systems in developed economies should facilitate sustainable development; this is the triple bottom line of economic, social and environmental sustainability. It supports "public participation and informed and accountable government decision-making in relation to the built and natural environments" (ibid).

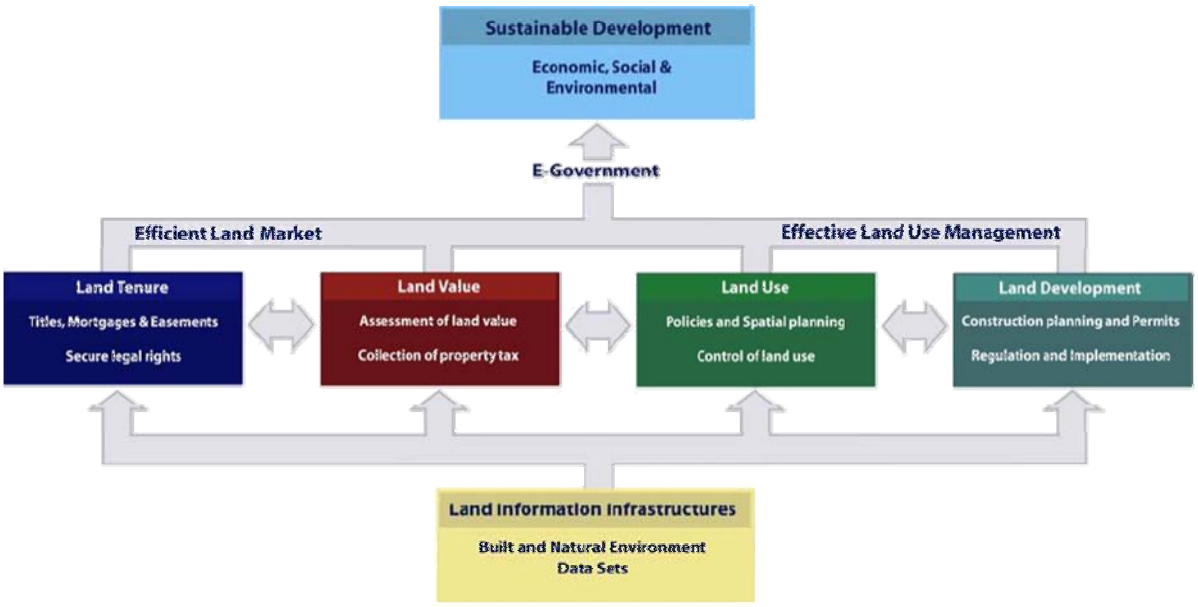


Figure 2 - A Global Perspective of Modern Land Administration Systems (Enemark et al., 2005)

Enemark's model identifies an underlying land information infrastructure as supporting the identified land administration functions and, by extension, sustainable development economically, socially and environmentally. The following section contextualises this model by incorporating the local conditions and drivers.

The Western Australian Context

As discussed in the introduction section of this paper, there have been a set of local conditions, hierarchical and chronological, that have supported the adoption of a shared and integrated approach. These conditions, or drivers, can be seen as the local socio-political context, and can be represented as the "wrappers" that help contextualise the global model within the local environment (Figure 3).

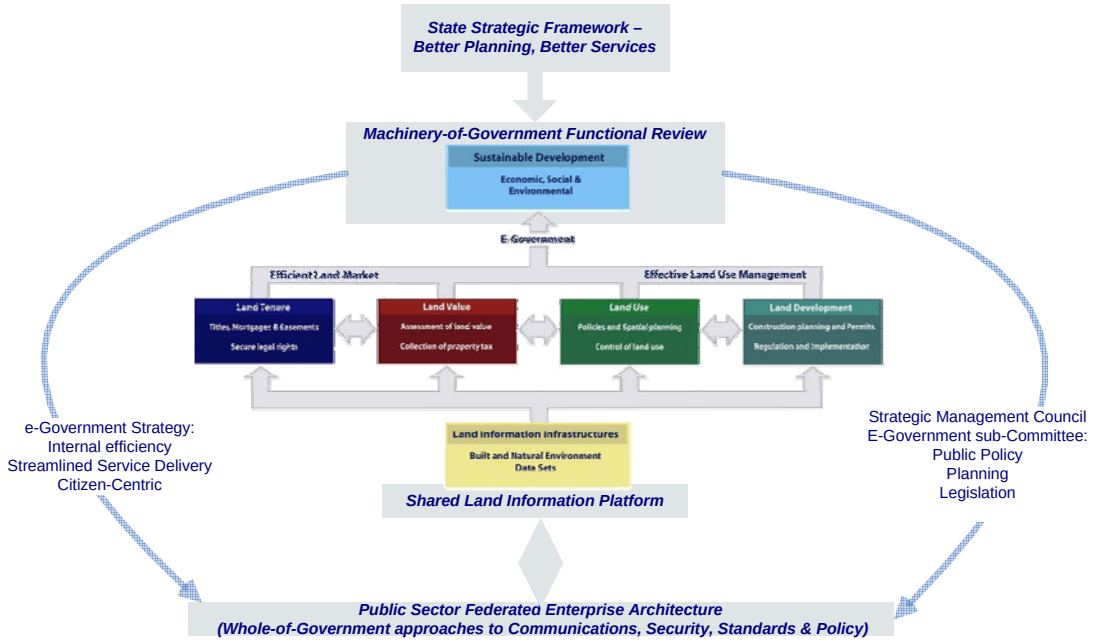


Figure 3 - The Global Paradigm in the Western Australian Context.

One of the key elements which supports land information integration is the concept of a federated enterprise architecture and its emphasis on Interoperability – the idea that the adoption of interchange standards (which can be seen as "translation" services or "middleware") will allow disparate systems to communicate and to share data. Interoperability supporting the integration of land information systems is about provision of web services which help to translate the language of bureaucracy for citizens (consumers). In line with fundamental concepts of e-government, or "joined-up government", users of land information systems will not need to know how government organises itself in order to get access to the information they require.

Land Information Integration

One of the key reasons for the success of the Shared Land Information Platform to date has been its focus on business opportunities or outcomes within four areas or scenarios:

- The emergency management scenario (EM, lead by the Fire and Emergency Services Authority);
- The natural resource management scenario (NRM, lead by the Department of Agriculture WA);
- The electronic land development process scenario (eLDP, lead by the Department for Planning and Infrastructure); and
- The integrated land information scenario which explores land information as a commercial commodity within emerging markets (the Register of Interests, or ROI, is the first of these opportunities and is lead by the Department of Land Information).

This section discusses how the Shared Land Information Platform is currently well advanced in its planning and preparations for the delivery of integrated land information services and how each of the program's focus areas addresses specific aspects of the Global Land Management Paradigm.

The Register of Interests (ROI)

The Register of Interests program explores integrated land information as a commodity.

Interests influence the potential use and enjoyment of land. Access to this information should be a simple, straightforward process - yet repeatedly individuals and businesses find their dreams and development plans curtailed due simply to not knowing what interests exist over a parcel of land. The register of interests component will deliver a new online system which will provide a single access point for the discovery of the rights, obligations and restrictions over any area in Western Australia. The land development and real estate business, government agencies, and current and potential property owners will be able to identify interests on a piece of land with a single, on-line enquiry rather than having to visit multiple agencies. Government agencies will benefit from the opportunity to automate routine enquiries, improve compliance levels and provide support for those in regional areas. These outcomes are consistent with an e-Government, citizen-centric approach which promotes increased levels of citizen trust and confidence in government.

The new online ROI system will provide:

- A catalogue which will allow users to discover all interests related to an area from a pre-defined index created by relevant custodians;
- A series of business profiles which will allow users to readily identify interests relevant to their business by choosing the appropriate business type. Each business profile will then enquire on a pre-defined list of interests and custodians;
- An administration system which will allow custodians to maintain the interests' information accessed by the catalogue and ensure this information is kept up to date;
- A logging and metering system which will allow custodians to track user activity, including numbers of enquiries for the collection of fees (in accordance with custodians' policies);
- A series of enquiry automation components which will pass enquiries to custodians using varying levels of automation (according to custodians' systems and protocols).

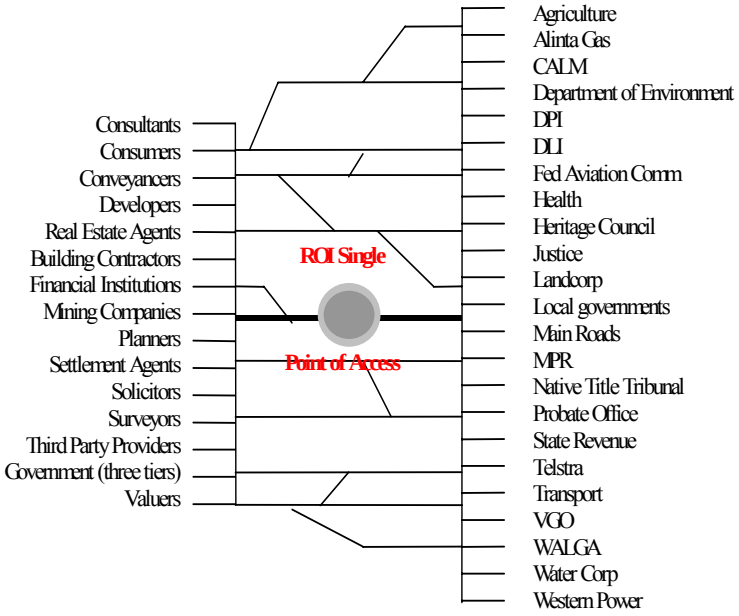


Figure 4 - The Register of Interests will open up access to information held across government.

The Register of Interests project has now completed initial planning. Ongoing stakeholder consultation is taking place, with the identification and refinement of business scenarios. This is likely to result in the bringing-forward of Phase Two functionality into Phase One, resulting in a system that will deliver real-time access to data in other agencies concerning interests across a defined range (spatial query). The delivery of the prototype that will demonstrate the capability and functionality is scheduled for February 2006.

The Register of Interests supports the Global Land Management Paradigm in the way it meets the needs of citizens and business by providing streamlined access to a wealth of tenure and valuation related information and thereby generates new market opportunities.

Land Use and Development

The high demand for government land development approvals coupled with an increase in the complexity and scope of decision making, has led to increased time-frames and a reduction in the transparency of the land development process (LDP). Stakeholders and industry have raised concerns at the ministerial level with the increased timeframes to gain statutory approvals combined with a lack of certainty in land development approvals.

The Shared Land Information Platform will provide the land development industry and government agencies with an online transactional system that will allow for the transparent and auditable processing of development applications and surveys within reduced timeframes. Agencies involved in land development will have the opportunity to automate their components of the land development process, yielding efficiencies and reducing re-work. The State will benefit from a shorter land development cycle, and ability to attract land development investments.

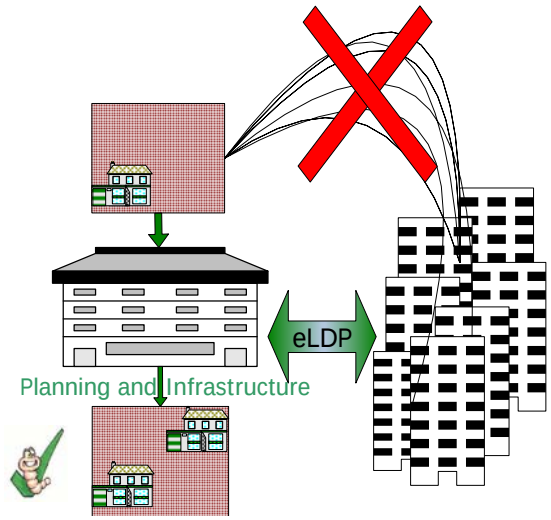


Figure 5 - The land development process will be streamlined.

The overall eLDP system will comprise a series of components, each of which will deliver specific functionality. The new eLDP system will also provide improved access to information and improved business processes.

The new online eLDP system will include the following components:

- An online lodgement system which allows the electronic lodgement and version control.

- An application and plan tracking system which will allow the tracking of both electronic and hardcopy applications and plans;
- An electronic referrals system to manage the referral processes between all regulatory agencies through the provision of automatic notifications to government agencies (including LGAs) and developers;
- Enhancements to the Valuation Services System which allow the downloading of valuation data and automated notifications to agencies.

The eLDP system will be supported by improved data quality and accessibility, including:

- A new concept layer for proposed land development layouts being created in the spatial cadastral database with version control.
- Government agencies will be able to download OGC compliant GIS data;
- Direct connections to data at source between key organisations involved in the LDP; and
- An improved, unified pre-cal data set, jointly maintained by stakeholder organisations.

The move toward an electronic land development process demonstrates how traditional land administration functions, usually organised along the lines of departmental silos, can be streamlined through the adoption of an integrated land information approach and through the provision of a shared spatial data infrastructure. Whilst the Shared Land Information Platform is primarily about the integration of land information, it can be see how the delivery of such an integrated approach supports broader land administration functions and the systems that support these.

Natural Resource Management

There is an increased emphasis on environmental management and monitoring at the state and national levels. The natural resource management (NRM) component will provide ready access to integrated NRM data and streamline State government agency processes in support of the following activities:

- State and National Environment reporting;
- National Land and Water Resources Audit; and
- State Biodiversity Conservation Strategy.

The NRM focus of the Shared Land Information Platform will create opportunities for state-federal relations in that the delivery of information products (as opposed to raw data) will support the demonstration of state natural resource management capabilities in cooperation with regional groups. This will help to streamline the process for Commonwealth – State bilateral agreements and thereby ensure that funding is channeled to those initiatives that promise to deliver the maximum benefit.

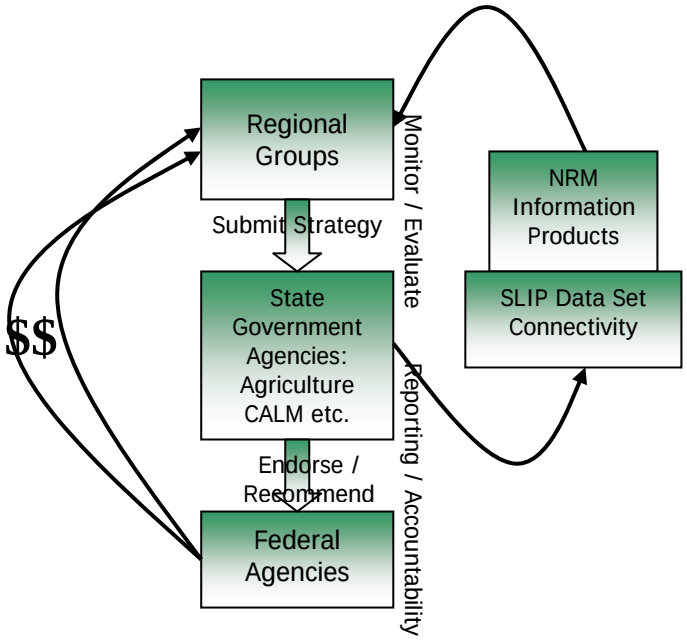


Figure 6 - The provision of up-to-date information will assist the State Government and Regional Groups in their interactions with the Federal Government

The provision of direct access to digital mapping data will benefit NRM agencies and the community by ensuring that the most current information is used for decision making. It will also enhance the ability of agencies to engage the community over decision making, monitoring and reporting activities.

The NRM deliverables will provide:

- A customised map viewer which provides authorised access to all relevant spatial services and information layers for stakeholders;
- An NRM catalogue which provides an index to the available and relevant services, information and metadata;
- Supporting components such as data extraction and data upload tools which will allow agencies and the community to extract data and re-supply data to agency custodians;
- A new system which allows Crown land information to be jointly managed as a unified data set by multiple agencies. This will allow information relating to Crown land to be accessed and managed as a single, virtual data set by stakeholder agencies;

The online mapping systems developed by the Department of Agriculture, Department of Environment and Conservation and Land Management will be enhanced to enable direct online access to other agencies' data. In this way, the Shared Land Information Platform is supporting the key element in the Global Land Management Paradigm of environmental sustainability.

Emergency Response Management

For emergency management (EM), the Shared Land Information Platform is about improving public safety, reducing reaction times and helping save lives. The organisations involved in EM in the State have identified over 150 data sets that are required for their activities. This information is currently distributed across several State government

agencies and statutory authorities, with a lack of sufficient coordination to allow access to fit for purpose information by all organisations involved in EM.

The use of, and expertise with systems that display and interrogate this information varies greatly between agencies. Some agencies have significant in-house systems and technical expertise while others have limited capabilities or awareness of the potential benefits of spatial information for EM. For EM organisations, an integrated platform will provide 'fit for purpose' web based mapping, analysis, notification and enquiry services for specific EM operations linking authorised and distributed information sources. There will also be important data extraction services to support offline use.

The EM deliverables will provide:

- An interactive online interface which provides access to information and tools to support the prevention, preparation, response and recovery phases of EM.
- A customised map viewer which provides authorised access to relevant spatial services and information layers for EM organisations.
- Enhancements to existing agency services and applications to access and use common base level information.
- A notification system which will allow information from different sources to be regularly disseminated in event of emergencies.
- A synchronised data updating system which will allow locally stored copies of data to be synchronised with the online system for offline use.
- Security tools which control access to information and audit and track its use.

Work has already commenced on the architectural design of an integrated incident management database as well as the identification of five key emergency management scenarios. Emergency response management is the key emerging priority in the delivery and use of integrated land information and the Shared Land Information Platform is making great inroads toward the establishment of real-time delivery of information from disparate databases in order to build holistic models of emergency situations

The Technology

The Enabling Framework

The Shared Land Information Platform Enabling Framework provides the infrastructure to enable access to the government's significant land and geographic information resources. The information is shared across 26 government agencies, with as many as 6,100 government employees regularly using land information in their work.

The Enabling Framework takes advantage of current internet-based technologies and standards so that data can be accessed transparently as a single, integrated land information system whilst data remains within the control of custodial agencies. Agencies retain accountability for their data; information security is improved; access to data is opened up; and there are opportunities to automate many land-related processes, currently considered labour intensive.

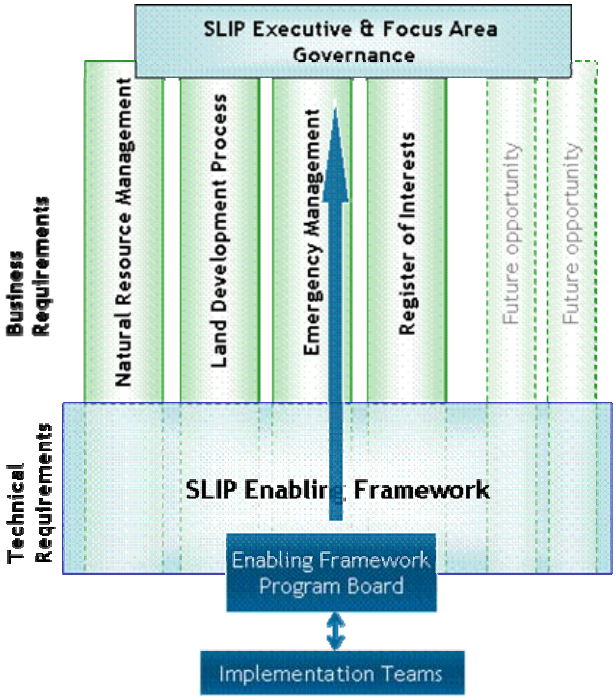


Figure 7 - The Enabling Framework facilitates the development of business solutions

The Enabling Framework is expandable. As new priorities and requirements are identified, they can be incorporated as new components. The cost of adding a component is significantly cheaper than developing a complete new system and the new component can immediately be shared across government.

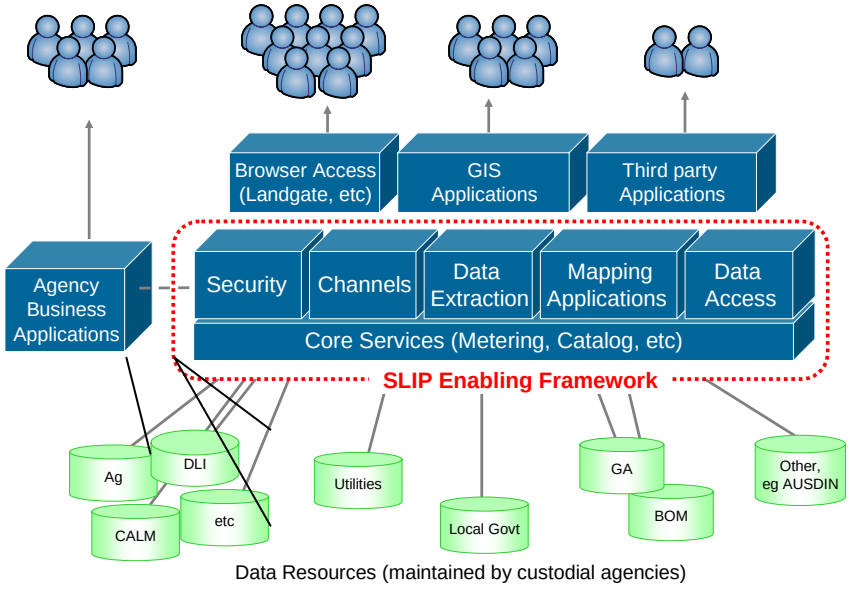


Figure 8: The Enabling Framework provides common services

The enabling framework program will provide:

- Completion of the detailed design of the Enabling Framework, including analysis of linkages to agency data sources;
- Development of the Enabling Framework including connection of four agencies' data, access to WA Atlas, services for security, metering, catalogue and downloads;
- Connection of remaining 11 agencies' data (total of 15 agencies); and
- Completion of prototype systems for each Focus Area.

Whilst the Enabling Framework will provide the innovative technical solutions required to deliver the business outcomes within the four focus areas, it was recognised early in the Shared Land Information Platform implementation planning that integration at the technological level is the easiest part of shifting to new paradigms: the more difficult task is the management of people and shift in thinking and attitude that is required to sustain collaborative relationships. The program has approached this problem with an innovative governance model.

GOVERNANCE AND CROSS-GOVERNMENT COLLABORATION

Governance of collaborative projects contributing to shared outcomes across government possesses a unique set of challenges, particularly in respect to clear lines of accountability. The governance and accountability challenges surrounding cross-government projects are compounded even further when trying to initiate, develop and subsequently maintain such initiatives.

A key outcome of the Shared Land Information Platform implementation planning has been the identification and acceptance by agencies of an agreed Governance Framework. This framework recognised the need to meet accountability and outcome provisions (under the Financial Administration and Audit Act and the Public Sector Management Act), but at the same time balanced the need for effective collaboration across agencies in order to achieve the best outcome from a whole-of-government perspective.

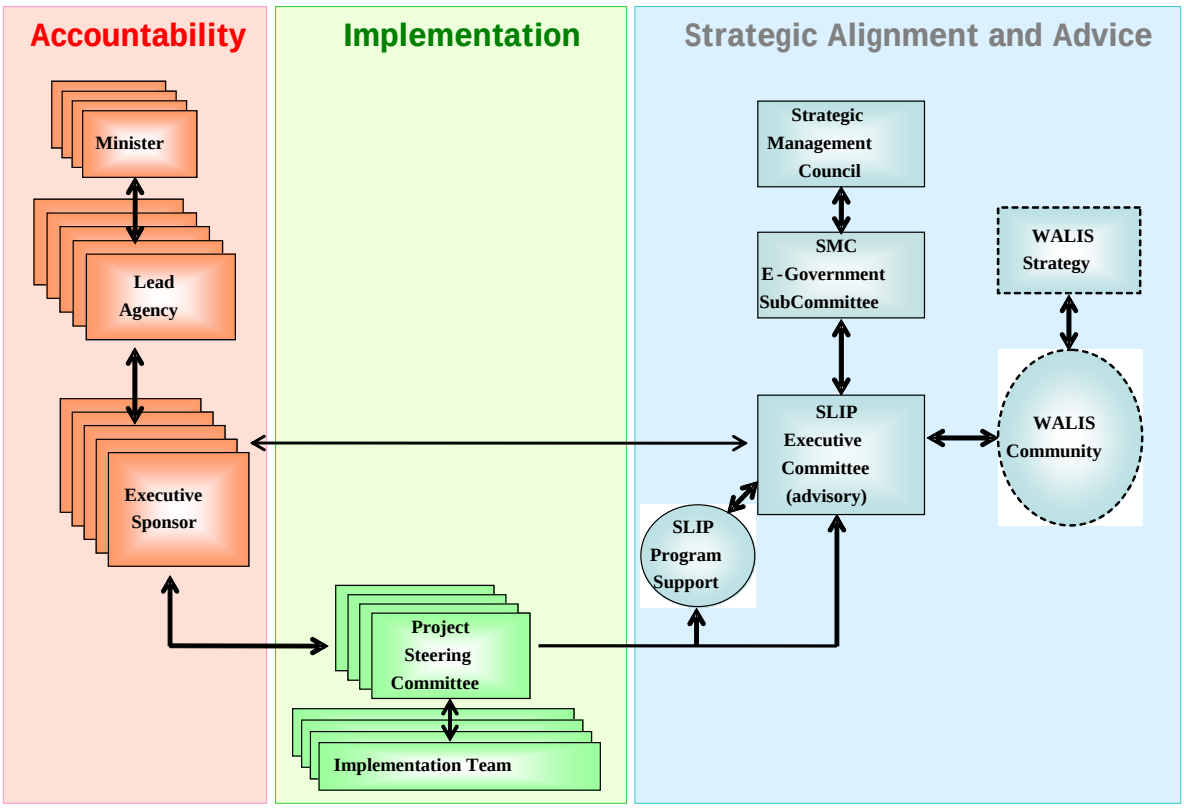


Figure 9 - Governance Model

The Shared Land Information Platform governance model aims at achieving integration at the technical and business levels, whilst maintaining accountability and transparency at the

political level. In this way, it is firmly secured within the model of representative democracy, wherein accountability is maintained along ministerial lines and ultimately to electors. To date, the program has established governance charters at the whole-of-program level, as well as at the focus area level, driving collaboration and shared outcomes, whilst maintaining accountability in accordance with Westminster principles.

CONCLUSION

In an era where "Land Administration Systems are now challenged by new technology and radically different demands for land information for government" (Wallace et al., 2005) the Western Australian Shared Land Information Platform, whilst in its infancy, shows great promise for governments, both at the state and national levels. Its focus on key business outcomes ensures that results are measurable in terms of benefits to the state and its citizens. With its unique governance arrangements and commitment to e-government principles it demonstrates "how can Australia's land administration systems (LAS) [can] be adapted to capture the efficiencies available from new technologies and to provide essential information needed by government" (Wallace et al. 2005).

REFERENCES

DLI, (2004), The Shared Land Information Platform Implementation Plan.

Enemark, S., Williamson, I., and Wallace, J. (2005), Building Modern Land Administration Systems in Developed Economies. Accepted for publication in the Journal of Spatial Science, Australia in the December Issue 2005.

Office of e-Government, (2004), The e-Government Strategy for the Western Australian Public Sector.

Searle, G. and Britton, D. M. (2005), Government Working Together Through a Shared Land Information Platform (SLIP). Proceedings of SSC 2005 Spatial Intelligence, Innovation and Praxis: The national biennial Conference of the Spatial Sciences Institute, September, 2005. Melbourne: Spatial Sciences Institute. ISBN 0-9581366-2-9

Wallace, J. and Williamson, I. (2006), "Spatial information opportunities for government", accepted for publication in *Journal of Spatial Science*, June issue.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

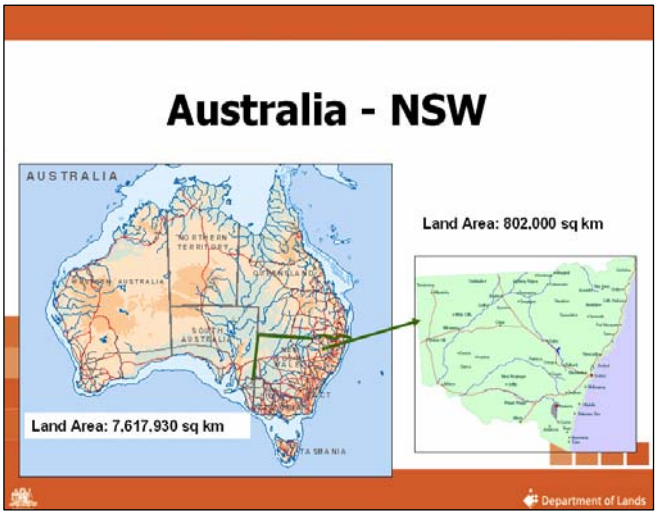
A NEW SOUTH WALES PERPSPECTIVE IN THE CONTEXT OF THE LAS MODEL

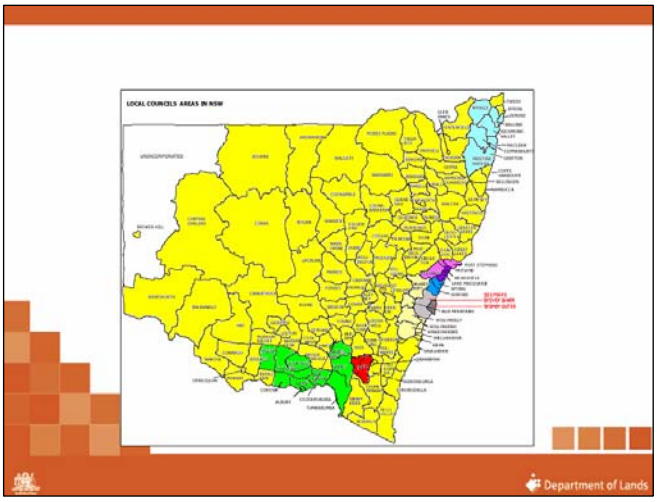
Warwick Watkins
Director General and Surveyor General
Department of Lands, New South Wales
Email: warwick.watkins@lands.nsw.gov.au

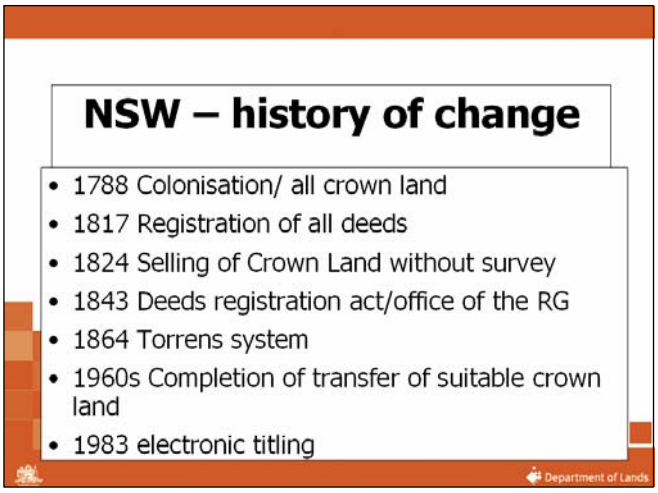
SUMMARY

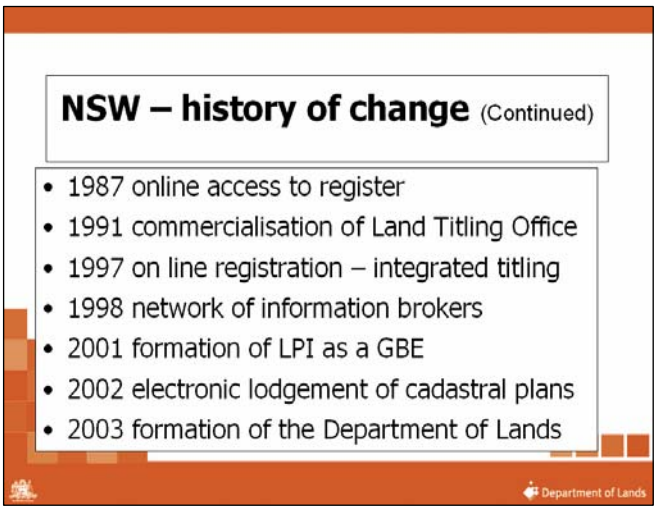
The following presentation gives an overview of the history of land information within a NSW context, followed by a summary of the significance of the Department of Lands core business. An overview of the positive and negative aspects of the states land administration system is given along with a critique of the integrated LAS model. Finally, an overview of the role that ANZLIC, the spatial information council, plays within the sphere of land administration systems is given.


NEW SOUTH WALES
DEPARTMENT OF LANDS
Department of Lands


Australia - NSW
AUSTRALIA
Land Area: 7,617,930 sq km
Land Area: 802,000 sq km
Department of Lands


LOCAL COUNCILS AREAS IN NSW
Department of Lands


NSW – history of change
• 1788 Colonisation/ all crown land
• 1817 Registration of all deeds
• 1824 Selling of Crown Land without survey
• 1843 Deeds registration act/office of the RG
• 1864 Torrens system
• 1960s Completion of transfer of suitable crown land
• 1983 electronic titling
Department of Lands


NSW – history of change (Continued)
• 1987 online access to register
• 1991 commercialisation of Land Titling Office
• 1997 on line registration – integrated titling
• 1998 network of information brokers
• 2001 formation of LPI as a GBE
• 2002 electronic lodgement of cadastral plans
• 2003 formation of the Department of Lands
Department of Lands


Integration of Land Information
• LPI brought together 3 independent agencies
– Land Titles Office Maintain the NSW register of land titles
– Land Information Centre – Mapping the State on behalf of the Government
– Valuer General's Office – Maintain Register of Land values for rating and taxing purposes
Department of Lands

Significance of LPI to NSW

- Supports private trading of 1,000 properties per day worth $400 million
- Supports the collection of $24 million per day in duties, rates & taxes
- Underpins the spatial data infrastructure of the State of NSW
- Is a significant facilitator of economic activity in NSW

Information Assets

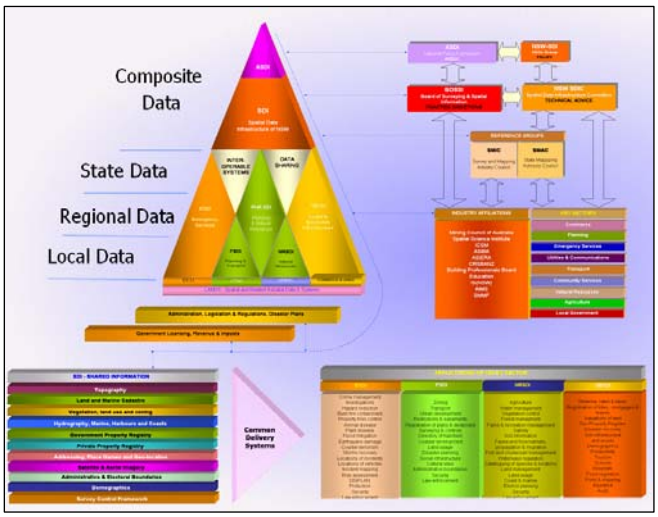
- 1.7m registered plans defining the boundaries of discrete property titles
- 3.5m registered titles recording interests in land
- 30m registered dealings effecting interests in land
- 180,000 registered survey control marks
- 0.5million paper maps
- 3.5million polygons in the DCDB
- Aerial archive of NSW
- Full topographic coverage of NSW

Department of Lands

Summary of Core Business Volumes

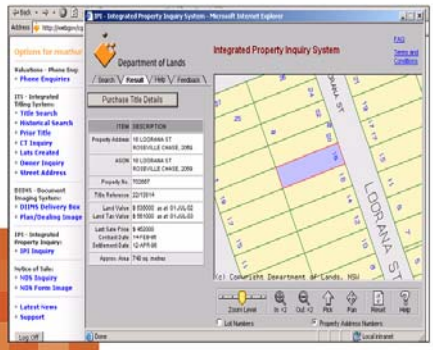
Dealing Registrations	1 million last year
New Titles created	70,000 per year
Total Inquiries Processed Electronically	6 million per year
Search Transactions Processed via Internet	4.7 million in the financial year 2003-04

Department of Lands



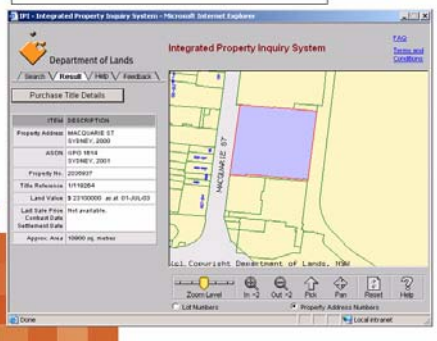
Result – Search by Address

Click on Purchase Title Details

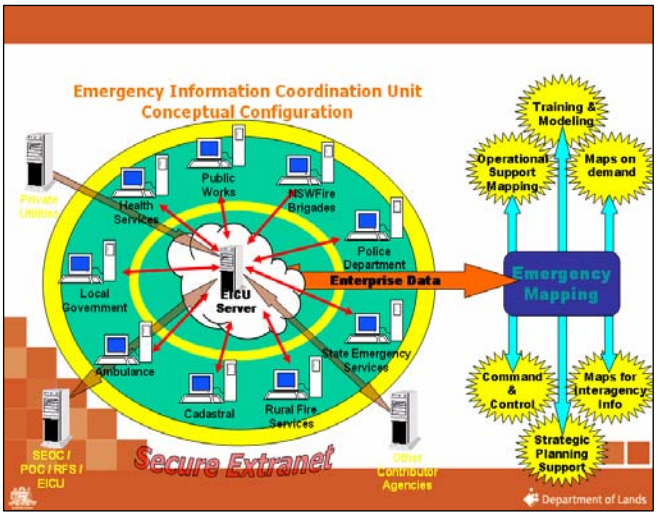


Department of Lands

Result by Property Number



Department of Lands



Positive aspects

- The Torrens system in NSW
- Technology as an enabler
- A register of rights, not just a titling system
- Spatial data infrastructure approach
- Focus on rights, obligations and restrictions in the central register of restrictions
- Surveying outlook, vision and integration

Department of Lands

We are busy building and developing the Title Registries of today and struggling with the complexities of introducing a whole new way of doing business through electronic conveyancing.

But what will the Registries of the future be like?

Department of Lands

Will the role of the Registries within the conveyancing industry change?

Will they be virtual organisations?

Will they be relegated to back-room processing factories?

What will be the scope of their activities?

Will their influence expand across other sectors?

Department of Lands

Before we can consider these questions we need to look at what is happening in related industries and with the associated enabling technology.

Around the world jurisdictions are taking advantage of inter operability and enterprise architecture to link and combine spatial and aspatial data to provide electronic service delivery (ESD) and expose themselves to the concept of "location based services".

The following slide shows the four stages of ESD Activity and the underpinning activity of e-pay.

Department of Lands

ELECTRONIC SERVICE DELIVERY ACTIVITIES

This table outlines ESD activities and describes the role of service providers and customers.

ESD Activity	Service Description	Role of Service Provider	Customer Action	Customer Experience
e-Publish	•Information, instructions, hyperlinks •One way traffic, static	Up-to-date webpage information	Seeks e-information	Static web
e-Inquiry	•Specific inquiry to a database •Multiple or combined inquiry to database •Static view	Up-to-date databases & e-service system	e-Service request	e-Response
e-Lodge	•Client submits information to a database electronically	Process information received through e-facility	e-Transmit by client	e-Receipt
e-Trade	•Two way "trade" of data •Interdependent e-actions •Combination of e-lodge, e-pay and e-inquire	Provides secure, accessible environment for e-market	e-Trade	Staged completion of e-Trade
e-Pay	•Completes financial transfers for all e-activity sales, trades, lodge, billing	Provide access to secure electronic banking services to support business	Authorise payments	e-Receipts e-Debits

Department of Lands

Most of the examples around the world show a proliferation of websites but a relatively low take up rate of these electronic Services, especially those related to "location based services", which are inextricably linked to the core business of RG's and SG's.

This is understandable as most sites have not progressed past the e-publish and e-enquiry stage and it is not until the services can provide e-lodge and e-trade that a comprehensive business interaction can take place.

The present direction in Australia towards e-conveyancing is an example of e-trade. However, some other jurisdictions across the globe who have implemented e-conveyancing have been disappointed by the take up rate – why?.

Department of Lands

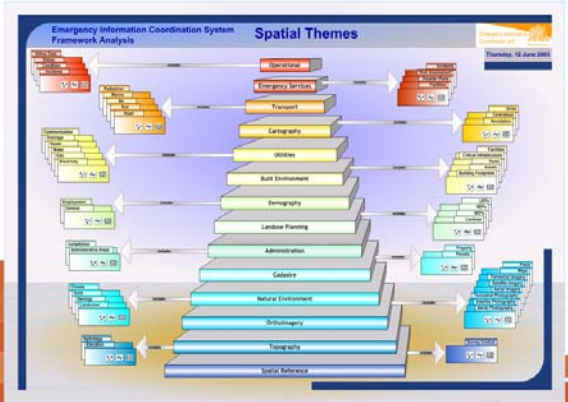
The following slide shows the complexity and hierarchical nature of the layers of geo-spatial information that is required for Emergency Management and Counter Terrorism.

This information relies on cadastral and property information to provide the framework for all the other layers.

Naturally each industry has a different hierarchy of information, but they are all dependent on the fundamental cadastral and property layers.

What will be the role of the Land Registries in such future activitiy ?

Department of Lands



Department of Lands

To access this complex information we need an interoperability framework that allows for a distribution and flexible approach.

This approach means that custodians maintain control of the data but each group or industry with appropriate authority can seamlessly build interactive integrated information sets.

Department of Lands

Given this world of interoperability and whole-of-Government enterprise architecture combined with the ability to provide comprehensive e-trade functionality where do Registries of the future fit in?

If we return to the questions posed at the beginning of these slides we can now address these in the context of the new enabling technologies.

Department of Lands

Will the role of the Registries within the conveyancing industry change?

The way we undertake our business through the registry offices is and will continue to change significantly, however, this should not diminish in any way the leadership role the Registrars General (RG's) will continue to play in the conveyancing and land based industries.

Will the registries of the future be virtual organisations?

Part of the activities could be undertaken in a virtual sense, but the important advisory and leadership role of the Registrars General will not be virtual – what will their "value added be" setting of standards, guiedlines and oversight of statutory compliance.

Department of Lands

Will the Registries be relegated to back-room processing factories?

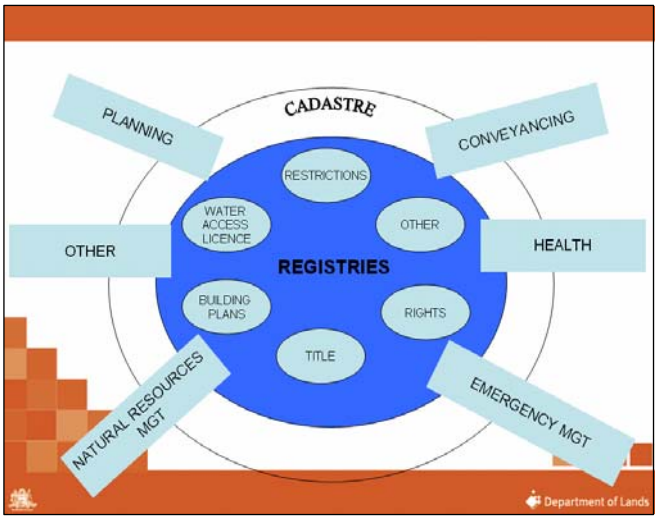
Only if we allow this to happen.

For example, the term 'automatic registration' is sometimes used to describe what is really 'electronic examination'. If these terms give rise to the belief that registration is a simple 'vending machine' transaction, then we will be perceived as a back end process only.

What will be the scope of the activity?

The next slide depicts a range of the expanding activities that some registries are embracing and a selection of the industry sectors that are dependent on this information.

Department of Lands



Department of Lands

Will their influence expand across other sectors?

The preceding slide shows that as a central part of the fundamental building blocks of geo-spatial information, some Registrars may have an expanding responsibility and accountability across other major sectors – they will need to if their relevance is to be increasingly maintained.

Department of Lands

Negative aspects

- Impact of historical policy decisions
- Structural failure and silo mentality – resistance to change.
- Federated system with another tier of local Government

Department of Lands

National co-operative initiatives

- ANZLIC
- PSMA
- National e-conveyancing project
- Counter Terrorism
- National Data Network (Statistical/Spatial Interface)
- National Competition Reform
- Sustainability (landscapes, water, rural, communities)

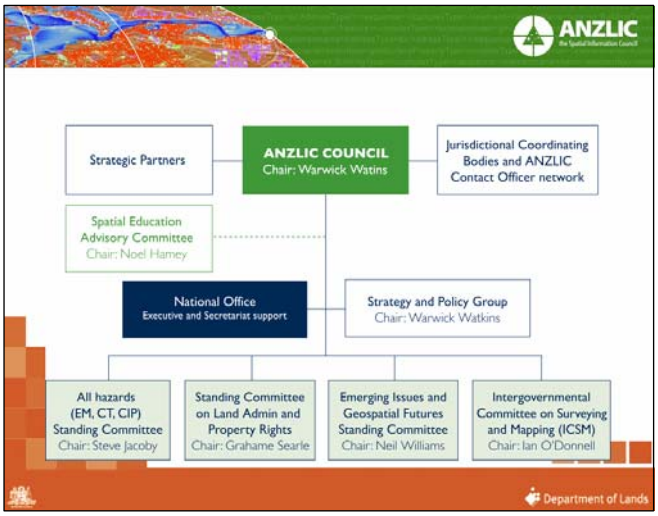
Department of Lands

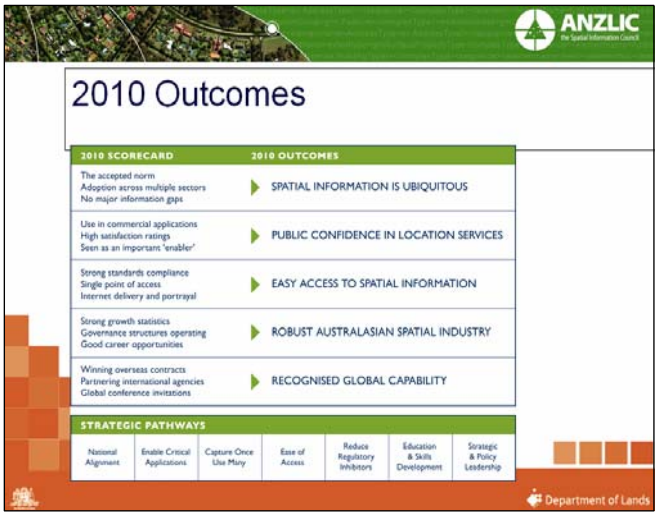
ANZLIC

Who and what is ANZLIC?

ANZLIC – the Spatial Information Council is the peak intergovernmental organisation providing leadership in the collection, management and use of spatial information in Australia and New Zealand

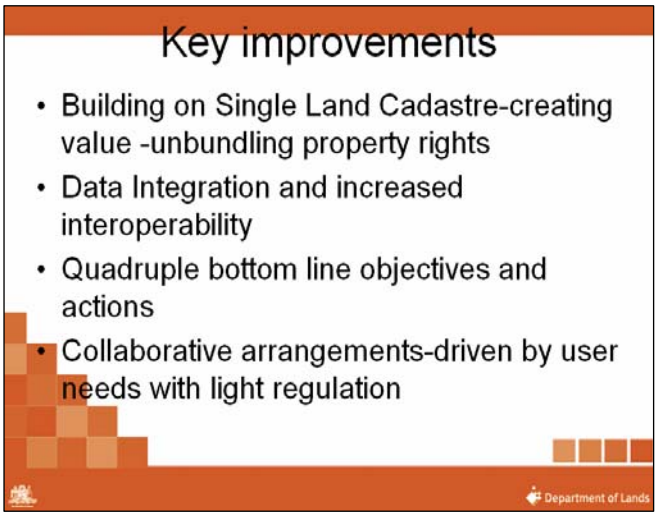
Department of Lands

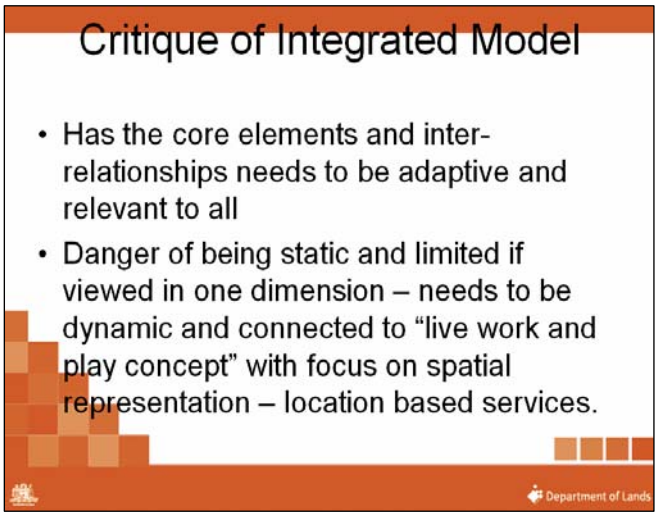

ANZLIC
Strategic Partners
ANZLIC COUNCIL
Chair: Warwick Watins
Jurisdictional Coordinating Bodies and ANZLIC Contact Officer network
Spatial Education Advisory Committee
Chair: Noel Hamey
National Office
Executive and Secretariat support
Strategy and Policy Group
Chair: Warwick Watkins
All hazards (EM, CT, CIP) Standing Committee
Chair: Steve Jacoby
Standing Committee on Land Admin and Property Rights
Chair: Grahame Searle
Emerging Issues and Geospatial Futures Standing Committee
Chair: Neil Williams
Intergovernmental Committee on Surveying and Mapping (ICSM)
Chair: Ian O'Donnell
Department of Lands


ANZLIC
2010 Outcomes
2010 SCORECARD
2010 OUTCOMES
The accepted norm
Adoption across multiple sectors
No major information gaps
SPATIAL INFORMATION IS UBIQUITOUS
Use in commercial applications
High satisfaction ratings
Seen as an important 'enabler'
PUBLIC CONFIDENCE IN LOCATION SERVICES
Strong standards compliance
Single point of access
Internet delivery and portrayal
EASY ACCESS TO SPATIAL INFORMATION
Strong growth statistics
Governance structures operating
Good career opportunities
ROBUST AUSTRALASIAN SPATIAL INDUSTRY
Winning overseas contracts
Partnering international agencies
Global conference invitations
RECOGNISED GLOBAL CAPABILITY
STRATEGIC PATHWAYS
National Alignment
Enable Critical Applications
Capture Once Use Many
Ease of Access
Reduce Regulatory Inhibitors
Education & Skills Development
Strategic & Policy Leadership
Department of Lands


ANZLIC
2006 Milestones
1. Parliament House national SI showcase
2. Jurisdictional SI showcases
3. Showcase "Team Aust/NZ" to FIG in 2006
4. Industry partnerships developed
5. Framework to identify key national datasets
6. Topographic Information Management Toolkit & standards developed
Department of Lands


ANZLIC
2006 Milestones – continued…
7. Develop and deliver metadata tool compliant with new ANZLIC metadata profile
8. One new community of practice engaged
9. Graduate & practitioner recruitment and skills needs/development promoted
10. Schools education package developed
11. Harmonised regulatory framework scoped
Department of Lands


Key improvements
• Building on Single Land Cadastre-creating value -unbundling property rights
• Data Integration and increased interoperability
• Quadruple bottom line objectives and actions
• Collaborative arrangements-driven by user needs with light regulation
Department of Lands


Critique of Integrated Model
• Has the core elements and inter-relationships needs to be adaptive and relevant to all
• Danger of being static and limited if viewed in one dimension – needs to be dynamic and connected to "live work and play concept" with focus on spatial representation – location based services.
Department of Lands

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

A QUEENSLAND PERSPECTIVE IN THE CONTEXT OF THE LAS MODEL

Steven Jacoby and Bronwyn Huitfeldt
General Manager Information Policy,
and
Principal Advisor Information Policy
Department of Natural Resources & Mines Queensland
Email: steven.jacoby@nrm.qld.gov.au

SUMMARY

This paper represents an overview of Queensland's land administration systems in the context of the LAS model. A detailed sketch of the State of Queensland is presented to provide an indication of the size and rate of growth which sets Queensland apart from the other Australian States.

The review highlights that Queensland is a leader in automated land administration systems but lacks the capability to easily discover all interests in land to enable planning and decision making for sustainable growth. Much of the information about interests in land is held in separate, unconnected databases, additionally the fundamental reference layer for spatial information systems in Queensland, the Digital Cadastral Database (DCDB) is parcel based while a number of the interests in land, such as Native Title and mining rights are not parcel based. The lack of a 3D cadastre also has planning and development implications.

INTRODUCTION

Significant effort is underway to address issues including that much of information about interests in land is held in separate, unconnected databases. Additionally the fundamental reference layer for spatial information systems in Queensland, the Digital Cadastral Database (DCDB) is parcel based while a number of the interests in land, such as Native Title and mining rights are not parcel based. The lack of a 3D cadastre also has planning and development implications. Queensland is pursuing a collaborative approach to its sustainability issues with significant incentives for land owners to partner with the Government in developing sustainable approaches to land, vegetation and water management and use. Whole of Government technology initiatives are enabling data sharing and new integrated service delivery options and continual improvements are being made in the availability, access and quality of data.

QUEENSLAND STATE DESCRIPTION (SKETCH)

Area (source: Geodata 100k Coastline database)	1,730,648 SqKms – 22.5% of Australian land area
Population (ABS June 2004)	3,882,037
% Share of Australia's Population (ABS June 2004)	19.3%
Population growth	2.1% (12 months to June 2004. Highest in Australia)
Population increases by LGA (ABS June 2004)	Brisbane City and Gold Coast City Councils rank respectively 1 and 2 in Australia
Brisbane Statistical Division Population as % of Qld population	45.7% (Second lowest of Capitol cities in Australia – Hobart 41.9%)
Local Government Authorities	157 (125 Local Councils plus 15 Aboriginal Councils & 17 Island Councils)
Rateable properties (as at 30 Sept 2005)	1,445,319
Parcels – total (Based on DCDB Sept 2005 figures) The balance of parcels are:: Secondary purpose Lots (eg lease over a Reserve), Road, Water and Easements parcels	DCDB Total parcels = 2660941 Lot parcels = 1946543 DCDB Freehold Tenure = 1838037 Lots (21.2% of State by area) DCDB Leasehold Tenure = 45094 Lots (68.4% of State by area)
Parcels – New 2005 (Based on Sept 2005 figures)	DCDB New parcels since Jan 2005:: 45281 parcels, 36727 Lot parcels
Parcels – Unallocated State Land	DCDB USL tenure = 22251 Lots (0.5% of the State by area)
Reserves	DCDB Crown Reserves = 32601 Lots (0.9% of State by area)
National parks	DCDB National Parks = 2573 Lots (4.1% of State by area)
State Forests, Timber Reserves and Forest Reserves (Declared under the EPA Conservation Act::	DCDB State Forests etc = 3500 Lots (2.5% of State by area)

No. of survey plans in archives	860,555
Parcel dealings 2004-2005	924,160
Water allocation 'titles'	5422
Water registrations	819
Development Mining tenures (Based on Sept 2005 figures)	Minerals = 3893 (0.35% of the State by area) Coal = 237 (0.22% of the State by area) Petroleum Leases = 185 (1.24% of the State by area) Pipeline Licences = 89
Pre-Development Mining tenures	Minerals = 68 (0.03% of the State by area) Coal = 70 (0.225 of the State by area)
Mining Exploration tenures	Minerals = 1156 (8.46% of the State by area) Coal = 200 (3.15% of the State by area) Petroleum = 104 (14.38% of the State by area)
Native Title determination Applications (claims)	188 (Qld) 628 (Aust)
Actual Native title determinations	Consent 32 (Qld) 45 (Aust) Litigated 2 (Qld) 15 (Aust) Unopposed 1 (Qld) 12 (Aust) TOTAL 35 (Qld) 72 (Aust)
Determinations since 1 Jan 2004 to Sept 2005	Qld 14 consent 1 litigated NSW 3 litigated 1 Un-opposed SA 1 litigated WA 3 consent 2 litigated NT 1 litigated
Registered Indigenous Land Use Agreements to 27 Sep 2005	120 (Qld) 192 (Aust)
Professional surveyors	820 surveyors, PLUS 121 Body Corporates
Professional valuers	1397 valuers

POSITIVE ASPECTS OF STATE EXPERIENCE

The Queensland Department of Natural Resources and Mines (NR&M) leads the State in the stewardship of natural resources. In undertaking this role the department has a portfolio responsibility to balance current demands on our natural resources with the sustainable needs of future generations.

The department works closely with other government agencies, industry and the general community to develop and implement programs to achieve common goals for the management and maintenance of Queensland's natural resources. Strategies implemented by the department include consultation, cooperation and partnerships with the community, other agencies and industry to develop and implement policy and planning frameworks, and provide natural resource information, monitoring and evaluation services.

Positive aspects of the Queensland State experience in land administration and land management focus on the three key elements of investment, integration and access. Theses three elements will be discussed using the following examples:

1. the significant investment that the State has in its land administration systems and the level of maturity and integration of those systems;
2. the robustness and integrated character of Queensland's legislative planning framework.
3. access to integrated Government information through the Information Queensland initiative.

Queensland's investment in data and land administration systems

An integrated approach is taken by the department to the sustainable management of the state's land, water, mineral, petroleum and vegetation resources to support Queensland's economic and social development. This integrated approach is evidenced in the department's significant investment in the land administration systems that underpin the department's capability to sustainably manage land based on accurate and comprehensive data.

A number of these systems such as the titling system, cadastral database and land asset management system are mature systems with a long history of data capture and maintenance. However the systems were developed independently over a period of time and contain some inconsistencies in the way that they hold elements of data. Work is underway to rectify these inconsistencies.

Integrated Titles Registration

Land and water registrations are held on the department's automated titling system, providing a definitive "point of truth" for ownership, tenure and other interests. However not all parcels are held in the titles register and a project is planned to integrate some categories of currently non-registered land parcels, such as unallocated State land, Commonwealth land, national parks and state forests into the titles registration infrastructure.

Information in the land registry system is used by/shared with:

- Local government for rating purposes
- Office of State Revenue for land Tax purposes
- State Land Asset Management for rentals on State land
- Queensland Valuers for valuation purposes
- Digital Cadastral Database for graphics.

While significant advances have been made and continue to be progressed in the provision of integrated land interest data by NR&M, a number of interests in land are not recorded in the titling register. These interests include among others:

- Native Title
- Commonwealth heritage listings
- State heritage listings
- Vegetation
- Local Government Planning requirements; and
- Contaminated land (currently registered in the Queensland Environmental Protection Agency's Environmental Management Register (EMR) and the Contaminated Land Register (CLR).

Other NR&M systems using integrated approaches

Current projects are also underway for the integration of water management & use licensing and billing systems. The new integrated system will support the Council Of Australian Government's (COAG) National Water Initiative to encourage the expansion of water markets & trading and the Smart Service Queensland program for delivering online services.

Another departmental system using an integrated approach is the Native Title claims system (QNTIME) which holds a number of datasets that can be overlaid on top of the DCDB's cadastral property boundaries. QNTIME is also able to link to other NR&M information systems such as ATS, the Computerised Inventory of Survey Plans (CISP) , Queensland Valuations and Sales database (QVAS), & the Tenure Administration System (TAS) and quickly retrieve information that can assist in identifying the current tenure of an area of interest and historical plan and tenure information.

Natural resource management (NRM) data is also being made available through the NR&M Environment for Natural Resource Integrated Information (ENRII).

The DCDB- A foundation data set for integration

The department's Digital cadastral database is a continuous spatial dataset defining all State land, freehold land and non-property parcels within the State. It is a fundamental reference layer for spatial information systems in Queensland, recording the property boundaries and related descriptive information of the State's cadastre. Digital cadastral data is used by a variety of organisations as an asset management tool and is an ideal base for searching, planning and analysis of land related information. Most Local Governments in Queensland use digital cadastral data to assist them in their activities.

The DCDB is continuously updated by inputting metes and bounds descriptions from registered plans and from any attribute updates from government gazettes and other administrative notifications. Plans are also in place for electronic lodgement of survey plans.

Selected areas of the dataset are being upgraded for an improved positional accuracy, this is an ongoing process affected by data sharing agreements with Local Governments or by internal projects.

The Integrated Planning Process

The Integrated Planning Act 1997 (IPA) forms the foundation of Queensland's planning and development assessment legislation. IPA provides a framework for achieving ecological sustainability through integrated planning and managing of development and its effects on a 'whole of Government' basis. The legislation established a simple step by step process for making, assessing and deciding development applications in Queensland. This process is called the Integrated Development Assessment System (IDAS).

The Act allows private certifiers to conduct code assessments and to inspect and certify certain works, and it streamlines development approvals by implementing a process under which development applications are considered by a single assessment manager (usually the local government) rather than several State and local government agencies. The planning assessment system has been designed to remove the arbitrary barriers to the submission and assessment of applications, which were a common feature under the previous system.

Information Queensland (IQ) – Access to integrated information

Information Queensland (IQ) is a program in which a number of agencies are collaborating to give users fast and easy online access to Queensland Government information. IQ will lay the groundwork for agencies to deliver integrated information services via a one-stop Queensland Government web portal providing benefits such as:

- Faster and easier access
- Time and cost savings
- Better interactions with government.

Through IQ access will be provided to government-held information on land, resources, demographics, and statistical information; as well as satellite imagery, topography, property and land use information.

By 2008, access will be extended to include all appropriate information held by departments and agencies – from population trends to community facilities and services. The initial access mechanism used by IQ is a web based atlas containing information from 10 Government agencies which allows Queenslanders to search for their properties on the internet, look at satellite pictures of their suburbs, discover local facilities, and learn more about their regions.

NEGATIVE ASPECTS OF STATE EXPERIENCE

Three key factors negatively influence Queensland's capability to effectively and sustainably manage its natural resources – land, water, vegetation, minerals and petroleum. These key factor are:

1. the complex interests of the three tiers of government, Local, State and Federal.
2. The fact that Queensland does not have a 3D cadastre to facilitate planning.
3. Queensland's regulatory approach to land management is being challenged by land owners.

Roles & relationships between the 3 levels of Government

Queensland has a history of relatively strong local government with 158 Local Government Authorities (LGAs), including 15 Aboriginal and 17 Island Councils. This situation reflects a number of factors:

- Queensland is Australia's most decentralised State, with a smaller proportion of the population in the capital city metropolitan area (although this has now become contiguous with the Gold Coast metropolis), a number of quite large regional centres remote from the capital both inland and along the north coast and a strong rural tradition
- Brisbane City Council is the largest local government authority in Australia, with a population of around 850,000 and a budget of well over $1 billion
- Throughout Queensland, local government not State government retains responsibility for water supply and sewerage, and continues to exercise considerable autonomy in planning
- Politically, local government in Queensland is well organised with an effective local government association (LGAQ)

Despite this strong local government base Queensland Local Authorities face a number of significant issues with funding and their relationship with the other two levels of government seen as perhaps the most critical.

The 2002 investigations of the House of Representatives Standing Committee on Economics, Finance and Public Administration inquiry into local government and cost-shifting chaired by the Minister for Regional Services, Territories and Local Government represented an important opportunity to openly debate the financial and budgetary issues and the roles and relationships between the three tiers of government in Australia.

One of the recommendations from that Inquiry involved the development of Intergovernmental Agreements (IGAs) between the different levels of government which could assist with clarifying roles and responsibilities improve financial security, and reduce potential cost shifting to local government.

A 3D-Cadastre for Queensland

The NR&M Digital cadastral database (DCDB) is an abstraction of the information recorded on cadastral surveys, together with some ancillary location data. The primary purpose of the DCDB is to provide an overall picture of the spatial extents of land over which interest are held.

Typically data is entered into the DCDB 5-7 days after the conveyancing process has been concluded and the registration has been processed. While this means that no data is shared by NR&M until the survey is legally registered it is possible for utilities for example to gain access to and be working from, pre-approval plans that were submitted to Local Government Authorities by property developers.

While 3D descriptions of properties are maintained in the titling register the DCDB only includes the footprint of these 3D parcels The 3D geometry is not available in the cadastral geographical data set, and therefore it is not possible to query the 3D situation from the DCDB, nor is it possible to see if two volumetric parcels overlap.

A market need has been identified for additional cadastral data to be made available to support new uses associated with planning and investment. Three dimensional spatially accurate information covering rights, restrictions and obligations needs to be available with merged built and natural data.

NR&M operates within a mature legal and organisational framework and has considerable technical expertise. These factors indicate that NR&M is well positioned to implement a 3D cadastre in the future.

Rights, obligations & restrictions

Over the past two decades law governing land use in all Australian jurisdictions has changed markedly in an attempt to urgently balance land sustainability with the equally pressing need for development. Practices which formerly encouraged and / or subsidised land development and were even a major condition of becoming landholders are now prohibited.

This situation has been exacerbated by the fact that over the last 20 years, and particularly over the last seven, the Federal Government has been taking a much higher profile/interest in the environment and in sustainable land use. This has challenged the historical situation of rights, obligations & restrictions and their administration as the responsibility of the States and Territories while Local Government has administered development rights, generally under guiding State Legislation.

A number of pieces of Federal legislation, particularly those with environmental implications - the Environment Protection and Biodiversity Conservation Act 1999 and the

Native Title Act 1993 have impacted significantly on rights, obligations & restrictions in land.

State legislation, such as the Water Act 2000 and the Vegetation Management Act Amendments of 2004 have also imposed a new regulatory regime on all landholders, resulting in landowners having to significantly change the way that they manage land. Landholders are increasingly required to undertake conservation work from which they perceive little or no immediate benefit, and only limited long term benefits. Figures released recently by Property Rights Australia indicate that as many as 4,000 Queensland landowners may have infringed the vegetation management Act 2004 or the Water Act 2000.

As a result, landholders overwhelmingly believe that they had been economically adversely affected or are having difficulties in pursuing better conservation outcomes on their properties. Many landholders consider it unfair that they should undergo public good conservation activities when they derive only limited benefits and often do not possess the financial capacity to carry out the works required.

BUILDINGS IN THE CADASTRE

Responsibility for the Built environment

Local Government Authorities (LGAs) in Queensland are responsible for town planning, building approvals, local roads, parking, public libraries, public toilets, waste removal, domestic animals and community facilities. In addition, Queensland LGA's provide a wider range of utility services such as water and sewerage compared to other states. This has a major impact on LGA finances. All LGAs are required to provide building certification services for domestic buildings. This includes providing general advice on building applications and issuing building permits.

While recent initiatives such as the State Government South East Queensland (SEQ) Regional Plan have been developed in consultation with the LGAs of South East Queensland to guide growth and development in SEQ over the next two decades there is still a significant level of disconnect between the two levels of Government with regard to the planning and development of the built environment.

Addressing

A number of important addressing initiatives have recently been implemented nationally and in Queensland. These initiatives make it possible, for the first time, to locate the exact position of all physical addresses in Australia. These initiatives include the Geocoded National Address File, or G-NAF, developed by PSMA and the rural addressing and the Property location Index (PLI) initiative being coordinated in Queensland by the Queensland Spatial Information Council (QSIC).

National Cooperation Initiatives

The national agenda is driving a number of key activities at State level in Queensland. These national initiatives have significant policy and resourcing issues at State level and impact on State planning and development activities. Key examples include:

1. The Council of Australian Governments (COAG) water agenda which seeks to establish integrated and consistent approaches to water resource management, including water trading throughout Australia. Queensland's response to the COAG reforms is the Water Act 2000 which converts an existing water license into a

transferable water allocation – an entitlement created within a 10 year Water Resource Plan (WRP) which is legally enforceable, as subordinate legislation.

2. ANZLIC and the PSMA are driving a number of State resourced activities in land management such as the land administration reforms under the ANZLIC Standing Committee on Land Administration and the spatial data activities undertaken to support the PSMA.
3. The National Action Plan for Salinity and Water Quality (NAP) and the Natural Heritage Trust (NHT) are jointly delivered by the Australian and Queensland Governments through bilateral agreements and commit the Queensland and Australian Governments to working with the regions to assist them to develop better representational and structural arrangements to implement fully integrated natural resource management plans.
4. Counter- terrorism is a major national agenda that is driving State activities. In Queensland separate projects have been undertaken to address Government agency preparedness and identification of Critical infrastructure. Disaster recovery planning and business continuity planning are well advanced. Practical exercises have also been undertaken to test the response in the event of a major terrorist event.

THREE KEY IMPROVEMENTS IN THE NEXT DECADE

Data access/quality /Coverage

The Department of Natural Resources & Mines is leading a number of initiatives to improve community access to land related information and to improve the quality of the data and information made available to the community. Key initiatives include the IQ project, a Strategic Data Capture Plan and a revised access and pricing policy for data. These recent initiatives will be refined and enhanced over the next decade to better reflect changing market trends

Concurrent with these initiatives NR&M has recently undertaken a review of its data custodianship to ensure ongoing responsibility and accountability for data management through a whole of lifecycle approach. The implementation of custodianship across NR&M involves a significant culture change and is expected to take some time to fully implement. A key element of the new custodianship regime is a focus on user needs and requirements and a cyclical approach to custodianship with annual reviews and regular reports on activities that support custodianship.

A whole of Government standard on custodianship is currently in draft format and when endorsed will provide added impetus to custodians for better data management processes.

E-business – integration, connectivity

The 2005 Queensland Government Smart Directions statement highlights the importance of providing easily accessible and seamless Government services to all Queenslanders whether they live in Brisbane, regional or island communities. The Smart Directions statement is aimed at ensuring that the Government invests appropriately in ICT, supports the delivery of efficient and effective business operations of Government, and works collaboratively with the ICT industry. Implicit in the Smart Direction statement is a whole of Government technical platform & collaboration between agencies to provide better integrated services and exchange information.

The Smart Directions Statement has five key focus areas:

- Government as a single enterprise
- Enabling the business priorities of Government
- Improving value for money
- Increasing public sector capabilities
- Partnering with the private sector

Key examples of initiatives supporting the focus areas include::

- Integrated Justice Information Strategy (IJIS**)- e**xchange of information through the justice system
- TRANSLink – integrated ticketing
- *Smart Service Queensland* (SSQ**)-** planning and facilitating integrated service delivery
- Information Queensland (IQ**)** – integrated information delivery.

From regulation to cooperative partnership models

The negative perception from landowners over the erosion of their property rights, particularly in land and water, through implementation of recent legislation has been a challenge for the Queensland Government. Ensuring that the requirements on landholders and community were fair and equitable, that landholders had access to the necessary information and financial resources to make transitions in land use and ensuring the sustainable future of the State's resources is a complex balancing act.

The solution has been to try to move from a highly regulatory, compliance and penalty driven regime to a cooperative partnership model between landowners and government. This model is being achieved, and will be refined in the future, through working with landowners on a blueprint for progress at the individual property level using planning instruments that achieve sustainable outcomes for the environment, the landowner and the Government. A recent example of the new collaborative approach is the new $12 million Vegetation Incentives Program (VIP), giving landowners the opportunity to enter into partnership with the State Government to help preserve areas of regenerating natural vegetation.

CONCLUSION

The brief Queensland review documented in this paper supports in generalised terms the proposed LAS model but suggests that the main challenges related to sustainability are in the areas of land management. In particular the need to manage the increasing complexity of land, water, mineral, vegetation, cultural (etc) activities. Difficulties will arise in continuing to extend the 'land' administration system model to cover these other areas.

The model must also better reflect the realities of different policy/legislative levels and responsibilities eg. Local/State/Federal. Rarely will there exist a 'one size fits all' land policy framework or where the policies are readily integrated/complimentary.

An important principle, from a Queensland perspective, that should underpin any LAS model is the essential requirement for availability and access to LAS information by landowners/policy makers to ensure decisions are based on reliable and comprehensive data and information.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the contributions from: Peter Lennon, A/General Manager Land Information, DNR&M Qld; Max Locke, General Manager Titles Registration, DNR&M,Qld; and Graeme Rush, General Manager Land Management & Use, DNR&M Qld.

REFERENCES

Council of Australian Governments Water Reform Framework (2004), http://www.deh.gov.au/water/policy/coag.html

Leyland, M. (2005), Inter-governmental relations in Australia: the cost-shifting inquiry story so far. In Online Opinion. http://www.onlineopinion.com.au/view.asp?article=3712

Bell, P. (2005), The Challenges ahead. In Local Government Focus Jan 2005 http://www.loc-gov-focus.aus.net/editions/2005/january/january.shtml

Department of Natural Resources & Mines (Queensland) (2005), An introduction to water reform http://www.nrm.qld.gov.au/water/reform/pdf/info_paper2.pdf

Department of Natural Resources & Mines (Queensland) (2005), Property Location Index (PLI)http://www.nrm.qld.gov.au/products/access_pricing/dig_data/prop_address_info.html

Information Queensland (2005), http://www.information.qld.gov.au/

Intergovernmental Committee on Surveying & Mapping (ICSM) (2004), Cadastral Reform Workshop: Final report.

Office of Urban Management (2005), South East Queensland Regional Plan http://www.oum.qld.gov.au/?id=241

Rural Road Addressing (QSIC) (2005), http://www.qsiis.qld.gov.au/QSIIS/QCMCS.nsf/TPByUNID/171B6183BD6B99D24A256E4C00158960

Sansom, G. (2002), Three Weddings, a Loveless Marriage and a Rich Uncle:Local Government Reform and Inter-government Relations in Australia http://www.clg.uts.edu.au/Research/WebsiteSansomWellingtonPaper.PDF

Stoter, J. (2004), 3D Cadastre. PhD Theis, Delft University (includes section on Qld 3D cadastre) http://www.itc.nl/library/Papers_2004/phd/stoter.pdf

Prasser, S. (2005), The state of priorities: On Queensland's infrastructure mess In Australian review of Public Affairs http://www.australianreview.net/digest/2005/06/prasser.html

Wypych, S. (2000), Integrated Planning and development Assessment processes. Lessons from Queensland's Integrated planning Act 1997. Paper delivered to the 3rd Annual Urban Planning and management Conference, Sydney 1-2 June 2000.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

AUSTRALIAN GOVERNMENT AND LAND ADMINISTRATION SYSTEMS

Peter Holland
General Manager,
Spatial Industry Information Access and Facilitation Branch,
Geoscience Australia
Email: peter.holland@ga.gov.au

SUMMARY

This paper was prepared for the Expert Group Meeting on Incorporating Sustainable Development Objectives into ICT Enabled Land Administration Systems, University of Melbourne, 9-11 November 2005.

The paper is not a definitive view of the Australian Government on land administration systems. Rather it is a reflection by the author on some of the issues of relevance to the Australian Government. Its purpose is to help inform a broader discussion on the topic at the meeting.

The author was requested by the meeting organisers to present Australian Government views on needs for large scale land related information, particularly cadastral data, land administration data, and people related data and the means available to satisfy them. Issues were to include agriculture, water, marine, Centrelink, environment, tax, emergency response, counter terrorism, immigration, health, quarantine, etc. The author was also asked to critically review the proposed integrated land administration model.

This paper makes a general statement on land administration, describes some of the interests of the Australian Government in land administration systems, outlines the Australian Government spatial data access and pricing policy, identifies some gaps in data availability to Australian Government, and draws some conclusions from this commentary.

LAND ADMINISTRATION

A system or systems for recording land ownership, land values, land use and other land-related data is an indispensable tool for a market economy like Australia to work properly, as well as for sustainable management of land resources. All industrialised nations with a market economy maintain some sort of land register system that fulfils these requirements. A good land administration system will (UN, 1996):

- Guarantee ownership and security of tenure;
- Support land and property taxation;
- Provide security for credit;
- Develop and monitor land markets;
- Protect State lands;
- Reduce land disputes;
- Facilitate land reform;
- Improve urban planning and infrastructure development;
- Support environmental management; and
- Produce statistical data.

Australian States are under some pressure to reform land administration systems, given the plethora of interests, obligations and rights over land, many of which are not recorded on land titles and are administered by authorities at all levels of government (ANZLIC 2005). These authorities include Australian government entities.

SOME OF THE INTERESTS OF THE AUSTRALIAN GOVERNMENT IN LAND ADMINISTRATION SYSTEMS

The Commonwealth of Australia Constitution Act defines the legislative powers of the Federal Parliament. These powers do not overtly include land administration, which are a responsibility of the States and Territories, with some important exceptions such as the Great Barrier Reef region and Commonwealth waters. Execution of some Commonwealth powers is facilitated by (or potentially hindered by) matters of land administration. These include:

- Taxation;
- Census and statistics;
- Banking and insurance;
- Communication;
- Defence; and
- Pensions and allowances.

An obvious area of Commonwealth reliance on land administration systems relates to its need to acquire and dispose of property.

Australian Government administrative arrangements reflect the constitutional responsibilities of the Commonwealth, policy priorities at a particular point in time, and other relevant considerations. Many Ministerial portfolios have interests that are touched upon by land administration systems. In terms of present administrative arrangements, these include (Commonwealth of Australia, 2004):

- Treasury and finance and administration;
- Transport and regional services;
- Defence;

- Attorney-General;
- Human services, health and ageing, and family and community services;
- Environment and heritage;
- Communications, information technology and the arts;
- Agriculture, fisheries and forestry; and
- Industry, tourism and resources.

The Australian Government has interest in land administration as a user. That is, relying upon these systems, or accessing data from these systems, to give effect to policy and program implementation. The Australian Government could also have an interest in these systems insofar as they may adversely impact on the efficient operation of the national economy.

However, in exercising its powers the Australian Government does place land-based responsibilities upon individuals, States, and itself. For example the Commonwealth Environmental Protection and Biodiversity Conservation Act (EPBC) addresses only matters of National environmental significance, but this has the effect of limiting the rights of individuals at a local scale. State governments are following a similar pattern, through for example anti-pollution and land-clearing legislation. These (growing) responsibilities and rights are not closely linked to land ownership, and are therefore not well represented in traditional, ownership-based, land administration systems. Accurately representing these obligations is therefore a basic requirement of and important challenge for any comprehensive land administration system.

SPATIAL DATA POLICY

The Australian Government has a policy on spatial data access and pricing. The purpose of the policy is to provide a whole-of-government approach to pricing of fundamental spatial data. A whole-of-government approach is designed to ensure efficient and effective use of resources and maximise the economic and social benefit to the nation through the use of this important information resource.

The policy applies to fundamental spatial data collected by agencies in the public interest, where copyright in these data is held by the Australian Government. The fundamental spatial data, and related custodian agencies, are described in a schedule to the policy.

The essential elements of the policy are:

- Fundamental spatial data is provided free of charge over the Internet, and at no more than the marginal cost of transfer for packaged products, and full cost of transfer for customised services;
- There are no restrictions on commercial value-adding to the listed fundamental spatial datasets, although each transaction is subject to a licence setting out the conditions of the transfer; and
- The Australian Government will negotiate a multilateral agreement with the States and Territories for access to spatial datasets required for Australian Government purposes.

In 2004-05 the Australian Government:

- Delivered 220,000 copies of schedule datasets, an increase of 318% over the previous year;
- Spent $80 million on spatial data production and maintenance, an increase of 8% over the previous year;

- Earned revenue of $2.4 million from sales of schedule datasets, an increase of 54% over the previous year; and
- Introduced a whole-of-government licence registration service and developed a new metadata profile based ISO 19115 to improve access to data under the policy.

SOME GAPS IN DATA AVAILABILITY TO AUSTRALIAN GOVERNMENT

Many Australian Government agencies use spatial data. These agencies include:

- Australian Antarctic Division
- Australian Bureau of Statistics;
- Australian Electoral Commission;
- Australian Fisheries Management Authority;
- Australian Hydrographic Service;
- Australian Institute of Marine Science;
- Australian Maritime Safety Authority;
- Bureau of Meteorology;
- Centrelink;
- CSIRO Land and Water;
- Defence Imagery and Geospatial Organisation;
- Department of Agriculture, Fisheries and Forestry;
- Department of Communications, Information Technology and the Arts;
- Department of the Environment and Heritage;
- Department of Family and Community Services;
- Department of Health and Ageing;
- Department of Veterans' affairs;
- Directorate of Oceanography and Meteorology;
- Emergency Management Australia;
- Geoscience Australia;
- Great Barrier Reef Marine Park Authority;
- National Land and Water Resources Audit;
- National Native Title Tribunal; and
- National Oceans Office.

In 2004-05 a number of Australian Government agencies were asked whether there were gaps in data available under the spatial data policy and whether they were interested in joint procurement of missing datasets. Notwithstanding the number of responses to the question there were still many Australian Government agencies that were not asked the question.

The following table lists those datasets where five or more agencies expressed a willingness to collaborate on procurement, and where it would be desirable to add these datasets to the policy schedule.

Category	Sub-category	Dataset name	Custodian	Number of requesting agencies
Society	Census data	CData	ABS	15
Boundaries	Administrative	Administrative	PSMA	14

Category	Sub-category	Dataset name	Custodian	Number of requesting agencies
	Boundaries	Boundaries		
Transportation	Streets and Roads	Streetpro	MAPINFO	14
Transportation	Transport & Topography	Transport & Topography	PSMA	13
Location	Other Man-made Features	Streetpro	MAPINFO	13
Boundaries	Postcode Boundaries	Postcodes Australia	MAPINFO	11
Location	Health Care Facilities	Hospital Locations	DOHA	10
Oceans	Bathymetry	Seafloor Topography	AHS	9
Location	Education Facilities	School Locations	DEST	9
Elevation	Topography	TOPO 250K	GA	8
Planning, Cadastre	Land Tenure and Use	National Land Cadastre	?	7
Planning, Cadastre	Land Tenure and Use	State Cadastres	STATES	7
Planning, Cadastre	Street Addresses	GNAF	PSMA	7
Location	Government Facilities	Office Locations	DOTARS	7
Environment	Natural Resource Management	Land Use	BRS	7
Software	GIS	ESRI Products	ESRI	7
Oceans	Ocean Temperature	Ocean Temperature	CSIRO	6
Oceans	Ocean Salinity/density	Salinity/Density	NOO	6
Environment	Land Tenure and Use	Cropping and Irrigation Areas	BRS	6
Planning, Cadastre	Cadastre	CadLite	PSMA	6
Location	Places	Points of Interest	PSMA	6
Society	Natural Resource Management	Socioeconomic Census	ABS	6

Category	Sub-category	Dataset name	Custodian	Number of requesting agencies
Imagery, Base Maps, Earth Cover	Satellite Optical Imagery - Australian Mainland	HiRes (Quick Bird, Spot 5, Ikonos)	GA	6
Oceans	Bathymetry	Coastal (1:80 001 to 1:300 000)	AHS	5
Oceans	Bathymetry	General (1:300 001 to 1:2 250 000)	AHS	5
Planning, Cadastre	Land Tenure and Use	Commonwealth Interests in Land	DEH	5
Boundaries	National Parks	Marine Parks	GA	5
Environment	Natural Resource Management	Soils – condition	CSIRO	5
Oceans	Marine Sediments	Marine Sediments	NOO	5
Oceans	Ocean Chemistry	Ocean Chemistry	NOO	5
Oceans	Ocean Circulation	Ocean Circulation	NOO	5
Oceans	Ocean Waves	Ocean Waves	NOO	5
Oceans	Ocean Winds	Ocean Winds	NOO	5
Oceans	Tides	Tides	AHS	5
Elevation	Topography	Physical Large Scale (1:25 000)	STATES	5
Oceans	Bathymetry	World (1:2 250 001 and smaller)	AODC	5
Utilities, Communication	Infrastructure	Utility Networks	STATES	5
Utilities, Communication	Infrastructure	Critical Infrastructure	GA	5

Agencies were not specifically asked to identify the data they needed from land administration systems and whether these systems adequately whether these systems were able to adequately provide these data.

CONCLUSION

Good land administration systems help facilitate good outcomes for Australian Government, particularly in terms of policy and program implementation. For example, Australian Government is interested in the efficient operation of the economy and related

markets. Therefore, it would most likely not wish to see land administration arrangements contribute adversely to these outcomes. Notwithstanding, Australian Government has traditionally deferred to States and Territories in matters related to land administration.

There are several gaps in spatial data required by Australian Government. A few gaps are data that Australian Government agencies believe should be available from land administration systems. A number of Australian Government agencies would like to see these data made available under the conditions of the spatial data policy.

Data from land administration systems is likely to become more important to decision-making in a national context in the future. Whole-of-national-government issues like counter terrorism, bio-security and climate change are present examples. Reform of land administration systems might include a more national approach to access to information from these systems.

Several Australian Government agencies administer interests, rights and obligations that affect land. In effect these interests overlay the cadastre. Some are of the view that the cadastre must be able to accommodate all of these interests, now and in the future. A risk in this approach is that already complex systems will become even more complex and potentially ineffective. Flexible, extendable and interoperable approaches are required to manage interest overlays. Efforts by States and Territories to reform land administration systems, particularly in regard to the issue of interests, rights and obligations, will need to involve relevant Australian Government parties.

The author has not attempted to critically review the proposed integrated land administration model in this paper. Feedback will be provided during discussion at the meeting. Nor has the author been able to undertake an extensive analysis of the need by Australian government for access to data in land administration systems. This would require more research.

APPENDIX A – USE OF SPATIAL DATA IN AUSTRALIAN GOVERNMENT AGENCIES

Australian Antarctic Division

The Australian Antarctic Division (AAD) leads Australia's Antarctic Program. As an agency of the Department of the Environment and Heritage, its charter is to ensure Australia's Antarctic interests are advanced by maintaining the Antarctic Treaty System and enhancing Australia's influence in it; protecting the Antarctic environment; understanding the role of Antarctica in the global climate system; and undertaking scientific work of practical, economic and national significance.

The Australian Antarctic Data Centre (AADC) was established, within the AAD to provide a national facility to manage and disseminate scientific data resulting from Australia's Antarctic scientific research program in response to Article III.1.c of the Antarctic Treaty which states that "scientific observations and results from Antarctica shall be exchanged and made freely available." As per the Antarctic Treaty, the AAD makes data freely available and accessible. The AAD is the leading Antarctic Data Centre. GIS and remote sensing allows the AAD to efficiently monitor the Antarctic environment, and to plan effective response strategies. Through archival of Antarctic data, and creation of databases such as the State of Environment database, the AAD provides a valuable resource for the better understanding of global climate. Having a spatial data archive allows scientists to more effectively plan future work. The AAD is able to support current scientific programs with data resources and substantial GIS capabilities. Almost all of the data handled by the AADC has a spatial component. The AAD uses GIS and other spatial technologies to manage, manipulate, publish and disseminate data.

Australian Bureau of Statistics

The Australian Bureau of Statistics (ABS) is Australia's official statistical organisation. The ABS assists and encourages informed decision-making, research and discussion within governments and the community, by providing a high quality, objective and responsive national statistical service.

The ABS uses spatial data to manage the collection, processing and dissemination of statistics. Detailed spatial data covering all of Australia is used to design and map enumeration areas and to manage the collection phase of surveys and censuses. The ABS also delineates precise boundaries describing the regions for which statistics are published. These boundaries, or geographical classifications, inform the users of statistics on the size, shape and location of the area to which a particular statistic relates and are thus a vital item of metadata for the statistics.

Australian Electoral Commission

The Australian Electoral Commission's charter is to help its primary customer, the eligible voter, have a say in who will represent him or her in the government of Australia.

Spatial data and GIS systems are used to model and finalise the boundaries of federal electoral divisions during the periodic redistribution of electoral boundaries as required in accordance with the *Commonwealth Electoral Act 1918*. Spatial data is used to produce electoral maps and is made available to interested parties in electronic and/or paper form for use as required.

Australian Fisheries Management Authority

The Australian Fisheries Management Authority (AFMA) manages the resources of Australian Commonwealth fisheries on behalf of the Australian community and key stakeholders.

Spatial data is used as outputs in reports, and is used as both outputs and filters in internal fishery management functions. AFMA uses fishery boundary maps provided by Geoscience Australia, maps of various types of fishery closures, and maps from external sources such as boundaries of marine parks and bathymetry maps.

Australian Hydrographic Office

The role of the Australian Hydrographic Office (AHO) is provision of official nautical charting and related products to Defence and the maritime community and the management and maintenance of Australia's hydrographic survey archive.

As the national charting authority, spatial data is fundamental to the performance of the AHO role and critical to achieving its charting and defence objectives. The hydrographic survey archive is a conglomerate of survey fairsheets of Australian waters collected over a period of 200 years by the United Kingdom Hydrographic Office, the Royal Australian Navy, and submissions by private companies. Whilst these fairsheets do not represent the final fundamental dataset as defined in the policy schedule, this is the nearest equivalent available at present. Owing to national security concerns, not all fairsheets can be released outside Defence.

Australian Institute of Marine Science

The charter of the Australian Institute of Marine Science (AIMS) is to generate the knowledge to support the sustainable use and protection of the marine environment through innovative, world-class scientific and technological research.

GIS is used extensively as a data integration tool to allow AIMS to compile a number of complex datasets into a single geographic system or layer. Remote sensing is used for sea surface and ocean colour mapping and subsequent mapping and monitoring of ocean systems.

Australian Maritime Safety Authority

The Australian Maritime Safety Authority (AMSA) is a largely self-funded Australian Government agency with the charter of enhancing efficiency in the delivery of safety and other services to the Australian maritime industry. This is achieved through the provision of highly effective maritime safety, aviation and marine search and rescue, and marine environment protection services.

Almost everything AMSA does has a spatial context. GIS application and data is mission critical for AMSA. It supports the operations of emergency response 24/7. An incident has a latitude and longitude. GIS is used in every aspect of incident response from intelligence collection, data modeling and search planning; to asset allocation, reporting and training. The combination of specialised tools and extensive use of spatial data in four dimensions has greatly increased the efficiency of response to search and rescue and marine pollution incidents.

Bureau of Meteorology

The purpose of the Bureau of Meteorology (BoM) is to contribute to Australia's social, environmental, economic and cultural goals through the performance of the functions of a

National Meteorological Service in the public interest generally and in particular for the purposes of the Defence Force; civil aviation, navigation and shipping; and primary production, industry, trade and commerce.

Spatial data and associated technologies assist BoM through the provision of more accurate and authoritative data; greater techniques for investigating and manipulating spatial data; and use of visualisation tools for improved information provision.

Centrelink

Centrelink is an Australian Government agency delivering a range of services to the Australian community. Centrelink was created to provide superior service to the community by linking Australian Government services and achieving best practice in service delivery. Centrelink is set up so people can get more of the help they need in one place.

Spatial data assists with analysis of Centrelink resources and customer demographics; and determining optimal locations for Centrelink resources.

CSIRO Land and Water

CSIRO Land and Water's Charter is to develop innovative solutions for Australia's land and water management challenges, with the aim of delivering options to policy makers and land managers that are economically viable, socially acceptable and environmentally sustainable.

Spatial information and related technologies are important to many of the research projects undertaken by CSIRO Land and Water. There are two groups within the Division (Spatial Analysis and Remote Sensing) consisting of around 40 staff whose prime mandate is the application of these tools to meet Divisional objectives. Spatial information is used as an input into most of the Division's models and is generated as an output for many. In fact a number of the models for environmental processes developed by CSIRO scientists have been implemented using spatial technologies. The Division also has scientist skilled in the generation of many spatial datasets; in particular, terrain related information such as digital elevation models.

Defence Imagery and Geospatial Organisation

The charter of the Defence Imagery and Geospatial Organisation (DIGO) is to provide geospatial intelligence from imagery and other sources, in support of Australia's defence and national interests.

Spatial data and associated products are crucial in the production of geospatial intelligence products to assist Defence in its planning and execution of its mission.

Department of Agriculture, Fisheries and Forestry

The Department of Agriculture, Fisheries and Forestry (DAFF) is responsible for Australia's agricultural, fisheries, forestry and food industries. Its role is to increase the competitiveness, profitability and sustainability of these industries through sustainable use and management of the natural resources; protecting the health and safety of our plant and animal industries; responsive and efficient industry; improved market access and performance; benefiting from new technology and practices; and skilled, financially self-reliant producers.

Spatial data and associated technologies provide part of the mechanism for undertaking and delivering scientific assessments of available data and information products which drive

good policy and decision-making. Our clients are in government, research, education and in the private sector and span the full range from large corporations to individuals.

Department of Communications, Information Technology and the Arts

The Australian Government Department of Communications, Information Technology and the Arts (DCITA) provides strategic advice and professional support to the Australian Government on a wide range of significant and rapidly changing policy areas including arts and culture, broadcasting and online regulation, indigenous programs, information and communications technology, the information economy, intellectual property, post, sport and telecommunications. DCITA also administers legislation, regulations, grants, and incentives to industry and the wider community.

Spatial data is used in the formulation of policy advice, the development and administration of programs and for analytical modeling in relation to industries relevant to portfolio activities and responsibilities. Several programs administered by the Department are supported by spatial data analysis and the provision of information in interactive map form through the telinfo portal. Modeling activities include estimation of premise catchment areas for infrastructure subsidies, and as a base for cost modeling of telecommunications infrastructure.

Department of the Environment and Heritage

The goal of the Australian Government Department of the Environment and Heritage (DEH) is a natural and cultural environment, valued, enhanced and protected in harmony with the nation's social and economic goals. The Department's mission is national leadership in the protection and conservation of the environment.

DEH's comprehensive, accurate and accessible information base together with a range of different levels of GIS applications provide the agency with high quality, timely, comprehensive advice to the Minister on environmental policy and legislation; and tools that enable the Government to make informed environmental decisions, and provide information for the community.

Department of Family and Community Services

The Family and Community Services portfolio is responsible for a broad range of social policy issues affecting Australian society and the living standards of Australian families, communities and individuals. The portfolio is responsible for income support, housing policy, community support, disability services, child care services and family issues, including family payments, child support and family relationships. The Department of Family and Community Services (FaCS) advises the Australian Government on all policy issues within the portfolio, and manages the delivery of FaCS services through a range of service providers. FaCS also advises the Government on the social policy implications of wider government policy including taxation, superannuation and savings policy. As well as families, FaCS focuses on groups with differing needs such as young people and students, people living in rural and remote areas, Aboriginal and Torres Strait Islander peoples and people from diverse cultural and linguistic backgrounds. The FaCS national office is located in Canberra and employs about 1,800 staff at locations around Australia.

Spatial data and associated GIS techniques assist FaCS to map geographical areas of Australia with needs for social welfare services, to establish the locations and service areas of FaCS-funded welfare service provider organisations and thus to identify gaps and overlaps in current service provision. Classifying both citizens and services into the remoteness categories — Major Cities, Regional and Remote — is an important reporting

function performed by GIS. The acquisition of spatial datasets of relevance to indigenous welfare service management has become a recent priority as a result of FaCS inheriting some staff and functions of the former Aboriginal and Torres Strait Islander Commission.

Department of Health and Ageing

The Department of Health and Ageing (DoHA) vision is better health and healthier ageing for all Australians.

DoHA uses spatial data in program design, funding and reporting. Eligibility for certain programs is based on geographic location (e.g. outer metropolitan funding for general practitioners and rural health initiatives). DoHA may also report on the services delivered in metropolitan, rural and remote areas.

Department of Veterans' Affairs

The Department of Veterans' Affairs exists to serve members of the Australia's veteran and defence force communities, war widows and widowers, widows and dependants, through programs of rehabilitation, compensation, income support, commemoration and defence support services.

Spatial data, in the form of geocoded information, assists in enhancing the delivery of services and better targeting service to the Department's clients, in terms of their location. It is also used in the management of contract with health providers, in relation to the availability of health services.

Directorate of Oceanography and Meteorology

The Directorate of Oceanography and Meteorology (DOM)is responsible for the acquisition, management, production and distribution of meteorological and oceanographic information to support our Defence Force and national infrastructure; enable our Defence Force to utilise the above and below water physical operating environments for strategic, operational and tactical advantage; contribute to the preservation of the marine environment, and satisfy national and international obligations to manage oceanographic data. The Defence Oceanographic Data Centre (DODC) performs the data related functions of the Directorate: archiving and managing marine environmental data collected by the Royal Australian Navy; developing products based on climatological statistics and historical observations, and disseminating this information in GIS formats to support the planning and conduct of Australian Defence Force activities. DODC has also operated as the Australian Oceanographic Data Centre within the UNESCO Intergovernmental Oceanographic Commission since 1965, participating in various international data collection, management and exchange programs. DOM is currently a partner to the newly formed Australian Ocean Data Centre Joint Facility and is transitioning national responsibilities to the new organisation.

Within the Defence information environment all meteorological and oceanographic data is considered spatial data and must therefore be disseminated using GIS technologies. The availability of this spatial information to the military planners and warfighters is a critical force enabler and directly contributes to operational success and the protection of units and embarked personnel. Standards-based spatial data and technologies also underpin the Directorate's contribution to preservation of the marine environment and participation in data management activities through improved interoperability and rapid access and visualisation when coupled with web technologies.

Emergency Management Australia

Emergency Management Australia (EMA) provides national leadership in the development of measures to reduce risk to communities and manage the consequences of disasters.

EMA is planning to implement GIS and spatial data systems for:

1. National Emergency Management Coordination Centre
   - Improve response, communication, coordination, planning, and consequence management.
   - Provide parity with existing facilities in States and Territories.
   - Utilise and amend real-time data in a distributed environment.
   - Enable dynamic publishing and editing of map layers by work groups.
2. Education and training
   - Use GIS in training courses to reflect current emergency management practice.
   - Raising awareness and institutionalising GIS in emergency management.
   - Simulation and scenario modelling.
   - Little need for real-time data; would use pre-packaged data to which event developments (injects) would be added. Interoperability applications not scoped but EmerGeo would seem suitable.
   - Use of GIS for education and training would be via LAN rather than web and would typically involve 12–20 students over 1–3 days in emergency planning exercises or simulations at Mt Macedon, Victoria.
3. Knowledge management and business
   - Research wider applications of GIS in emergency management.
   - Enable closer working relationship with ANZLIC.
   - General awareness-raising and information management.
   - Research and development in areas such as spatial capability on the EMA Disasters Database, use of GIS in recovery planning, land use planning and information management.

Geoscience Australia

Geoscience Australia (GA) plays a critical national role by producing first-class geoscientific information and knowledge that enables government and community to make informed decisions about the exploitation of resources, the management of the environment, the safety of critical infrastructure, and the resultant well-being of all Australians.

In undertaking research and in the development of spatial data products the agency utilises both GIS and remote sensing technologies extensively. Geoscience Australia's primary objective is to enhance potential for Australian community to obtain economic, social and environmental benefits through the application of first-class geoscientific research and information. Geoscience Australia's activities are reflected in: the level of global oil, gas and mining exploration industry investment in Australia; its contributions to resource management; the information it generates to support regional development and environmental protection; its work on maritime boundaries and its direct contribution to establishing and maintaining Australia's sovereignty; its geomagnetic information and advice provided to maintain navigation standards for maritime transport and aviation industries; and its geohazards information which is assisting communities to better plan for and mitigate against the risks and effects of natural and, increasingly, man-made hazards.

Great Barrier Reef Marine Park Authority

The Charter of the Great Barrier Reef Marine Park Authority (GBRMPA) is to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the Great Barrier Reef Marine Park, an area of 344,000 km2. The GBRMPA administers the Great Barrier Reef Marine Park Act (1975) including permitting tourism and other operations in the Great Barrier Reef Region. A system of zoning, including roughly 2000 legally defined boundaries, is a primary land administration tool.

Spatial data assists GBRMPA by delivering high quality spatial analysis, GIS and mapping services to support marine park management decisions. The GBRMPA uses spatial data to communicate legal boundaries to the public through hard-copy maps, on-line maps, and down-load of boundary coordinates from the GBRMPA web site.

National Land and Water Resources Audit

The Charter of the National Land and Water Resources Audit is to provide data, information and nationwide assessments of Australia's land water and biological resources to support sustainable development.

Spatial data underpins most of the assessments of natural resource condition and trend at national, state and regional levels. Data on natural resources is often collected through remote sensing technologies and analysed and modeled with spatial tools such as GIS. The application of spatial technologies to natural resource management has steadily increased over the past two decades.

National Native Title Tribunal

The Charter of the National Native Title Tribunal (NNTT) is to assist people to resolve native title issues.

Spatial data and associated techniques allow the NNTT to enable searches of native title registers, for which it is the custodian. It is necessary to define and maintain a spatial definition of each application, agreement and determination. For efficiency and effectiveness of operations these records need to be spatially compatible with those matters associated with land administration and management practices, such as land parcels, tenements, and other land/water interests, that as part of due diligence processes, need to be considered in association with native title.

National Oceans Office

The functions of the National Oceans Office (NOO) are to: provide secretariat and technical support to the National Oceans Advisory Group, Oceans Policy Science Advisory Group and Regional Marine Plan Steering Committees; coordinate the development of Regional Marine Plans (RMP); coordinate the overall implementation and further development of Australia's Oceans Policy (AOP); act as the main administrative coordination point between the Commonwealth, States and Territories on oceans policy issues; and coordinate and distribute information to all stakeholders on oceans policy and regional marine planning matters.

Spatial data (covering oceanography, biology, geology and human uses of the marine environment) is the raw material that NOO uses to progress its Oceans Policy and RMP work. Its availability, quality and coverage directly impacts on the Office's (and the Australian Government's) ability to make informed decisions on marine management and planning matters. Spatial data tools such as GIS are widely used by NOO and its

contractors (often science agencies) to collate, manipulate, integrate and display marine data that underpins AOP and RMP activity.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

THE PSMA AUSTRALIA PERSPECTIVE

Graeme Rush
General Manager, Land Management and Use
Department of Natural Resources and Mines Queensland
and
Director, PSMA Australia Limited
Email: graeme.rush@nrm.qldgov.au

SUMMARY

PSMA Australia Limited (Public Sector Mapping Agencies Australia) is an unlisted public company, established under the Corporations Act (2001), wholly owned by the state, territory and Australian Governments.

It draws on the public sector's extensive, but discrete, geospatial data resources to co-ordinate the development of national datasets that deliver economic, environmental and social benefits to Australia.

The Board of Directors consists of nominees of each shareholder and an independent chairman, Mr Olaf Hedberg. The company was incorporated in 2001 with a paid up share value of $8, and now has assets in excess of M$6. The company office is located in Canberra with staff numbers increasing from 1 to 7 in the years since incorporation.

This paper describes PSMA's role within the spatial information industry in Australia including its role in Land Management.

INTRODUCTION

PSMA Australia Limited (Public Sector Mapping Agencies Australia) is an unlisted public company, established under the Corporations Act (2001), wholly owned by the state, territory and Australian Governments.

It draws on the public sector's extensive, but discrete, geospatial data resources to co-ordinate the development of national datasets that deliver economic, environmental and social benefits to Australia.

The Board of Directors consists of nominees of each shareholder and an independent chairman, Mr Olaf Hedberg. The company was incorporated in 2001 with a paid up share value of $8, and now has assets in excess of M$6. The company office is located in Canberra with staff numbers increasing from 1 to 7 in the years since incorporation.

A BRIEF HISTORY OF PSMA

When the six colonies of Australia came together as States within the Federation of Australia in 1901, each State maintained responsibility for its own jurisdictional mapping, charting and recording of land title.

This continues to this day, with the additional level of approximately 717 Local Governments responsible for building and planning approvals.

Over the years, Australia developed a wealth of spatial information, using discrete State-based systems and different standards across the nation. This effectively prevented a natural progression to a seamless national dataset, and Australia's relatively small population made a commercial enterprise of this nature unviable.

In an increasingly demanding commercial and technological environment, the absence of a national dataset could not be ignored.

In 1992, the Australia Bureau of Statistics (ABS) sought a single contractor to source base map data from the public sector to produce maps for analysis and integration dissemination products.

The Australian Public Sector Mapping Agencies responded to the call, bidding for the project through a consortium with, and represented by the NSW Land Information Centre. This was the first time the mapping agencies had considered pooling their data resources.

Upon giving a guarantee that they would deliver to specification in time for the 1996 Census of Population and Housing, the Public Sector Mapping Agency, representing 9 different Federal, State and Territory jurisdictions, was awarded the ABS contract in June 1993.

With support and cooperation from the Australian and New Zealand Land Information Council (ANZLIC), the Intergovernmental Committee on Surveying and Mapping (ICSM), the States and Territories, and the private sector, the PSMA embarked upon the Census Project.

The Census Project was a success with the PSMA delivering as agreed. It was this project that created the opportunity for a valuable national geospatial framework, and highlighted the potential for the application of an integrated map database for other uses.

Following this success, the PSMA was approached by other private and public organisations with national activities to create or provide other national datasets.

With the benefit of the nation as a priority and non-exclusive brokering a condition, the PSMA developed strategies to create further national datasets.

The PSMA's growing success in this area over the following few years drew attention to the suitability of its potentially-limiting public sector structure.

In June 2001, the PSMA was incorporated to form PSMA Australia Limited, an unlisted public company, limited by shares and owned by the Governments of Australia.

Today PSMA Australia closes the institutional distance between public sector resources and private sector needs. The company exists to coordinate the assembly of, and facilitate public and private sector access to fundamental national geospatial datasets.

PSMA Australia's Vision is "the creation of a national asset of comprehensive, quality and accessible spatial knowledge".

PSMA Australia's Mission is "the return of economic, environmental and social benefits to the nation through the coordination, assembly and delivery of standards-compliant, national datasets".

As detailed in the PSMA Australia Limited Constitution, the objects listed below collectively define the scope of company operations. The Objects of the Company include:

- To coordinate, assemble and deliver national products from jurisdictional datasets and to achieve the widest possible use of the PSMA Australia datasets;
- To contribute to the establishment of the Australian Spatial Data Infrastructure that is being facilitated through (ANZLIC);
- To promote Australian land information knowledge, expertise and technology which may be marketed both in Australia and overseas.

PSMA AUSTRALIA'S MARKETPLACE FOR NATIONAL DATASETS

PSMA Australia grew out of a marketplace need. The ABS were dissatisfied with their previous map supplier (the Commonwealth Mapping Agency) and went to the marketplace. The consortium of Australian Mapping Agencies responded to this need by combining all their mapping data to meet this end.

One of the principles that drives the organisation is that PSMA Australia only builds national or multi-jurisdictional datasets. This ensures that PSMA Australia does NOT compete against Jurisdictions in the marketplace.

PSMA Australia's general approach has been to work with a significant user to develop a product that meets their needs. This was the case for our initial topographic dataset that was produced to meet the needs of ABS. We have subsequently worked with ABS to produce new and enhanced datasets that better meet their needs.

PSMA Australia's most recent dataset, the Geocoded National Address File (G-NAF), was developed in collaboration with two major users, Australia Post and the Australian Electoral Commission.

In the area of Administrative Boundaries, PSMA Australia is working with the ABS on the development of "Mesh Blocks", the new "fine" mesh that will be used by ABS for its smallest statistical area. In addition, PSMA Australia is working with Australia Post to manage its Spatial Postcode Boundaries.

All these datasets have application by other users, and the marketplace is quick to respond and utilise these datasets.

PSMA Australia's preferred approach is to develop datasets that meet a real client need.

However, PSMA Australia does produce datasets that we believe are in the national interest, regardless of whether a specific client is identified. An example is CadLite®, a dataset which represents Australia's 10.5 million registered land parcels. PSMA Australia believe that this is a fundamental dataset that will be used in conjunction with other datasets as a "background" or framework. In the 2004-2005 financial year, royalties on CadLite returned only $50,000 with maintenance costs at around $80,000.

SOURCING DATA FROM CUSTODIANS

PSMA Australia firmly believes that in order to be able to maintain datasets, data should be sourced from those organisations whose primary role is the generation and maintenance of the data, the Custodians.

This means that because property addresses are (usually) generated by Local Governments, the data should be sourced from Local Government. It may be "checked" through comparison with data from other sources (e.g. Australia Post or the Australian Electoral Commission), but the prime source is the Custodian.

Where PSMA Australia has attempted to source information from a new custodial source (e.g. Points of Interest (POI)), we have found the process was unsustainable, and the data did not meet reasonable accuracy specifications.

INSTITUTIONAL ARRANGEMENTS

Data Inputs

The principle of sourcing data from custodians is easy in theory, however, the practice of making it sustainable is much more difficult.

It has been PSMA Australia's experience that it takes a great deal of time to put in place the institutional arrangements that are required to support the ongoing timely supply of relevant information from custodians.

A contract is the last thing you need!

Custodians usually want answers to questions like:

- Why do you want our data?
- Will you "abuse" our data?
- Will your actions undermine our markets?
- If we give you our data, will we become irrelevant?
- Why are you in this business? and
- lots of other subjective questions.

But these are NOT the questions our Custodians ask. They ask questions about royalty returns, business cases, etc.

What has to happen is that trust must grow between the custodian/supplier and PSMA Australia.

PSMA Australia devotes a lot of effort into developing this "trust relationship".

We operate in a very transparent way with our suppliers/custodians. In this area of its business, PSMA Australia does not operate in a traditional commercial way. Any perceived

concerns by our suppliers are dealt with in a serious, compassionate and professional manner.

Data Management

PSMA Australia does little data management "in house", with most data management tasks contracted out to private sector organisations.

The work contracted out includes:

- Data integration;
- Data management;
- Research & Development associated with data integration or data management; and
- Some business case development.

Data Distribution

PSMA Australia has positioned itself as a WHOLESALER rather than a RETAILER.

In general, we deal only with Value Adding Resellers (VARs), although there are some exceptions with some government agencies such as the ABS.

PSMA Australia ensures that its data is:

- Available;
- Reasonably priced;
- Sold through VARs; and
- Accessed through transparent and simple licence agreements.

PSMA AUSTRALIA IS A RELATIONSHIP MANAGER

PSMA Australia has recognised that its major role is that of a RELATIONSHIP MANAGMENT organisation.

PSMA Australia's "value add" is primarily in managing the relationship between itself and:

- Its suppliers (CUSTODIANS);
- Its contractors (DATA MANAGERS); and
- Its clients (mainly VARs).

LAND ADMINISTRATION AND LAND MANAGEMENT

The FIG 1998 publication CADASTRE 2014 made 6 visionary statements about the cadastre of the future.

These statements were:

Statement 1

Cadastre 2014 will show the complete legal situation of land, including public rights and restrictions.

Statement 2

The separation between maps and registers will be abolished.

Statement 3

The cadastral mapping will be dead. Long live modelling.

Statement 4

Paper and pencil cadastre will have gone.

Statement 5

Cadastre 2014 will be highly privatised. Public and private sector are working closely together.

Statement 6

Cadastre 2014 will be cost recovering.

In Australia, significant progress has been made towards achieving statements 2, 3 and 4. However, the same cannot be said about statements 1, 5 and 6, and some thoughts are presented as to why these statements are unlikely to be achieved in the present Australian environment.

Statements 5 and 6 are unlikely to be achieved in Australia due to our Torrens System of Title. This system relies on a "government guarantee of title", and because the community presently have a high degree of "trust" in this government guarantee, it is highly unlikely that much, if any of the process that underpins this guarantee will be prioritised in the near future.

The situation with respect to Statement 1 is quite different.

The cadastre paradigm is one about the relationship between LAND, PEOPLE and TAXES. This paradigm is heavily slanted towards an ECONOMIC mindset. Land is a commodity that can be bought, sold, mortgaged and taxed.

This cadastral paradigm is consistent with a Land Administration mindset. However, it is only part of the picture that is encompassed in the Land Management paradigm that is emerging in Australia.

Since 1992 when the "Mabo Decision" was handed down by the High Court of Australia, we have seen the progressive "unbundling" of the interests in land. The first of these was Native Title, an inappropriate term for what is effectively a spiritual interest in land.

We have also seen the separation out of other interests such as WATER, VEGETATION, CONTAMINATED LANDS, etc.

Each of these interests is being separately regulated through separate pieces of legislation that do not always recognise that the management activity needs to relate to the LAND.

Many of these interests in land are not recorded on the title documentation.

We have recently begun using the term "Rights, Obligations and Restrictions" (RORs), to both reflect the fact that there is a growing amount of legislation that effectively tells us what we can do (RIGHTS), what we can't do (RESTRICTIONS) and what we must do (OBLIGATIONS) on land.

The mindset behind these RORs is a more holistic view of land, rather than the narrower economic focus. The Land Management paradigm encompasses the quadruple bottom line, encompassing economic, social, environmental and spiritual consideration of our land environment. The way these processes come together is in the actions that are taken "on the ground" in the form of the Land Management practices undertaken on the land.

PSMA AUSTRALIA'S ROLE IN LAND MANAGEMENT

The products that PSMA Australia has brought to the marketplace will, in many instances, assist Property Managers in the management of their resources. These products provide managers with data about:

- Topography;
- Cadastral boundaries;
- Administrative boundaries;
- Etc.

PSMA Australia attempts to "value add" to data collected by Custodians, some of whom play other roles in the Land Management environment. For example, in the generation of G-NAF, PSMA Australia sources geocode information from jurisdictional DCDB data, and property address from Local Government.

Another example is the Roads layer of PSMA Australia's Transport & Topography™ dataset. This dataset is generated in part from the jurisdictional DCDB data and Local Government street names.

To date PSMA Australia has not attempted to play an active role in the Land Management arena, because this is primarily the responsibility of the various State and Territory Jurisdictions.

However, PSMA have attempted to capitalise on the data that has been generated by these jurisdictions to produce information products that meet the needs of other users.

PSMA Australia is aiming for the ubiquitous use of its datasets within Australia, and that these datasets are comprehensive, diverse and needs driven.

PART 3 – AUSTRALIAN APPROACH - SUMMARY OF DISCUSSION

Social/Environmental Dimension

- Australia is embracing sustainability principles at all levels of government and within its administration systems.
- Australia is using the concept of 'unbundling' property in order to achieve sustainability i.e. markets will provide for most efficient use of natural resources. This unbundling has resulted in disparate management of 'new property' i.e. managing outside the land administration system and they're not taxed.
- Australia is still coming to terms with the limiting of activities on land. At a minimum citizens demand information on such limitations.

Political Dimension

- Sustainability is a core policy driver at state and federal levels of government.
- Unbundling and market based instruments have been popular government policies since Native Title was introduced in the mid 90s.
- Security and anti-terrorism have been drivers for collaboration and coordination with Australia.
- Politics has had a large impact in rural Australia, this is different to Europe.
- Australia is heading towards national systems of management and administration.
- Australia suffers from the same institutional inertia as Europe: common understandings and collaboration are hard to achieve.

Economic Dimension

- The need for business efficiency has been a driver to achieve change with administration systems.
- Australian governments have sort to raise revenue through spatial information and selling data. This has not always achieved the desired results.

Technology Dimension

- Australian land administrators see themselves in the business of land information management rather than the larger role of land management.
- Interoperability (technical, semantic, legal), ICT convergence, web services and coordinated cadastres will continue to be important concepts and technologies. Such concepts will assist in unlocking the value of existing systems which is currently underplayed.
- There are not common data models within and between Australian jurisdictions. This limits the utility of the cadastre. Western Australia's shared architecture is an exception here.
- While standards have been established they're not always used widely.
- Built environment information is not being capturing in the same way as natural environment information.
- Australia has not embraced the concept of authentic registers used in Europe.

Further Questions

- How do we engage with the intended audiences (citizens, politicians and NGOs)
- How will globalisation impact on land administration and management systems?
- How do we overcome the silo approach? Is ICT really enough?
- How do we pay for change and maintenance costs?
- When and how do we make achieve 3D and 4D cadastres? Do we need to?

PART 4 – TECHNICAL PERSPECTIVE

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

SDI REQUIREMENTS OF LAND ADMINISTRATION

Abbas Rajabifard and Andrew Binns
Deputy Director and Senior Research Fellow
and
Research Fellow
Centre for SDIs and Land Administration
Department of Geomatics, The University of Melbourne
Email: abbas.r@unimelb.edu.au

SUMMARY

Sustainable decision-making requires access to accurate information (in particular, land and spatial information which are considered as an infrastructure), and tools to analyse and present it. Within this environment, the capacity to meet user needs and deliver services and tools within the spatial information market has gone well beyond the ability of single organisations or government agencies. Users require precise spatial information in real-time about real-world objects. This requires governments and industry to work together to create such products and services.

Internationally the spatial data infrastructure (SDI) concept has focused on national SDIs. However SDIs are increasingly focusing on large-scale people relevant data (land parcel based data or built environmental data) with the result that today it is suggested most SDI activity worldwide is at this level. A central aspect in understanding these developments is the evolution of mapping, and the growth of land administration systems and national mapping initiatives in different countries.

With this in mind, governments worldwide are moving forward in relation to creating policies and initiatives which open up some of their information to the public. However, what is lacking is the ability for industry to engage directly with these whole-of-government/cross-agency initiatives. There is a need to create an infrastructure or enabling platform linking government and private industry from which applications and services can be leveraged and value added, providing the ability to grow the private sector and spatial information industry as a whole. This is in line with the vision of spatially enabling government and requires designers to appreciate the difference between data and information.

This paper aims to discuss the SDI requirements of land administration and the importance and issues surrounding the creation of an SDI as an enabling platform linking governments spatial information initiatives and in particular the private sector within a land administration paradigm. This will help to identify the goals and structures for national land administration to help nations articulate coordination needs, technological reforms and capacity building in order to become spatially enabled.

INTRODUCTION

SDI is an integrated, multi-leveled hierarchy of interconnected SDIs based on partnerships at corporate, local, state/provincial, national, regional (multi-national) and global levels. This enables users to save resources, time and effort when trying to acquire new datasets by avoiding duplication of expenses associated with the generation and maintenance of data and their integration with other datasets.

SDIs have been effective in meeting user needs to a point, however to fully meet such requirements, there is a need to create a collaborative environment such as a Virtual Jurisdiction in which spatial information providers from various backgrounds can work together with current technologies to meet the dynamic and fast growing user market. This has led to the rapid advancement in information and communications technology to meet these differing needs.

Internationally the SDI concept has focused on National SDIs, however, SDIs are increasingly focusing on large-scale people relevant data (land parcel based data or built environmental data). A central aspect in understanding these developments is the evolution of mapping, and the growth of land administration systems and national mapping initiatives in different countries. Having said that however, in order to understand the role of SDIs at a sub-national level (eg. state level) the relationship between SDIs and land administration must be understood, and in particular how this can enable a holistic approach to performing the stated land administration functions of land rights, land value and land use through delivery arrangements and systems.

CHANGING ROLE OF SDI

The role of SDI has changed over the years within different communities. It is important to understand that an SDI is not a “data base”. It is an infrastructure which links people to data and comprises policies, access technologies and standards.

SDI practitioners started to develop SDI from the current initiatives to implement SDI as a mechanism to facilitate access/sharing of spatial data hosted in distributed GISs (the conventional concept). This vision has been changed through the access and chain of web services offered by distributed GISs, to a new business paradigm where ‘SDI’ is emerging as a ‘virtual jurisdiction’ or ‘virtual enterprise’ to promote the partnership of spatial information organisations (Public/Private) to provide a wider scope of data and services, of size and complexity that is beyond their individual capacity. This is in line with the concept of spatially enabling government that requires designers to appreciate the difference between data and information.

With this new vision, the development of such SDI requires an integrated platform to support the chaining of services across participating organisations. There are different reasons behind these changes. Some of the driving forces behind the changes are the fact that many spatial information organisations are forced to work in a more tightly coupled mode to deliver large products or services which are beyond their individual capacity, the concept of virtual jurisdictions and the opportunities offered by ICT and Internet which play a key role in realising such an environment. The objective is to improve the spatial information organisations share in the spatial information market. The other important driving force is the strengthening of the role of spatial data in e-government services. The role of sub-national government and the private sector in SDI development is also changing and this new direction is helping to facilitate the development of more holistic and

technologically advanced support mechanisms for land administration systems that support the triple bottom line objectives of sustainable development. This latest change is the most influencing factor in shaping future SDIs.

THE ROLE OF SUB-NATIONAL GOVERNMENT AND THE PRIVATE SECTOR IN FUTURE SDIS

There are a number of important issues related to any level of SDI development from design to technical, socio-technical, institutional and financial perspectives. There are also a number of other issues identified which do not fall into these categories. These issues are mainly in relation to options for a jurisdictional and institutional framework or enabling platform for SDI development. What is important is that these issues should be considered in the long-term in order to achieve sustainable and ongoing development of SDIs. As a result, some SDI development initiatives exhibit characteristics of different SDI development models, or of being in a transitional stage - developing a more process-based approach while having product-based origins. This has begun a process of looking beyond a single focus for strategic SDI development to the broader issues contributing to the context of any SDI initiative. Therefore, understanding of the relationships between different SDI jurisdictions, knowing more about SDI development issues and knowing about the potential and applicability of each SDI development model are important for effective SDI development and driving the flexibility required in the second generation of SDI development.

There has also been a movement away from national small-scale data to more people relevant large-scale information, generally derived at a sub-national level. The development and availability of this people relevant data together with the creation of an enabling platform or "Virtual Environment" is creating new opportunities for greater private sector involvement in SDI development. There is the need to build an enabling platform which will need to be the primary domain of sub-national governments, creating access to fundamental large scale datasets across linked jurisdictions. However there is a need to develop services and functions such as visualisation tools which link off the enabling platform, utilizing data and growing the spatial information industry as a whole.

It is interesting to note however, that although national mapping agencies have the responsibility for SDI initiatives, much of the SDI activity in these countries is not administered by these agencies. They are in fact administered by sub-national agencies including state or provincial organisations or organisations responsible for land administration or cadastral activities or city administration. This area of administration is focused on large-scale, dynamic, people relevant data and hence this is where most of the SDI action exists. In many countries, there is still a sharp divide between the activities of these national mapping agencies and their land administration or large-scale counterparts.

Figure 1 shows the continuum of SDI development from the 1st to 2nd generation. This has seen a rapid increase in the number of countries developing SDIs, fostered by the 1st generations documentation of experiences. The 2nd generation of SDI development characteristically falls into two groups: those countries who started to develop an SDI initiative during the period of the first generation and are gradually modifying and upgrading the initiative, as well as those countries who have recently decided to design and develop an SDI for their respective countries and/or have just commenced doing so (Rajabifard et al. 2005).

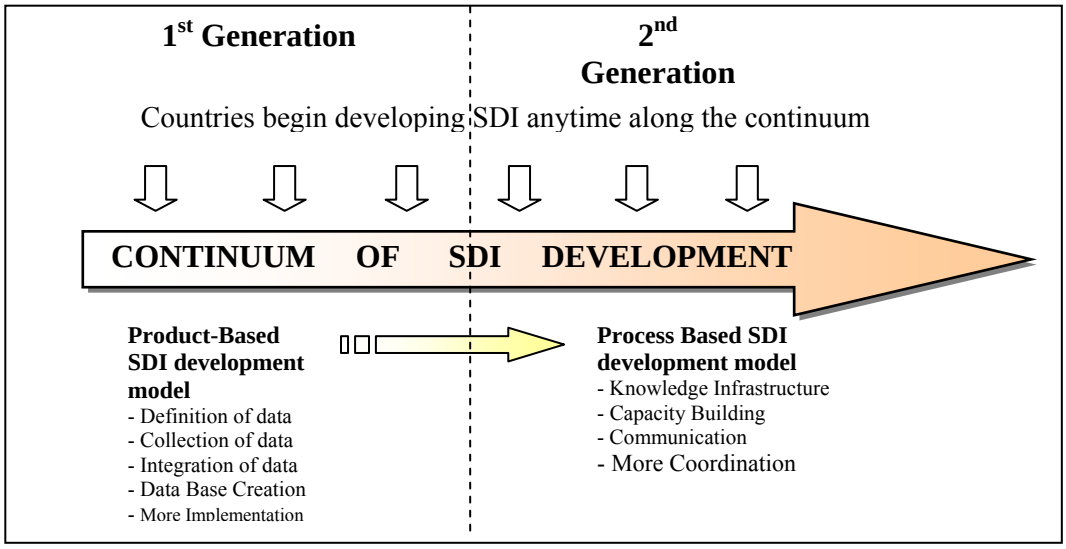


Figure 1: Relationship between the 1st and 2nd generation of SDI Development and the Product and Process Based SDI development models (Rajabifard *et al.* 2005)

Within the 1st generation of SDIs, data was the key driver in development and the focus of initiative development. The 2nd generation however is driven by the needs of the users, with focus on the use of data and data applications as apposed to the data itself. This has included the introduction of web services which are the main technological indicator of the second generation SDIs through an improved use of data. The 2nd generation also leveraged off the experience, expertise, social capital and the development of clearinghouse systems derived from the first generation. The development of the 2nd generation of SDIs has been relatively quick due to the existence of early prototypes, clarification of initial design issues, increased sharing and documentation of experiences to facilitate implementation, and also due to the concept itself gaining momentum (Crompvouts et al. 2004).

According to Rajabifard et al. (2005), much of the SDI development over the past 15 years has seen three main players emerge including Federal/National governments, sub-national governments and the private sector, and the role of each has been quite different. As described in Figure 2, initial SDI development was the domain of national governments

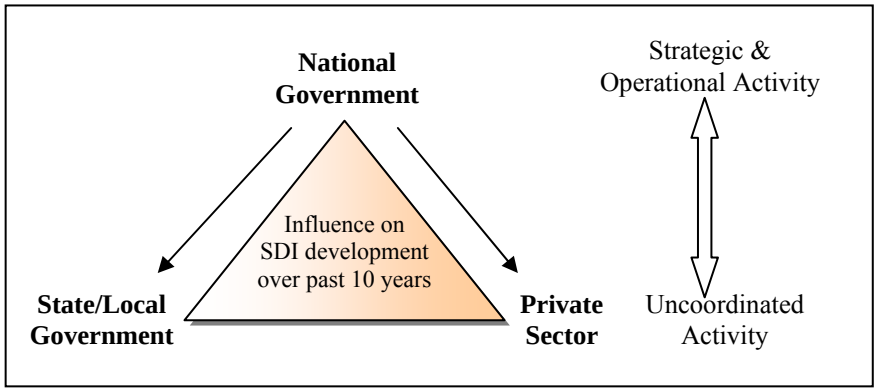


Figure 2 – Role of national government, sub-national government and the private sector in SDI development over the past decade

who's role it was to map and collect small-scale data about a nation. They played both a strategic and operational role in SDI development through a top-down policy development approach.

The building of the infrastructure was also seen as a national role, especially within developing countries whose sub-national level of government is generally not as well developed as that of developed countries. The involvement of sub-national governments and the private sector was not as coordinated as that of a national government with generally uncoordinated SDI activity occurring, although within countries such as Australia there was some coordinated activity occurring. As policy development came from the national level, there was no real driving role for these two sectors to play in SDI development.

The involvement of these three sectors has enabled the development of the initial concept of an SDI and the role that it can play in streamlining government activities. Overarching policy including national standards and concepts were also created, however not always implemented by sub-national governments. This is due to the needs of sub-national governments and the private sector beginning to change with the rapid advancement in information and communications technologies and the need for large-scale information to enable more efficient and effective decision-making.

However, Rajabifard et al. (2005) discussed that current trends and developments within SDIs have shown that the roles of the three major players have changed to meet the new large-scale focus of many SDIs, especially in the developed world (Figure 3). The previous influence of national governments as both strategic and operational levels has diminished, although there is still a strong case for a strategic national government role in SDI through coordination. This can be seen in Europe through the development of the proposal for a legal Directive establishing a European SDI currently before the European Parliament as well as within the federated system of governance in Australia.

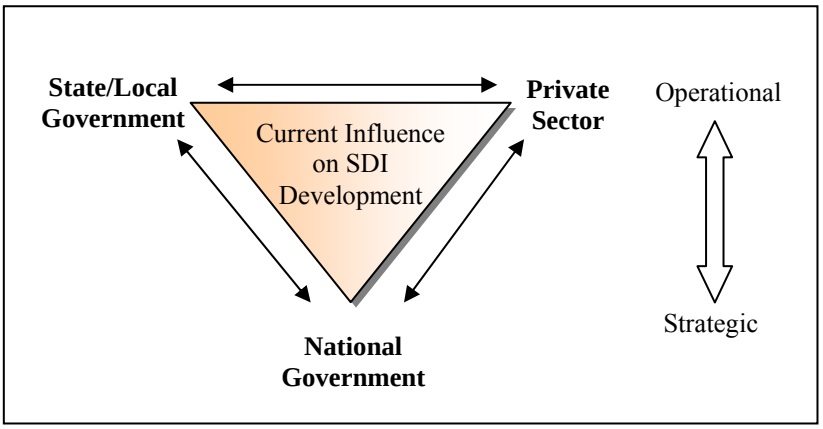


Figure 3 – Current role of national government, sub-national government and the private sector in SDI development – particularly in developed countries

As illustrated in Figure 3, the flow of information between the three main players has also changed. Building of infrastructure generally occurs at a sub-national, bottom-up level with the national government providing the overall framework in which such infrastructure can operate. This is what is beginning to occur within the development of SDIs, particularly in Australia, US, and other jurisdictions. Communication now flows between these three players, rather than from a top-down national government approach. Further, we cannot

separate land administration and SDI with Land administration at the core of sub-national (e.g. State) SDIs.

SDI CONTINUUM

The development of the SDI continuum based on the 1st and 2nd generations of SDI development with an indication of different groups of countries developing SDIs is shown in Figure 4. Countries are at some stage of the continuum, as illustrated in the figure. Mainly developed countries initiated the 1st generation of SDI development through a product based SDI development model with national government as the major influence. Some of the emerging economic and developing countries began to also create SDI initiatives as influenced by developed countries.

Countries either continue along this path of development, or moved on to the 2nd generation of SDI development as a result of a better understanding of the nature and process involved. This generation has seen a move towards a process based SDI model largely influenced by national and sub-national (local/state) governments and the private sector.

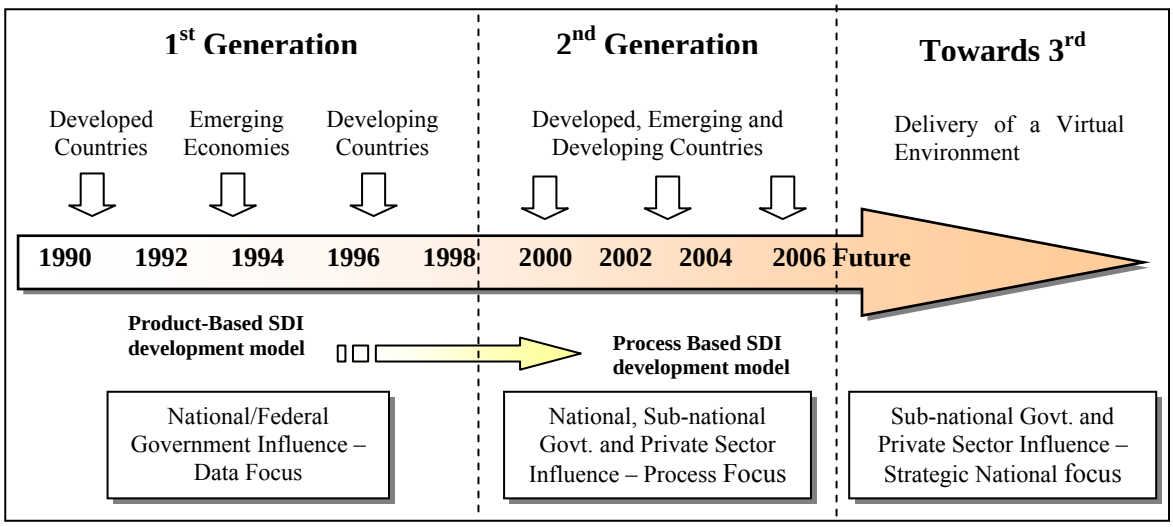


Figure 4: Continuum of SDI Development based on the 1st and 2nd generations of SDI (Rajabifard *et al.* 2005)

The current situation of SDI development within a country can also be placed on the SDI continuum. Countries only now beginning to develop SDIs are still influenced by national governments and begin through small scale SDI development. This is generally developing countries. As a country tackles broader capacity building and development issues, they are influenced more by large-scale decision making "people relevant" data – emerging economic countries. This means that sub-national governments begin to assert more influence on SDI development. Developed countries have also begun to tackle issues of sustainable development and "triple-bottom line" objectives in which large-scale decision making data is of the utmost importance. The private sector within such countries has also grown substantially to the point where they are beginning to utilize and influence the implementation of SDIs.

According to Radwan et al. (2005), to address today's information needs, the role of the traditional SDI needs to be adjusted. There is a need for a service-oriented infrastructure in which citizens and organisations can rely for the provision of required services. This goes

beyond current 1st and 2nd Generation SDIs of a data discovery and retrieval nature. This translates into the future focus for spatial information managers on the delivery of a virtual world which facilitates decision making at a community level within a national context. This requires integration of the natural and built environmental data sets and the need for an SDI that facilitates this integration. The technology exists to create this virtual world but this is not enough in itself without the sustained input from both data producers and users.

In line with the integration of the natural and built environmental data sets within any SDI initiatives, the UN-FIG Bogor Declaration on Cadastral Reform (1996) suggested that the spatial cadastral framework (usually a cadastral map) should be a fundamental layer within a Nation SDI so that topographic and cadastral maps are homogenous. Further there is a need to investigate the justification for integrating these two forms of spatial data in support of sustainable development and develop a model/ framework and associated tools capable of being used in diverse jurisdictions.

SDI AND LAND ADMINISTRATION

The ability to meet the range of land administration functions in the areas of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure and construction planning) require access to complete and up-to-date information about the built and natural environments. This is facilitated through the creation and implementation of effective SDIs at all jurisdictional levels, creating the need for a strong relationship between land administration and SDIs.

A model for a modern land administration system that meets sustainable development principles is shown in Figure 5. As can be seen from the diagram, the organisational structures for land management must take into account local cultural and judicial settings with institutional arrangements possibly changing over time to better support the implementation of land policies and good governance. Within this country context, the land management activities needed to support Sustainable Development may be described by the three components of Land Policies, Land Information Infrastructures and Land Administration Functions. The development of SDIs play a central role in facilitating a country's land information infrastructure.

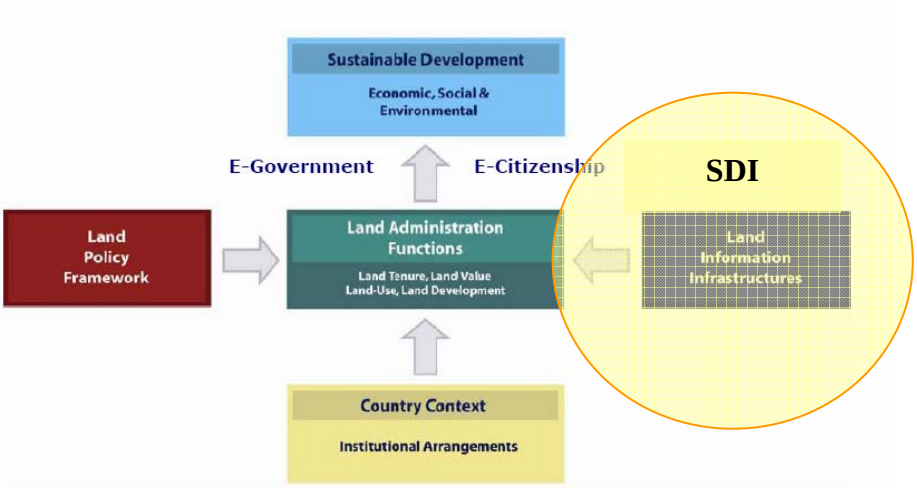


Figure 5: Land Administration Arrangements
(Adopted from Enemark *et al*, 2004)

The key lesson from this discussion is that this large scale "people relevant data" is driving many SDI developments. As illustrated, SDI is an enabling platform that can facilitate the land infrastructure functions and in particular it is facilitating land information infrastructures.

While small to medium scale national activities, local government (and particularly its role as a custodian for planning and street address data) and regional SDI initiatives (such as in the Asia and Pacific region promoted by PCGIAP) are making positive contributions to the SDI vision, it is the large scale land administration initiatives (often at a state or provincial level) where most of the SDI activity is occurring in many countries. This is where most of the current challenges in SDI development are being faced at inter- and intra-jurisdictional levels.

According to Wallace and Williamson (2005), *iLand* is the concept of integrated, spatially enabled land information available on the Web in which the DCDB is the central tool translating technical processes into accessible information. Implementation involves changes in both LAS and SDI so that the information generated is spatially enabled. In order to facilitate this vision, SDI creates an enabling environment which facilitates this *iLand* vision (Figure 6).

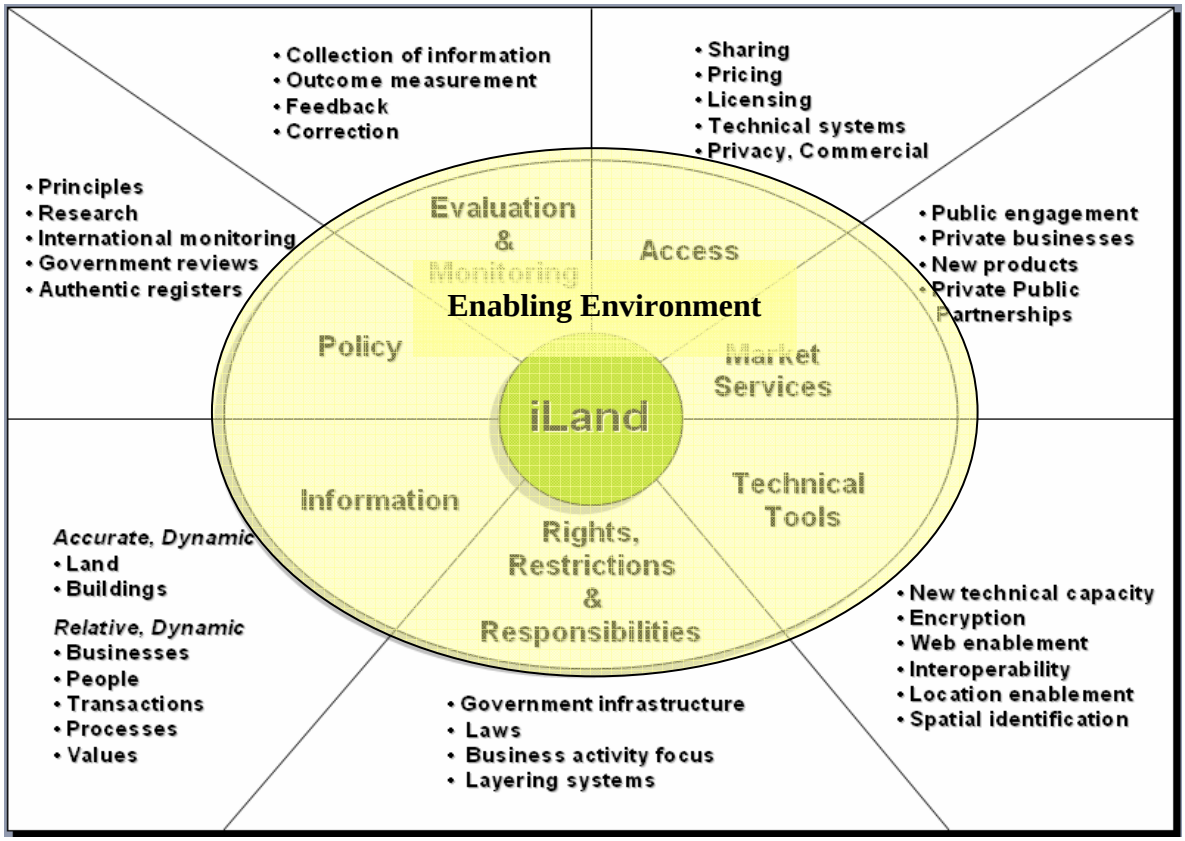


Figure 6: The *iLand* vision
(Adopted from Wallace and Williamson 2005)

CONCLUSIONS

The ability to meet the functions of land administration requires appropriate land information infrastructures that include cadastral and topographic datasets and provide

access to complete and up-to-date information. SDIs play a central role in facilitating such a land information infrastructure.

There is also now a move within the spatial information industry as a whole on the delivery of a virtual world which facilitates decision making at a community level within a national context. This also requires integration of the natural and built environmental data sets and the need for a spatial data infrastructure that facilitates this integration.

The integration of the natural and built environmental data sets and the need for an SDI to facilitate this integration requires new strategies, new partnerships, new models and new funding arrangements particularly between the national mapping agencies and the custodians and producers of large scale data.

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the Centre for SDIs and Land Administration at the Department of Geomatics, the University of Melbourne for assisting and supporting the preparation of this paper and the associated research. However, the views expressed in the paper are those of the authors and do not necessarily reflect the views of the University of Melbourne.

REFERENCES

Crompvoets, J., Rajabifard, A., Bregt, A. and Williamson, I.P. (2004), Assessing the worldwide development of national spatial data clearinghouses, *International Journal of Geographic Information Science*, 18(7), 1-25.

Enemark, S., Williamson, I. and Wallace, J. (2005), Building modern land Administration systems in developed economies, *Spatial Science Journal*, accepted for publication.

Radwan, M., Onchaga, R. and Morales, J. (2005), *The Design Requirements for Service-oriented Spatial Information Infrastructures*, Global Spatial Data Infrastructure 8 and FIG Working Week Conference, 14-18 April, Cairo Egypt.

Rajabifard, A., Binns, A., Masser, I. and Williamson, I. (2005), The Role of Sub-national Government and the Private Sector in Future SDIs, *International Journal of GIS* (In Press).

Wallace, J. and Williamson, I. (2005), *A vision for spatially informed land administration in Australia*. Proceedings of the Spatial Sciences Institute Biennial Conference, Melbourne, Australia, 12-16 September, 2005. CD ROM.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

THE PRIVATE SECTOR WITHIN THE LAS FRAMEWORK - COMMENTS ON THE PROPOSED DATA MODEL AND RELATED DOCUMENTATION

Brian Marwick
Manager Spatial Information Services
LogicaCMG Australia
Email: Brian.Marwick@logicacmg.com

SUMMARY

This document has been prepared in response to a request to provide some commentary on the paper "Building Modern Land Administration Systems (LAS) in Developed Economies" by Enemark, Williamson and Wallace and the Integrated Land Administration Model as proposed in the paper. In this paper, the authors have endeavoured to identify an ideal and historically neutral model capable of supporting Land Administration across a range of countries. This model is based on a vision for Land Administration Systems that adopts a holistic approach capable of incremental adoption of countries at the transitional stages of economic development. Case studies in Victoria and Denmark have been used as a basis for testing the model.

The comments provided have focussed on two aspects of the paper, namely:

- The terminology used throughout the paper and within the model itself and how this may impact the acceptance of the model as proposed and as a consequence limit the degree of integration as posed in the model
- The ability of the model to adequately address the "people" and "partnerships" aspects that would be necessary for the effective implementation of the model.

The comments have been based on the author's experience within Australia and do not attempt to provide solutions to the concerns raised but merely endevour to suggest some areas for possible enhancement of the model and the supporting documentation. The comments made assume that, as per the definition provided for "Land Development" (Page 2 of the paper by Enemark, Williamson & Wallace, being reviewed), utility organisations and similar organisations involved in delivering urban infrastructure services are within the scope of the proposed model. Given this it is also assumed that it is the intention of those involved in the development of the model to gain support for the model beyond the land related professions.

TERMINOLOGY

Within any society, particularly within highly complex urban areas, there exist a broad range of organisations from both the public and private sectors involved in the activities that impact the "administration of land". Each of these organisations will have their individual goals and objectives. The nature of these organisations will vary between jurisdictions as will the public / private sector mix. Within this network of organisations, people from many disciplines will be involved and as such bring to the mix another tier of objectives and expectations. Given that the model's objective as outlined in the paper is to achieve the highest level of integration possible between all those activities that use the land, one of the greatest challenges faced is gaining the broad acceptance of all organisations and people considered to be part of this holistic model.

From the terminology used throughout the paper and within the model itself, one gains the impression that it is presented from the perspective of "Land Related Professionals". This view is supported by the emphasis placed on land tenure systems and land markets compared to other activities that contribute to the holistic view the model is assumed to embrace. To a large degree, the role played by the Utilities for example, in terms of their contribution to the building and ongoing maintenance of land related information systems within Australia has not been adequately recognised. For example, the overview of the Victorian LAS indicates that it is "state based, through departments of the executive government". Given the power and gas industries are in private ownership and the water industry is operated through government owned corporations, the scope of the model becomes confused.

Assuming however that it is the intention to embrace the Utilities within the framework of the model, it is questionable as to how an organisation with the responsibility of delivering water and sewerage services or alternatively power and gas services will see the model as proposed. It is possible they do not see their role as part of the implementation of "Land Administration Systems" but rather for example, "Urban Infrastructure Systems".

Another instance of where the terminology could possibly limit engagement of organisations, is the use of the term "land development". The paper refers to this as "implementing utilities, infrastructure and construction planning". In Australia, this term would generally be applied to those activities involved the initial development of land as opposed to the ongoing delivery of services following the development. Those charged with the responsibility of the ongoing operations and management of utility assets once again could perceive themselves as being outside of the scope of this model. The fact that many of these organisations have historically established stand alone land related asset and billing systems in many jurisdictions could be seen to support the existence of this perception.

If organisations, such as these, do perceive the model as being outside the scope of their activities this poses risks in terms of achieving the level of integration sought by the model as they are less likely to have a sense of ownership given their perception regarding "land administration" and "land development".

In Australia and possibly other countries in recent years, the implementation of computer aided emergency dispatch systems have had a considerable impact on the collection and dissemination of land related information, particularly geocoded addresses. As with the Utility organisations, does the model as proposed lend itself to acceptance by organisations outside of the mainstream "land based" organisations.

Given the above, will the model and supporting documentation encourage acceptance by all organisations with an interest in land? If the model and paper are specifically aimed at providing a tool for the 'land related professionals' to assess the progress made by any particular country then the model should go a long way to achieving this goal. If however the model is intended to promote more effective integration through understanding of the broader picture at a policy level, beyond the "land related professions" it is possible the model may not achieve its full potential. This obviously poses the question what form should the terminology take that is used for an overall model and its various components. The solution to this must lie in the direct involvement of all those organisations and professions within each country with an interest in the development and promulgation of the broader "LAS model".

PEOPLE AND PARTNERSHIPS – RELATIONSHIP MANAGEMENT

The paper under review uses as a case study the situation that has evolved in Victoria. From a Spatial Information Infrastructure perspective, Victoria has made significant headway since 1995 in establishing the basis of a sound and sustainable spatial information system capable of supporting the wide range of land related activities as proposed in the model. Much of the success achieved can be attributed to the initiation of a broad range of partnerships established since 1995. These partnerships have embraced government departments, Utilities, Local Government and the private sector. They reflect to some degree the integrated approach necessary to support the LAS model under review. The establishment and maintenance of these partnerships has involved a wide range of changes in culture, systems and policies. The key to these changes has been an underlying commitment by those people involved in establishing and maintaining these partnerships, notwithstanding the effort that has been required.

The adoption of a successful partnership approach can also be seen at a National level within Australia given the considerable success that has been achieved by PSMA Australia Limited. As a company owned by the Jurisdictional Governments and the Commonwealth Government of Australia, PSMA Australia has been able to successfully compile, maintain and distribute a series of National datasets by focusing on the establishment of strong relationships (i.e. partnerships) with the organisations comprising its ownership, other non land related Government agencies and the private sector who have undertaken the bulk of the data management and distribution activities. These datasets include a national cadastral database, a national road centreline product and a geocoded national address file. Viewed from one aspect, PSMA Australia's role could be seen as one of a relationship management company that has been able to successfully bring about the integration of many discrete datasets to the benefit of Australia's Spatial Information Infrastructure.

To some degree, the requirement for relationships/partnerships are implicit in a number of aspects of the model as proposed. The paper "Building Modern Land Administration Systems in Developed Economies" raises the "people" aspect in its introduction however the impact of people is not specifically dealt with in the paper. From an implementation perspective perhaps the model would benefit from a specific element that sets out the requirement for effective partnership management. If the model was to be used as a basis for measuring performance, it would seem to be a key element in the effectiveness of an integrated model.

THE PRIVATE SECTOR WITHIN THE LAS FRAMEWORK

In considering the aspect of partnerships as indicated above in the building of an integrated "Land Administration System" it may be worthwhile to specifically consider identifying the role of the private sector in the model and its relationship to Government. Not merely as the supplier, and at times the implementer of systems, but also in terms of long term Service Delivery.

Using the example of Victoria again, LogicaCMG have for the past 10 years managed and maintained Vicmap Property (Victoria's digital cadastral and property system) for the Victorian Government. Over this period the contract has been through a public tender process on two occasions. A similar process has been used for the management and maintenance of Vicmap Transport. The distribution of spatial data is also undertaken by a number of Value Added Retailers (VAR's) on behalf of the Government.

These long term contracts also require the private sector organisations involved to prepare Development Plans for the activity covered by the Contract over coming years for consideration by Government and to actively participate with the Government department in its strategic planning processes. The involvement of the private sector in this manner often brings to the discussion another set of views that can often assist significantly in the planning and subsequent implementation process and promoting "partnerships".

This approach where the day to day service delivery is undertaken by the private sector under clearly defined long term contracts and the strategic policy and implementation are undertaken by Government has played a significant role in assisting the development of a shared view in many aspects of "land administration systems" in Victoria over the past decade.

Whilst traditionally the majority of the systems under discussion have been within the domain of the public sector, there are many instances where the mix is different and in some countries has changed over time. The example of Victoria outlined above is one example. As indicated previously, with the "people" aspect there may be value in modifying the model to specifically measure and evaluate this particular aspect of multi-sector partnerships as experience indicates it can assist significantly in promoting a culture which actively supports integration across industries and professions.

CONCLUSION

From a land professional's perspective, the model as proposed covers all the key aspects in that it focuses on the requirements necessary to ensure the key land systems such as tenure, valuation and planning are closely integrated in a holistic system. Given the establishment of effective systems of this nature, one would expect they should provide an appropriate foundation for all other land related systems. Viewed from another perspective, it is uncertain whether the model will achieve its goal and whether it has the potential to overcome the situation, as experienced in some countries, where other participants in the "development of land" have seen fit to develop and maintain their own independent systems.

More than ever before, the technology available today will certainly support the level of interoperability required to achieve more integrated systems. The challenge remains one of encouraging people and organisations to strive collectively for this integration through the development of the appropriate policies and underlying culture. This requires any model

and supporting documentation established to support such a system being seen as inclusive and where the scope of the model is clear to all those potentially embraced by the model.

The challenge for this model is to demonstrate that it is inclusive and with the development of the appropriate partnerships is capable of achieving the goals established by its authors.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

ACHIEVEING SUSTAINABLE DEVELOPMERNT OBJECTIVES THROUGH BETTER MANAGEMENT OF PROPERTY RIGHTS, RESTRICTIONS & RESPONSIBILITIES

Rohan Bennett, Jude Wallace and Ian Williamson
PhD Candidate,
Senior Research Fellow
and
Head of Department and Director,
Centre for SDIs and Land Administration
Department of Geomatics, The University of Melbourne
Email: r.bennett2@pgrad.unimelb.edu.au

SUMMARY

The existing management of property restrictions and responsibilities poses a major barrier to achieving sustainable land management. Proposed administrative responses have concentrated on organising information rather than achieving the original policy objectives of good land management. Disparate management of individual restrictions has made it extremely difficult to develop and evaluate the effects of land policy. The management of land and natural resources must be far more collective. The complex set of private and public interests that apply to land must be consolidated, simplified and made easily accessible to all. Restrictions on land need special treatment and must be understood in the context of a thorough analysis of existing regulatory regimes and management systems. Key characteristics of each restriction must be assessed, including spatial extent, impact on tenure and reason for creation. These characteristics enable us to determine the importance of a restriction and develop an appropriate administration tool that enables achievement of sustainability.

INTRODUCTION

The number of restrictions and responsibilities that control land use and development has rapidly increased over the last fifty years. Unlike the management of ownership, the administration of these new interests is ah-hoc and lacks integration. The new Land Management Paradigm (Enemark et al, 2004) demands that land and resources be managed holistically: a new model for the management of property rights, restrictions and responsibilities is required.

This paper describes the preliminary findings of ongoing research into the problematic management of property restrictions and responsibilities. The aim is to refocus the issue as one of land management, rather than one of information organisation. A preliminary framework for categorizing the different types of restrictions and responsibilities is provided: such a framework can guide future administrative responses. Also discussed are a number of institutional, regulatory and policy issues that relate to restrictions and responsibilities. To date, these issues have received minimal attention: achieving sustainable land management will require that these issues be addressed.

A BACKGROUND TO THE LAND MANAGEMENT PARADIGM

Sustainability theory now underpins the policy objectives of many developed countries. The philosophy promotes the equitable distribution of *economic* and *social* wellbeing amongst the community. The wellbeing must be sustained over many generations while maintaining the quality of the *environment* (FIG, 1999).

Land Administration has an important role to play in the achievement of these policies. Earlier Western land management paradigms that saw land only as a commodity for wealth generation must be modified (Ting et al, 1999). These systems separated the administration of land into isolated institutions and concentrated on recording only the legal and fiscal arrangements that related to land (Enemark et al, 2004). This led to the creation of many incompatible spatial/non-spatial information sets which record variations of the same thing: parcel location, ownership, use and value. Replication is costly and creates administrative voids: in order to achieve sustainability objectives there must mechanisms for linking the management of ownership, land use development, environmental conservation and other forms of property regulation. Land administration systems must become far more integrated. The operations of the four core functions: land tenure, land valuation, land use and land development, should be driven by a single sustainable land policy and underpinned by a spatial information infrastructure that provides the fundamental and authoritative spatial information sets, particularly cadastre and address (Figure 1).

This new Land Management Paradigm will allow for the practical implementation of sustainable land policies: better land tenure and valuation systems will continue to generate economic wealth through taxation and land transfer; better tenure systems will strengthen social cohesion through the provision of tenure security; and integrated land development and use systems will limit environmental degradation of land for the benefit of the wider community (Enemark et al, 2004).

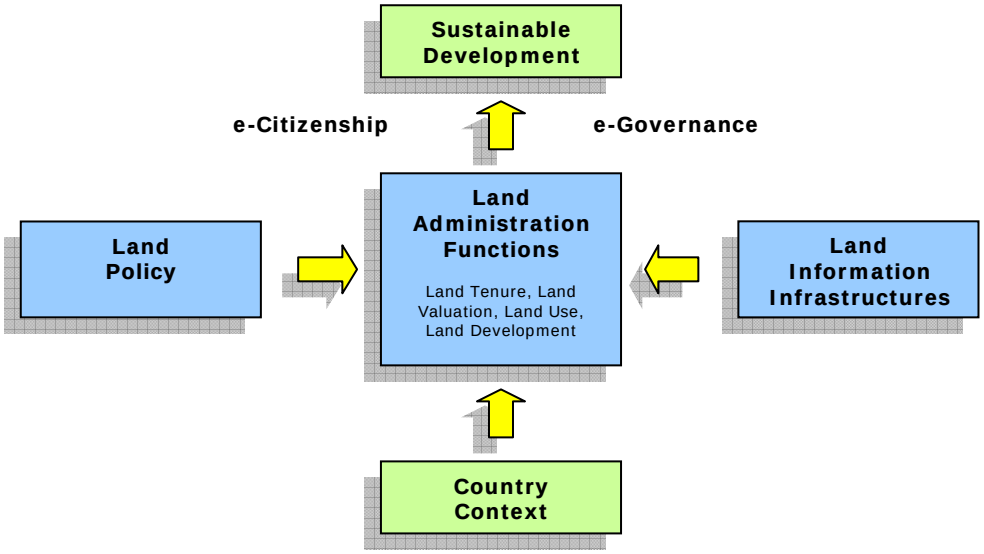


Figure 1 - The Land Management Paradigm (Enemark et al, 2004)

THE ROLE OF ICT AND SPATIAL INFORMATION

To overcome the historical lack of integration between Land Administration Functions the new Land Management Paradigm will require heavy investment by governments in ICT and geo-coded information. ICT allows for easy transfer of information between government departments and the public. Geo-codes link disparate datasets using the spatial attribute and as could be used to integrate the large amount of information required for the development of land policy (Figure 2) and the undertaking of any land related commercial, residential or agricultural development. Better decision making would result through enhanced environmental and social impact analysis of proposed developments. Geo-coded information also offers huge possibilities to other governmental and societal activities: spatial information will assist the policy creation and administration of areas as diverse as health, taxation, education, taxation, defence and immigration.

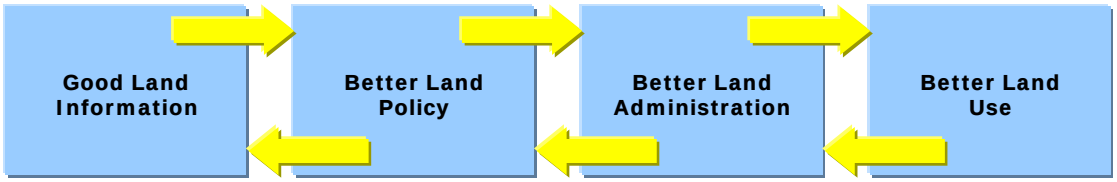


Figure 2 - Sustainable Development is not attainable without good land information (FIG, 1999)

RESTRICTIONS & RESPONSIBILITIES: BARRIERS TO THE VISION

Enemark et al's (2004) model offers a simple theoretical model to base our future land management systems on. However, in reality land administration systems are far more complex and the vision of complete integration is still largely unrealised. Even though there have been vast improvements in the data, standards and access regimes that comprise land information infrastructures, they have yet to produce substantial integration between land administration functions. Offsetting advances in ICT is the regulatory explosion in new land related legislation that has emerged over the last 50 years.

The post-WWII era presented a number of challenges to traditional Land Administration Systems. Population growth through birth and migration and the heavy industrialization of farming processes placed massive pressures on land. This led to the emergence of social movements that focused upon the environmental, rather than economic, dimensions of land use (Ting, 2002). These civil rights and sustainability movements drove the creation of legislative and management regimes that could exist independently of ownership registration while protecting land for the benefit of all (Wallace, 2004). Governments are continuing to embrace sustainable development policy and the number and complexity of laws and regulatory systems is increasing (Lyons et al, 2004).

There is still much debate over whether the legislative regime is valuable or even necessary. What is more certain is the inefficiency of the administrative regime: legislation is created in an ad-hoc manner and the institutions which administer the regulations are not integrated. The laws have undermined the vision of a single registry as the depository of all interests in land. Unlike the centralized management and law making related to the ownership layer, the creation of restrictions has been reactionary, ad hoc and non-centralized. The legislative restrictions are valuable; however, they work outside existing land administration systems. A title no longer reflects all interests in land and many interests are not secured or easily accessible.

There is now clear consensus that an information management problem exists; however the solution is contentious. Free market economists have called for a reduction in restrictions, to let the market manage land, but would such a system be reliable? Would it simply advance the land exploitation that has occurred for the last one hundred years? Some land administrators advocate a complete overhaul of the systems, in an effort to regain control and recentralize management, but is the cost and institutional upheaval of such a system justifiable? Others suggest that we extend title registration system to incorporate restrictions; however, these systems were designed for the management of private rights. Do we really want to tamper with the traditional registry? Or would a shift away from the parcel approach reap greater rewards? Furthermore, some restrictions are actually already managed well. While the solutions have some merit, they do not address the real issue: *creating an administrative regime that will enable the achievement of sustainable land management*.

DEVELOPING A BETTER UNDERSTANDING OF THE PROBLEM: VICTORIAN CASE STUDY

Thus far, the problem has been discussed on a broader level without being broken down into component parts. No attempt has been made to develop an analytical framework or ontology for restrictions and responsibilities. Consequently solutions proposed for the administration problems have been complex, expensive and government focused: end-user requirements, private sector involvement and emerging spatial information and communication technologies have not received enough attention. These proposed solutions will not adequately assist the provision of sustainable development.

It is proposed that a concise definition and classification model for restrictions and responsibilities needs to be established. For each classification appropriate management models can be developed. To develop the ontology and accompanying management models, the following methodology (Figure 3) was proposed and undertaken.

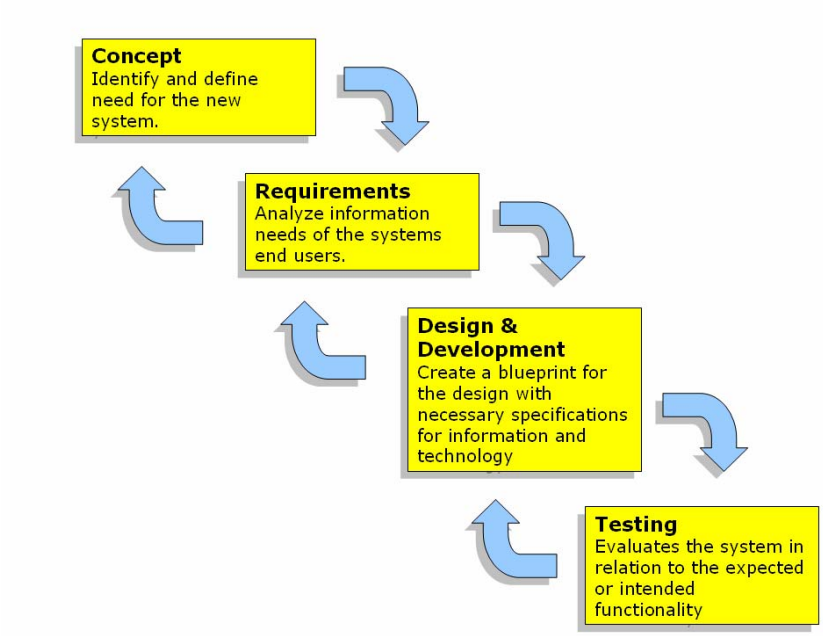


Figure 3 - Methodology for Development of Restrictions & Responsibility Ontology

To date, conceptualisation is complete and the requirements phase has commenced. Analysis will be conducted in a number of different areas. Previous projects based on restrictions and responsibilities management have concentrated on developing government driven management solutions. While this is important, it is also crucial to consider the role end-users and new information technologies can play: these are the main drivers for change. International initiatives also merit consideration. Therefore, this project will consider the Australian provider and user sides, emerging Geo-ICT and European initiatives, using the Netherlands as the illustrator. Figure 4 illustrates these four areas of analysis. Collectively they will provide the inputs for the Design and Development phase.

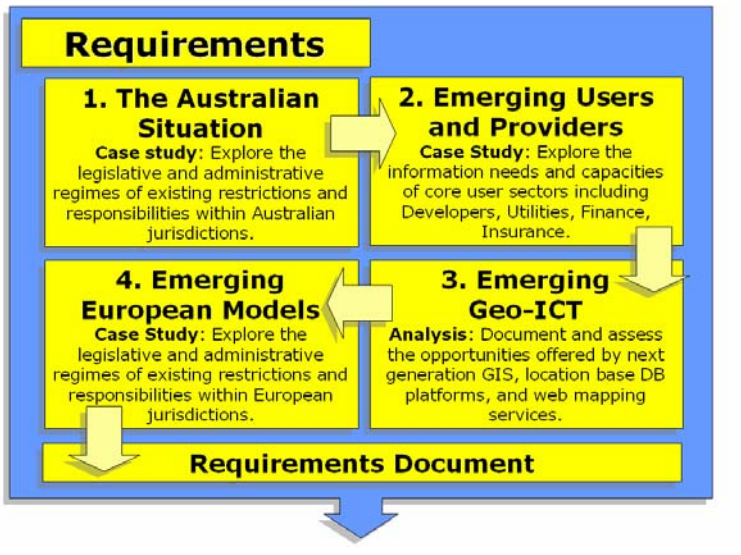


Figure 4 - The Four Analysis Areas of the Requirements Phase

The Australian state of Victoria was chosen as the primary case study jurisdiction. The first stage of the case study concentrated on assessing the impact and management of all of the restrictions and responsibilities in Victoria at a State, Federal and Local government level.

Table 1 identifies the different criteria considered in the analysis. The results of this analysis have been used to develop the preliminary classification model.

Category	Criteria	Possible Values
Policy Level	Legislative Origins	National, State, Local, Body Corporate, Unlisted
	Type of Legislation	Proscriptive, Descriptive
	Period of Creation	1950 ◊ 2000
	Driver for Creation	Government, Public Driven
	Type of Land Affected	Urban, Rural, Marine Environment, Commercial, Residential, Ind, Agr
	Type of Interest Created	Right, Liberty, Power or Immunity (Cole and Grossman, 2002)
Management Level	Type of Administration Body	Minister, Government Department, Local Council, Statutory Authority
	Private Sector Involvement	Public Private Partnership, None
Operational Level	Allocation Method	Systematic, Sporadic
	Registration Method	Single Register, Multiple Registers, Negative Register, No Register, Torrens, Deeds
	Update Method	On request, None
	Removal Method	Time Based, Request Based, None
	Level of ICT	Automated Online, Automated Onsite, Paper Based
Public Access Method	Price to access	Transaction Fee vs. Cost Recovery vs. Nothing
	Access Point	Automated Online, Automated Onsite, Onsite, Unavailable
	Altering Information	Online, Onsite, Unavailable
Impact on Rights System	Tenures Affected	Private vs. Public vs. Communal vs. Open Access
	Relationship to the Cadastral Map	Parcel Based, Non-Parcel Based
	Relationship to Land Registry	Recorded in Registry, Link to Registry using ID, No Relationship
Spatial Elements	Spatial Unit	Parcel (Polygon), Network, Points, Lines, None
	Identifier	Parcel ID, Property ID, Council Number,
	Mapping Status	Complete Automated Online Map, Incomplete Automated Online Map, Automated offline Map, Paper Based Map, None

Table 1 - Criteria for Assessing Statutes

Smaller case studies will be conducted on emerging users and providers of restrictions information. Emerging users include the utility sector, development sector, finance, insurance sectors, local councils, emergency agencies and agriculture. These case studies will concentrate on identifying the information needs of these sectors and determining innovative tools for restrictions and responsibility management. Industry bodies will be surveyed to gain an understanding of information needs. Individual organizations will be consulted to assess any innovative management solutions.

A smaller case study and testing environment will also be drawn from one European jurisdiction. These case studies will concentrate on identifying any innovative tools for restrictions and responsibility management. Western European jurisdictions have highly accurate and relatively complete cadastres. This supports their holistic management of restrictions and responsibilities. This case study will occur later in the project cycle- it will be used to test the universality of the preliminary classification and management models developed from the Australian case studies. Selection of these case studies will occur further into the project. It is envisaged criteria for selection will be similar to the Australian case studies. The most likely candidate at this stage is The Netherlands, a world leader in modern day land administration with high level of international engagement, and novel approaches to administration.

PRELIMINARY FINDINGS: NEW UNDERSTANDINGS OF RESTRICTIONS AND RESPONSIBILITIES

Relating restrictions and responsibilities to rights: redefining ownership and understanding competing property interests

There is little consensus on a theoretical definition of property restrictions and responsibilities. Given the importance of restrictions and responsibilities in social, economic and environmental terms it might be expected that a detailed and clear definition would exist. However, while much of the literature across the disciplines of economics, law and land administration refers to land based restrictions and responsibilities, there is no prevailing definition and consequently no classification system.

An analysis of property restrictions and responsibilities is inseparable from one of property rights. Lyon's et al (2002) believe the term "property rights" has many different definitions. Some commentators interpret the term to relate only to "real property" or definitions in particular legislation. Others view property rights as generic- encompassing access rights, use rights and entitlement rights; and some believe these terms have their own specific meanings. In relation to restrictions and responsibilities, there are two main lines of arguments: the first defines the term to incorporate restrictions, responsibilities and controls; the second divides the term into separate entities. These discussions might seem trivial; however, it is these disparate definitions that make building an appropriate administration system so difficult. The composition of a right in combination with the physical characteristics of the resource and the nature of the transactions within it play a key role in determining the most effective system for titling and registration (ACIL Tasman et al, 2004).

At a practical level, most definitions of property rights advocate the conferral of three qualities (Sheehan and Small, 2002):

1. Exclude: the ability to exclude others;
2. Withdraw: the ability to receive income or benefits; and
3. Alienate: the ability to sell or alienate the interest.

In this way property rights can be seen as comprising a 'bundle' of individual opportunities. Authors disagree on the number of individual rights; however, all definitions include the three listed above as a minimum. Tan's (2002) definition uses the bundled approach, maintaining that property is merely a legal entity and defines the relationship between a legal person and the resource in question (Figure 5).

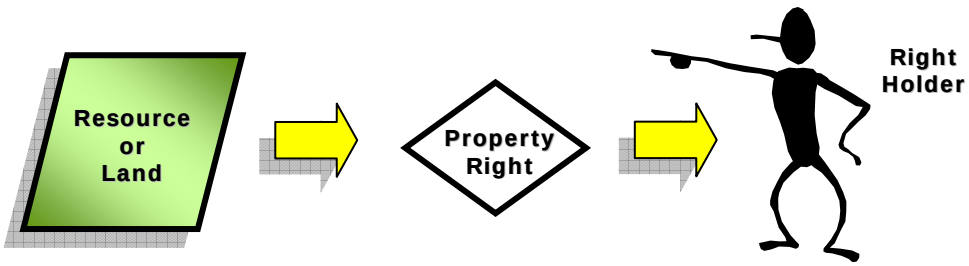


Figure 5 - Traditional Approach to Property

The belief that rights, including property rights, are generated only by government is known as *legal positivism* (Sprankling, 1999) (Figure 6).

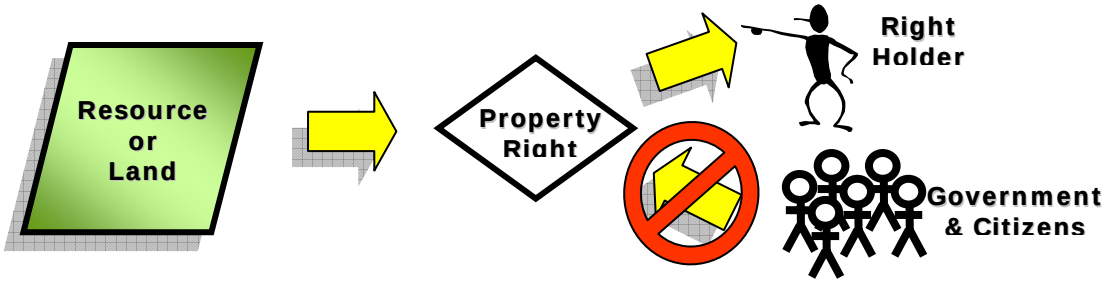


Figure 6 - Functional Theory of Property

This idea has been extended: a property right only exists when the community supports and protects the exclusive use and enjoyment of that entitlement (National Competition Council, 2001). Property rights are now considered legal statements that relate three entities: the resource, the owner (what they can/can't do) and the non-owners (what government and other citizens can/cannot do) (Figure 7). This third entity, 'non owners', is important in relation to restrictions and responsibilities as it is the reason they exist. It is this complex three-way relationship that administration systems must now attempt manage holistically.

In contrast to legal positivism, *natural law theory* suggests that rights arise in nature as a matter of justice and independent of law: the role of government is to enforce rights not create new ones (Sprankling, 1999). Natural law theory has been central to European philosophy for millennia; however, its influence has gradually diminished with legal positivism prevailing in the modern day (Sprankling, 1999).

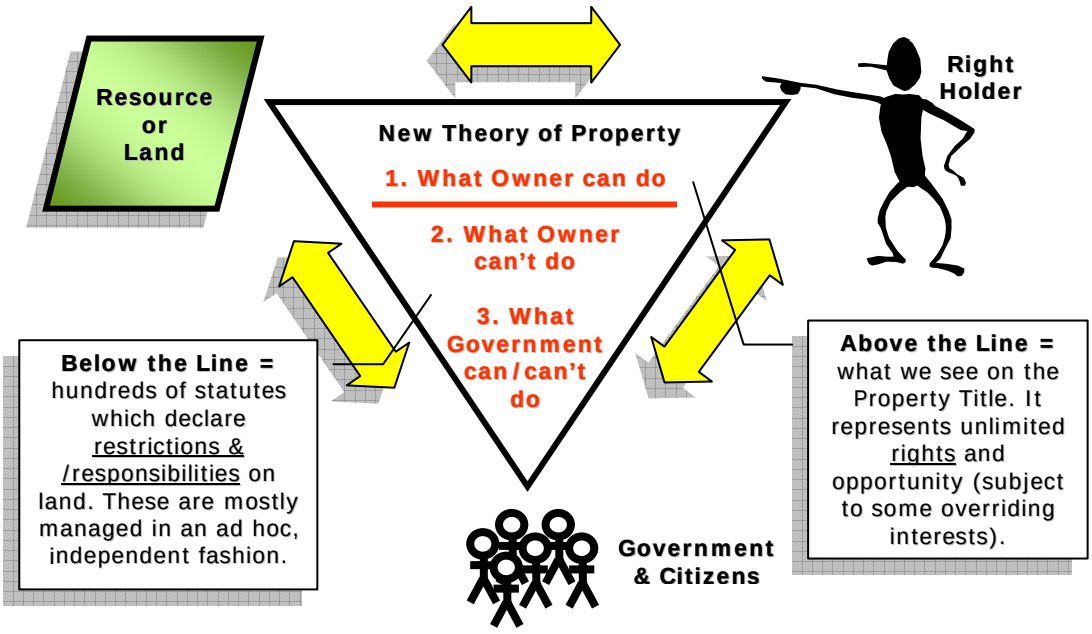


Figure 7 - New theory or property right incorporating restrictions and responsibilities

It is important to distinguish between property 'rights' and 'ownership'. There is often great confusion when debating property rights because terms such as 'property', 'property rights' and 'owner' are interpreted so differently (ACIL Tasman et al, 2004). It is generally the right to exclude that defines a legitimate owner, even though rights of exclusion are only one of the many rights that can be attached to a resource. Property rights can include

any of the three above mentioned rights, while outright ownership will typically encompass all of them (ACIL Tasman et al, 2004). Depending on an individual's or group's tenure they will hold a different number of individual rights.

It is possible for different people to hold the same type of right over the same area of land (Table 2). Tenure theory is often used to define the level of property rights held by an individual. Four primary tenure types are defined: private, public, communal and open access (Prosterman, 2001). Each classification can be further subdivided: for example, leases and mortgages are sub classes of private tenures.

	Owner	Proprietor	Claimant (Tenant)	Authorised User	Authorised Manager	Authorised Entrant
Access	X	X	X	X	X	X
Management	X	X	X	X	X	
Withdrawal	X	X	X	X		
Exclusion	X	X				
Alienation	X					

Table 2 - Bundles of rights associated with position (Ostrom and Schlager, 1996)

The above framework can be used to classify different statutory restrictions. The majority of government created restrictions convey the rights of access and management to statutory bodies or other private citizens (e.g. licenses/permits) thus creating "Authorised Managers" and "Authorised Entrants". It should be noted that many statutory restrictions offer withdrawal, exclusion and even alienation rights (e.g. Australia's Land Acquisition Act). In this way restrictions and responsibilities can be seen as collections of rights that vest in someone other than the owner i.e. government or other private citizens.

An administrative response should be in proportion to the type of tenure created: higher levels of interest need more security and their status should be available to all. In Australia the bundle of rights equating to ownership is registered and secured by the state government using the Torrens form of registration. This is expensive to, but appropriate, given the importance of the ownership layer. However, not all types of tenure need such extravagant methods of administration nor could it be afforded.

The above definitions (bundles of rights) and classification model (tenure theory) have greatly assisted the management of property rights; however, they have not been properly applied when designing administrative responses for restrictions and responsibilities. Thus restrictions and responsibilities have been managed in an ad hoc manner: some recorded on the Torrens title, others recorded in a range of different registers, some spatially defined, others not spatially defined, or others- not recorded at all, particularly if they do not relate to individual private parcels.

Wesley Newcomb Hohfeld's 'system of jural relations' is another framework that suggests restrictions and responsibilities are nothing more than property rights seen from a different stakeholder's perspective (Table 3). The system provides a good description for the relationship between rights and restrictions/responsibilities (collectively referred to as duties). Hohfeld expressed concerns about the vague definitions of rights: the term was being "used indiscriminately to cover what in a given case may be a privilege, a power, or immunity, rather than a right in the strictest sense" (Cole and Grossman, 2002). Hohfeld's jural relations suggest that in order to establish a right (as opposed to some other, lesser,

interest) one must be able to identify the corresponding duty (or restriction) that someone else "possesses".

Elements	Correlatives	Opposites
Right	Duty	No Right
Privilege	No Right	Duty
Power	Immunity	Disability
Immunity	Disability	Liability

Table 3 - Hohfeld's System of Jural Relations (Cole and Grossman, 2002)

Hohfeld's system raises a number of interesting points. Firstly, as previously stated, a person's perception of a right might vary according to how that right affects them. It might actually be perceived as a form of restriction. Nonetheless sound administrative systems for managing both rights and duties (restrictions/responsibilities) are required. Furthermore, not all interests in land are as strong as a right and therefore deserve less secure administrative systems. Conversely, some infringements are not restrictions and therefore do not warrant as much administrative attention: for example, the 'privilege' of a cadastral surveyor to enter someone's private property, while highly important, need not be recorded on the title; the long term minimal impact on the land owner does not warrant the administrative expense. Finally, governments must recognise that when they place a duty on a particular parcel they are not only creating a corresponding right for the community, they are tampering with the notion of property ownership, the fabric on which all western economies are based.

Ting et al (1999) provide another method for defining restrictions and responsibilities. The evolution of restrictions from the agricultural and rural restrictions used by the ancient Romans through to modern day zoning, environmental regulations and native title legislation are traced. This provides historical context to the creation of restrictions (Figure 8) and is useful for understanding the current relevance of the restriction and their corresponding administrative response.

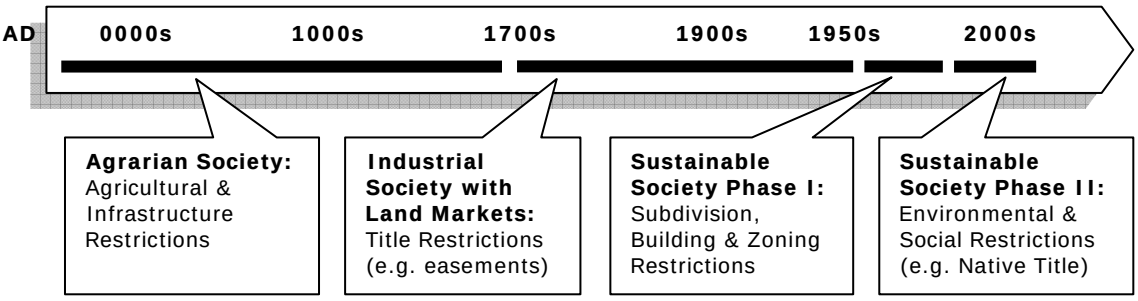


Figure 8 - The Evolution of Land Related Restrictions (extended from Ting and Williamson, 1999)

To summarise, existing definitions of rights, restrictions and responsibilities have been complicated by changing societal perceptions. Recent developments in land property- such as the evolution of governmental land-use planning controls- suggest that the previous theories of property as an unrestrained set of rights are now inadequate (Small, 2002). As discussed earlier, most property rights are subject to some form of regulation. Even those rights recorded in a Torrens register are not immune from subsequent legislative or regulatory modifications (ACIL Tasman et al, 2004). Restrictions and responsibilities are

now inextricably linked to our theories of property rights and ownership. Sustainable land management demands that these similar concepts be dealt with in a holistic manner.

Classifying restrictions and responsibilities: understanding the tenure and spatial elements

Having placed restrictions and responsibilities in a theoretical framework of property rights it is worth refocusing on the administration of the interests. Governments have created hundreds of different restrictions and responsibilities in legislation and divided their management across many different departments and statutory authorities. Attempting to reorganise and recentralise the management of all these interests would be impractical and expensive. The areas of immediate concern, those restrictions which impact on the achievement of sustainability objectives, should be addressed first. Assessing the spatial extent of each restriction is a useful way to determine its importance in the context of the whole jurisdiction.

Restrictions and responsibilities can impact spatially on a jurisdiction in a number of ways (Figure 9). The ownership layer can be used to compare the extent of different layers. The ownership layer covers an entire jurisdiction: all land must have a private, crown or communal owner attached to it. Similarly, a Blanket Restriction applies to an entire jurisdiction: land acquisition laws are examples. Blanket restrictions require minimal administration. A Single Parcel Restriction applies to a single parcel, property or small area and usually requires minimal administration. The Melbourne Cricket Ground Land Act is an example.

A Patchwork Restriction may or may not apply to any given land parcel. Licenses, permits and many environmental land use agreements fit into this category. Large amounts of administration are required for these restrictions and in the past this has been disparate and problematic. Non Parcel Restrictions do not relate to a single parcel, however, they can still be spatially identified. Examples are restrictions on utility infrastructure and in the marine environment. In the past these restrictions have not been administered spatially: much opportunity exists for more integrated management in this area.

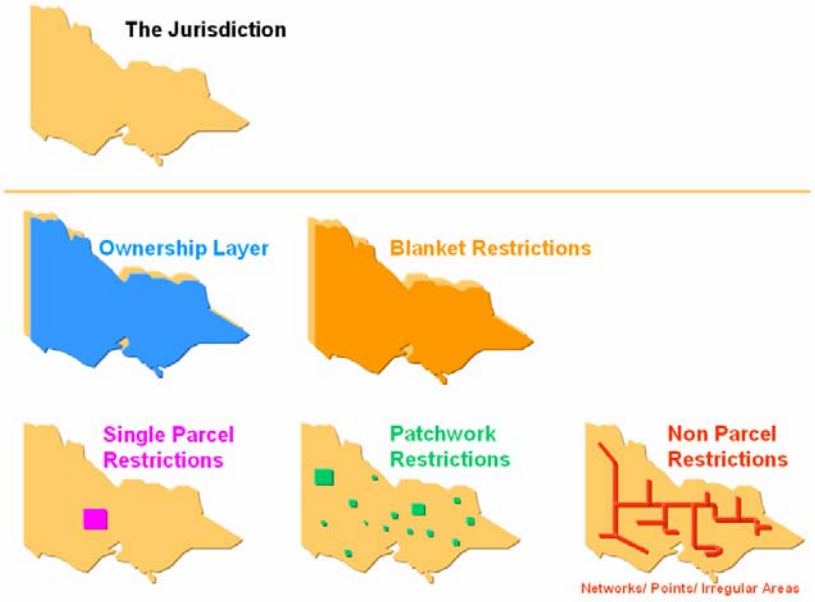


Figure 9 - The Spatial Extent of different Restrictions and Responsibilities

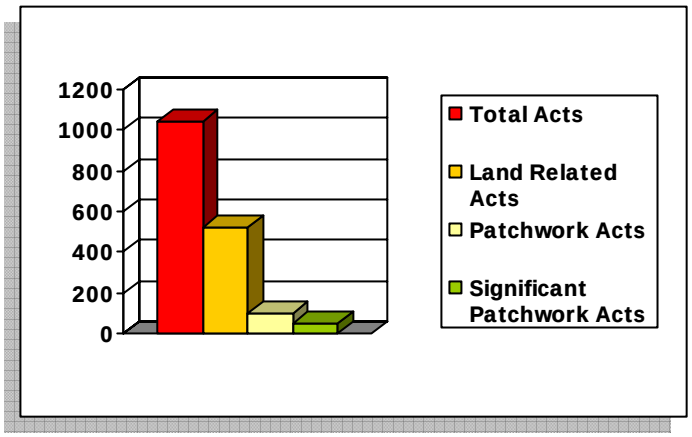
The impact that a restriction has on different tenures also offers a guide as to the type of administrative response that is required. As mentioned previously, all tenures can be classified as Crown, Private, Communal or Open Access. A regulatory restriction may impact on all or a single one of these tenures. In western countries it is most important to concentrate on administering those restrictions which relate to private tenures. By simplifying, consolidating and making available the restrictions that apply to private lands, permitted land development will occur more efficiently and there will be better enforcement of those who do wrong.

Tenure(s) Impacted by Restriction

Spatial Extent of Restriction	Crown	Private	Communal	Open
Blanket	e.g. Coastal Management Act	e.g. Land Acquisition Act	e.g. No selling Communal Lands	X
Patchwork	e.g. Alpine Resort Mngmt Act	e.g. Ag and Chemical Use Act	e.g. Proposal to Lease Communal Lands	X
Specific	e.g. MCG Land Act	e.g. CityLink Act	e.g. Mabo Case	X
Non-Parcel	e.g. Electrical Safety Act	e.g. Non-Real Property	X	X

Figure 10 - Patchwork restrictions that impact on Private Tenures should be focused on

Of the 1045 laws in the Victorian Statute Book (August 2005), 523 of them regulate activities on land. These first two types of restriction (Blanket and Specific) account for ~80% of the 523 and this reduces the size of the perceived problem greatly as these laws require minimal administration. The remaining 100 laws are either Patchwork or Non Parcel and of these, only ~50 appear to have a large impact on private land related activities (Graph 1). Administrative responses should now concentrate on organising the management of these 50 more important regulations as occurred in the Netherlands after a similar study was conducted.



Graph 1 - Land Regulations in the Victorian Statute Book

FUTURE RESEARCH DIRECTION AND QUESTIONS

Extending the Case Study: Other Levels of Government and End User Requirements

To date, the case study has only considered the laws in the Victorian statute book. This will not provide a complete list of restrictions that might apply in the jurisdiction. Australia is a federation of states and therefore other levels of government can also place restrictions over the same land and resources. A complete understanding of restrictions that apply can only be gained by looking at the statute books of these other levels of government: federal government laws, local government by-laws and body corporate restrictions will need to be included in the case study. The regulatory environment is even more complicated than this as will be shown below.

Analysis of statutes provides for a good understanding of the number and range of different laws that need to be administered; however, it does not offer an understanding of the requirements of those members of the public and private sector who are impacted by the laws and their administration. Different private sector industries have varied land information needs (Figure 11). To understand these end-user requirements interviews and surveys will be conducted. Private sector industries including agriculture, utility management, property development and insurance will be considered key stakeholders.

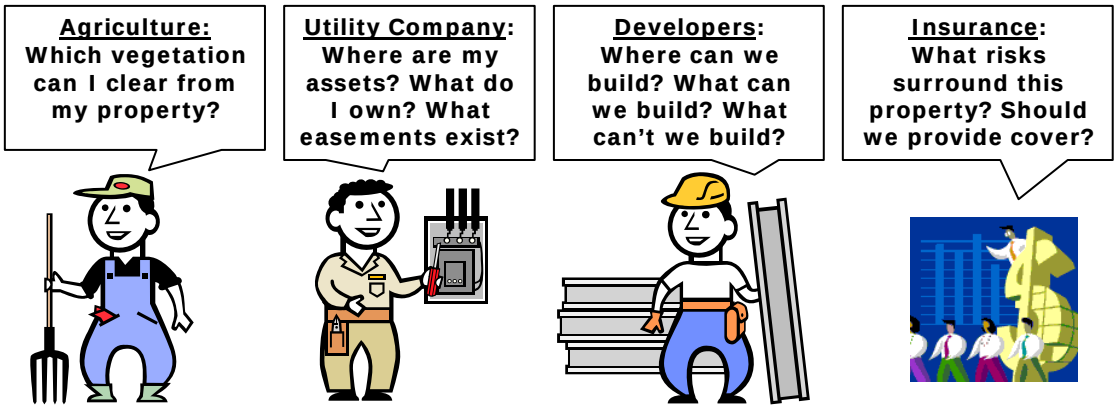


Figure 11: End-Users are interested in efficient administration and easy access to information

Overcoming regulatory voids, overloads and failures

There are a number of restrictions and responsibilities that can not be found in the statute books. Developments should not be built on old land fill sites, parks should not be created on grounds where toxic chemicals were stored and never cleaned up, land locked land should not be transferred without the new owner understanding the situation. These restrictions are implied but not always registered or even regulated against. These trouble cases that receive regular media attention, however, it is difficult to determine how many different types of cases might exist. Clearly regulatory reform is required: simplification, consolidation and easy access to information are necessary.

Another important issue is regulatory failure: legislation is written but not necessarily followed and therefore policy objectives are not achieved. In Queensland tree clearing legislation was ignored by many in the agricultural sector in the late 90s. Reasons for failure included farmers lacking location information and being economically better off by not following the laws. There are many more examples of land related regulatory failure and the reasons for them should be understood. If lack of information turns out to be a

common reason then spatial technologies can play an important role in overcoming problems, however, if neglect of laws is simply because they are deemed unfair or have low risk of being caught out, then an administrative response can do little to rectify the problem.

Another issue needing consideration is the acceptability of the many new regulations that have emerged over the last 50 years and whether creating a system to manage these new interests will only encourage more regulatory overload. While there does need to be controls on land to achieve sustainable land management, perhaps there also needs to be controls on those who have the power create laws. A set of guiding principles regulating the creation of a land restriction is a possibility here, although more thought is required.

Lessons from Europe: Netherlands Case Study

The Netherlands will be used to test whether the classifications and management models are transferable. The Netherlands is a world leader in modern day land administration with high level of international engagement, and novel approaches to administration. Management options for restrictions have been under consideration since the early nineties. New laws introduced in 2002 left management of restrictions with the individual authorities responsible for their creation, however, registration was linked with the cadastre using 'flags'. The Cadastre now acts as an integrated system which links the different restriction information that relates to individual land parcels.

Another interesting case from Netherlands involves the Supreme Court ruling that telecom cables should be considered as immovable property. The ruling will influence the way these cables are dealt with in taxation and registration within the Cadastre (Kap, 2005). A strong case for a registration of cables has been developed. The private and public sector processes of asset management, disaster management, minimizing excavation damage, assessing liability for damage and legal security will all utilize the information set. In earlier times a single centralised register would have been considered, however, developments in ICT and increased capacity within utility companies offers new solutions.

Using the Dutch rule of horizontal accession, ownership of the cables running under properties can be registered in the name of the utility company. Different utility organisations would be the custodians and maintainers of the spatial data and the information could be linked using web architecture. Achievement of these integrated systems was assisted by the development of a broad scale topographic map (1:1000). A proposed next step could be to see the networks of cables as separate legal entities, without a necessary connection to a ground parcel other than through coordination. This is a novel approach and certainly a move away from the parcel based approach. The private sector maintains the spatial datasets; however, management and access is still holistic and integrated.

The Compensation Issue: The Need for Policy

Another central issue arising from the property restriction debates is that of compensation. The Australian constitution provides government with the power to extinguish ownership within the jurisdiction in return for just compensation. However, the steady stream of new property related restrictions impacting on, but not extinguishing ownership, have resulted in no compensation being provided- even when value has diminished. While more recent legislation in Victoria does provide for the provision of compensation where a particular right has been brought out by an authority, the issue remains largely unresolved across Australia. However, there are lessons to be learnt from international experiences.

Robertson (2003) describes the case in the State of Oregan in the USA. In 2000, a small group of land owners sponsored a citizen-initiated referendum called Measure 7, which aimed to have landholders compensated for any loss in value of their land whenever the State or council passed a restriction on property rights. The majority of voters agreed with the proposal and Measure 7 succeeded. The effect of the proposal was dramatic. It was estimated the cost to the State and local councils would be $US 54 billion annually in compensation. At this estimate, it was calculated that in 15 years, the State would have paid as much in compensation as the total value of all property in the State. Even at lower estimates taxes would have had to rise significantly in order for government to continue to provide services.

As the number of property restrictions and responsibilities continues to increase the issue of compensation will need more attention. Whenever the ownership layer is impacted there will be perceived winners and losers. Ensuring that regulatory and administrative solutions are perceived as 'just' will go along way to them being successful.

CONCLUSION

The existing management of property restrictions and responsibilities poses a major barrier to achieving sustainable land management. Administrative responses have concentrated on organising information rather than achieving the original policy objectives of good land management. Disparate management of individual restrictions has made it extremely difficult to develop and evaluate the effects of land policy. The management of land and natural resources must be far more collective. The complex set of private and public interests that apply to land must be consolidated, simplified and made easily accessible to all. A thorough analysis of existing regulatory regimes and management systems is required. Key characteristics of each restriction must be assessed, including spatial extent, impact on tenure and reason for creation. These characteristics enable us to determine the importance of a restriction and develop an appropriate administration tool that enables achievement of sustainability.

REFERENCES

Acil Tasman in association with Ftrrhilld, (2004), An Effective System of Defining Water Property Titles. Research Report, Land and Water Canberra, Australia.

Cole, D. H. and P. Z. Grossman, (2002), The Meaning of Property Rights: Law versus Economics. Land Economics, 78, p317-330.

Enemark. S., I., Williamson, and J., Wallace, (2004), Building Modern Land Administration Systems in Developed Economies, Journal of Spatial Science, In Review, xx.

FIG (1999), The Bathhurst Declaration on Land Administration for Sustainable Development, The International Federation of Surveyors, Publication No 21, December 1999, Copenhagen, Denmark, p1- 9.

Kap, A. (2005), Harmonisation of Spatial Information on Utilities in the Netherlands, FIG Working Week 2005 and GSDI-8, TS 21 – SDI Data Issues I, Cairo, Egypt, April 16-21.

Lyons, D. K., E.C. Cottrell, and K.J. Davies, (2002), On the Efficiency of Property Rights Administration in Queensland. Research Report, Queensland Government, Department of Natural Resources and Mines, Brisbane. Australia.

Lyons, D. K., E.C. Cottrell, K.J. and Davies, (2004), A Summary of the Paper "On the efficiency of property rights administration". Research Report, Queensland Government, Department of Natural Resources and Mines, Brisbane. URL: www.anzlic.org.au/pubinfo/2393092707 (Accessed 18 August 2004).

Ostrom, E., and E., Schlager, (1996), The formation of property rights. In HANNA, S., C. FOLKE and K. MALER (Ed.), Rights to Nature: Cultural, Economic and Political Principles of Institutions for the Environment. Island Press. Washington DC, USA.

National Competition Council (2001), Water Property Rights. Prepared with the assistance of the Department of Agriculture Fisheries and Forestry Australia and the Australian Bureau of Agricultural and Resource Economics, (February 2001).

Prosterman, R. and T. Hanstad, (1999), Legal Impediments to Effective Rural Land Relations in Eastern Europe and Central Asia: A Comparative Perspective, World Bank Technical Paper No 436, Europe and Central Asia Environmentally and Socially Sustainable Rural Development Series, Washington.

Robertson, S. (2003), Property rights, responsibility and reason. A speech by the Minister for Natural Resources and Mines, Hon. Stephen Robertson MP, Queensland Government, 8th April.

Small, G. (2002), Parameters for the Research and Development of an Effective System of Transportable Property in Water. Initial scoping report on the development of water property rights, Property Economics Program, University of Technology Sydney, Australia.

Sprankling, J.G. (1999), Understanding Property Law, LexisNexis, Sydney, Australia, p1-9.

Ting, L. (2002), Principles for an Integrated Land Administration System to Support Sustainable Development, PhD Thesis, The University of Melbourne

Ting, L., I. Williamson, I. Parker, and D. Grant (1999), Understanding the Evolution of Western Societies' Land Administration Systems: A basis for cadastral reform, Survey Review, 35 (272) p83-102.

Wallace, J. (2004), 'Property Rights, Obligations and Restrictions in Land Administration Systems', 32nd Land Registrars of Titles Conference, Melbourne Victoria, 27-29 October.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

AN INTEROPERABILITY TOOLKIT FOR E-LAND ADMINISTRATION

Mohsen Kalantari, Abbas Rajabifard, Jude Wallace and Ian Williamson
PhD Student,
Senior Research Fellow,
Senior Research Fellow,
and
Head of Department and Director,
Centre for SDIs and Land Administration
Department of Geomatics, The University of Melbourne
Email: s.kalantarisoltanieh@pgrad.unimelb.edu.au

SUMMARY

Enablement of land administration with Information and Communication Technology (ICT) is heading toward e-Land Administration (e-LA): the transformation of land administration through the use of ICT. Existing initiatives include providing land information on line, electronic conveyancing, digital lodgement of survey plans, and online access to survey plan information. Thus far, implementation of these initiatives are isolated within their specific subsystems without reference to the broader land administration system or its core policy function of supporting sustainable development.

One solution to isolation is to develop effective communication among the different land administration subsystems by harmonising data and functionalities through interoperability, so they are capable of being used by all subsystems. There are various aspects for interoperability in an e-land administration system: semantic, legal, inter-community and technical. The aspects need a range of tools to facilitate the interoperability issues in e-land administration. The key to interoperability is data modelling which both recognizes and reengineers existing business processes. Modelling allows every single process in land administration to influence the cadastral data model and vice versa. This paper describes the need for interoperability in e-land administration and importance of cadastral data modelling in data management as well as coordination among subsystems in an e-land administration.

INTRODUCTION

Land administration systems evolved from a focus on core functions of regulating land and property development, land use controls, land taxation and disputes (Dale & McLaughlin, 1999) to an integrated land management paradigm designed to support sustainable development (Enemark et al., 2005).

In the new land management paradigm, the land development is added to the core functions of land administration: land mapping, land registration, and land valuation. These agencies are encouraged to take up new opportunities for better management of diverse internal approaches and overall delivery of land administration system policy. Also the unique institutional, economic, legal and technical settings of each country or jurisdiction are recognized.

In many countries, the diversity of agencies leads land administration to diversification of services and functions to mange real property. For example the land registry places emphasis on the holding and registration of private rights, restrictions and responsibilities on property parcels. At the same time the land development subsystem is concerned with use restrictions imposed through zoning mechanisms. Taxation and valuation focus on the economic function of real property.

Although these processes seem to be independent, each is generally applied to real estate parcels and moreover they, and other systems such as utility supply, can all be interrelated together. For example, local governments supply property details to the extent of their local government areas; the water utilities prepare proposed plans of their area of interest. On ground identification is provided by surveyors through development plans which are added to the property data set. The land taxation office requires the change of property use as well as the property owner to calculate the revenue and tax for specific purposes. Ideally, these activities require exchange of information among the subsystems; in the digital world, they should not duplicate information but should use each others' data sets as a resource and as an input for their own database (Figure 1).

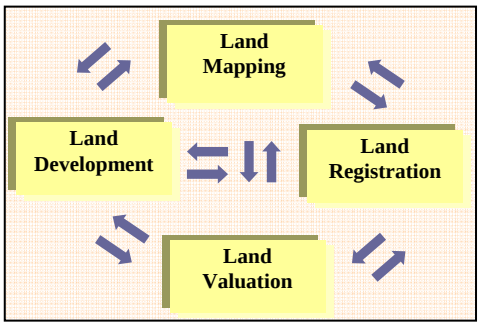


Figure 1 - Data flow within the subsystems

Each subsystem has specific functions and services. These specific functions or services directly impact on their databases. For example a register of title or deeds normally contains a record of the attributes associated with each parcel: its owner, the interests held and description of land. In an open registry, functions and services include providing this information to the public. In valuation and taxation systems several techniques for estimating the value of the property may be used; each technique serves different purposes and makes different assumptions. For land use planning and land development control, the

organization needs various datasets as well as various functionalities for analysis and decision making. The unique perspective of each agency causes it to implement specific functionalities to deliver its services and to develop different data structure.

To meet government needs for up-to-date, complete and comprehensive information, land administration systems intend to treat the data and services of each of the subsystems holistically, by utilising ICT.

ICT is being heavily utilized by land administration subsystems. Although it provides opportunities for better service delivery and customer satisfaction and reduction in operating costs, establishment of e-Land Administration has to date not been fully realized and is often problematic. This problem rises from the lack of flexibility and incompatibility of subsystems' services. They most often encounter problems with data coming from different sources, being highly dispersal, and lacking conformity to standards. The difficulties increase, when the data is coupled with complicated technologies and bureaucratic management. Interoperability is one idea offered to overcome this problem.

INTEROPERABILITY

Interoperability in information systems is the ability of different types of computers, networks, operating system and applications to work together effectively, without prior communication, in order to exchange information in a useful and meaningful manner (Inproteo, 2005). Interoperability is the capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units (Rawat, 2003).

In the domain of spatial information interoperability is the cooperation, the compatibility of an information system to run, manipulate, exchange and share the data of different organizations related to spatial information on, above, and below the Earth's surface; for any kind of application to serve the society over networks (Rawat, 2003). The idea was then developed for businesses and organizations as well as public administrations to improve collaboration and productivity in general, increase flexibility, enhance service efficiency and add to productivity while simultaneously reducing the costs.

The complexity of land administration systems raises issues not only related to technical aspects of the subsystems but also related to the semantic, legal and inter-community aspects which need to be addressed to achieve an interoperable e-Land Administration system. Interoperability in e-Land Administration facilitates the ability to link land administration subsystems cost effectively to share resources, find data, functions and processing to serve the public.

e-LAND ADMINISTRATION INTEROPERABILITY FRAMEWORK

As mentioned, the complexity of e-Land Administration is the main reason for creating interoperability between various subsystems in order to perform more efficient and effective services to users. Interoperability covers a wide scope which is undesirable. To make the concept workable it is classified as the ability to drill down through various levels of data. Interoperability in e-Land Administration framework can be considered in four aspects: semantic, legal, inter-community and technical (Figure 2).

Semantic interoperability: The land concept may be viewed from different perspectives. The ordinary citizen and physical planner may think of it as actual space in which people live and work; the lawyer may think of it as real property rights, while the economist and

accountant may see it as economic commodities. Others may see it as part of nationhood and cultural heritage (United Nations, 2004). From whatever perspective, land administration as an information infrastructure that supports land management should include harmonization in terms of terminology. Furthermore a lack of semantic interoperability and heterogeneity occurs where there is a disagreement about the meaning, interpretation, or intended use of the same or related data in various domains (Tuladhar et al., 2005). In other words these different, but related domains need to be harmonized, particularly because even within one domain, such as the cadastral domain, disagreement on the use of concepts and their semantics occurs. It is even more difficult when dealing with other domains like a land registry, land taxation and others. A single standard might not be possible but a core standard based on common concepts should be achievable; common concepts allow talking across boundaries (Lemmen et al., 2005). Semantic interoperability represents harmonized terminology and interpretation of concepts.

Legal interoperability: Mainly land administration organizations have internal process and workflow management solutions, but policies and supporting guidelines are needed to ensure land management/administration is effective across the range of organisations. For example, to ensure the optimum use of space and to enable the land market to operate efficiently and effectively there must be a framework of land and property laws (United Nations, 2004) which facilitates legal interoperability among the organisations. Another example is the uniform description of the cadastral domain which allows cost-efficient construction of data transfer and data interchange systems between different parts (Paasch, 2004).

Furthermore at the international comparative level, most property registration infrastructures remain mainly regional/local, while banking infrastructures are global. The real estate market has, at least for a subset of society, become global as well (Roux, 2004).

Legal interoperability will develop directives, rules, parameters and instructions for managing business work flow considering information and communication incorporation in the business of land administration.

Inter-community interoperability: Inter-community interoperability is concerned with the co-ordination and alignment of business process and information architectures that span people, private partnership and the public sector. Intercommunity interoperability leads land administration systems to be built on a basis covering the whole sector for land administration, so users should not have to turn to a number of systems to obtain a complete picture (Ljunggren, 2004).

The World Bank report on comparative study of land administration systems realized a lack of national interoperability in various study areas. For example multiple agencies with overlapping land administration roles and responsibilities, each supported by empowering legislation, is a critical issue in some countries in Asia (WorldBank, 2003). The same situation that is pervasive amongst almost every Latin American country is separation, at the information and institutional levels, between the property registry and the cadastre (WorldBank, 2003). Coordination is also a critical issue in Africa where there are major problems surrounding the flow of spatial information for land administration purposes both within government, between departments at national level, between national and lower level tiers of government, and between government and the private sector and users (WorldBank, 2003).

Inter-community interoperability includes consideration of providing a unique portal to perform various tasks and applications in land administration. A simple and single portal

for instance is Google.com which presents a very good example of simplicity to achieve interoperability. The user interface consists of approximately 31 words, a textbox, and two command buttons. This extremely simple interface hides some very complex logic and operations – a concept that we should seek to provide in land administration and real estate management (Roux, 2004).

Technical interoperability: The need for technical interoperability should be realised. Many types of heterogeneity are due to technological differences, for example, differences in databases, data modelling, hardware systems, and software and communication systems.

The differences in DBMSs is largely in data models which have direct impacts on data structure, constraints and query languages (Radwan et al., 2005). Also, in order to satisfy market needs, data must be reliable and accessible to all users in a timely manner. In order to minimise data duplication, data sharing partnership between data producers are coordinated so that there are fewer conflicts about their data standards (Tuladhar et al., 2005). Another example of technical interoperability is the benefit of web access to cadastral information services, which involves the ability to use the functions between various kinds of platforms, regardless of programming language, operating system, computer type, etc (Hecht, 2004).

Consideration of technical interoperability includes ensuring an involvement in the continued development of standard communication, exchange, modelling and storage of data information as well as access portals and interoperable web services equipped with user-friendly interfaces.

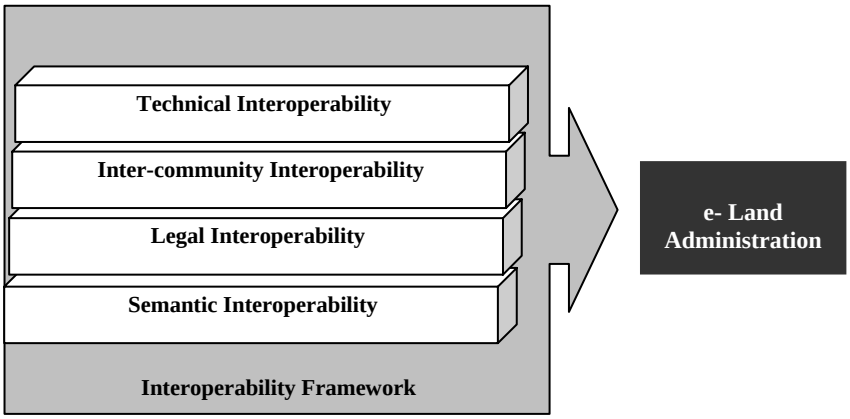


Figure 2 - Interoperability levels in land administration

e-LAND ADMINISTRATION INTEROPERABILITY TOOLKIT

The modern e-Land Administration system would include a range of processes that should be undertaken on a variety of land information and related data. Examples include the establishment of a water trading register, natural resource register and aboriginal heritage register which are being added to the classic processes of land administration like the private land registry. Holistic and comprehensive treatment of such an e-Land Administration system requires a range of tools to cover the mentioned interoperability levels in e-Land Administration.

The semantic, legal and inter-community issues impact more on administrative and political levels. They are related to the arrangement of data sharing and process among the

land administration subsystems. The spatial data infrastructure is a tool for meeting the objectives of those interoperability levels (Rajabifard et al., 2005). This can be considered as an organizational SDI (Figure 3). The challenge is integration of built environment and natural environment data to support sustainable development objectives.

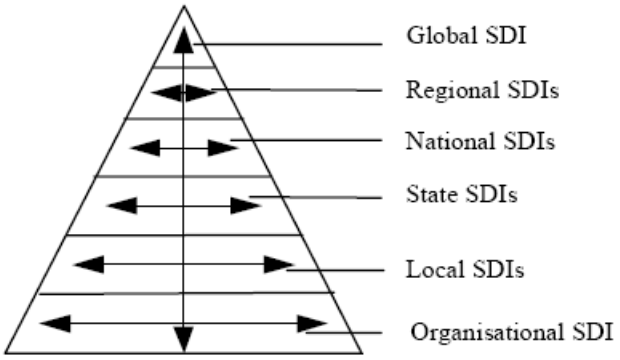


Figure 3 - Organizational SDI in SDI Hierarchy (Rajabifard *et al.*, 2005)

Implementing technical interoperability is influenced by the lower levels of interoperability and requires a range of tools to cover the scope of the other interoperability levels. In fact technical interoperability tools are instruments for implementation of the idea of interoperable land administration.

A technical interoperability toolkit should offer a wide range of facilities to cover the requirements of the other levels. It should provide tools for managing data including modeling, capturing and converting, etc. The toolkit also should provide tools to adapt the organizational structure of the land administration system in a digital and electronic format. Access and sharing tools facilitate data and information exchange among the subsystems of land administration. After providing data accessibility in a proper electronic architecture, the toolkit should supply the proper models and functionalities for decision making. So the technical interoperability toolkit includes four major tools (Figure 4):

Data management tools: Data management tools facilitate and manage the development or intensification of land information from multiple distributed sources. Cadastral data that are stored for use in local databases can often be used in external applications once they are published. The data management tool facilitates data description, data modelling, data capture, database design, data catalogue and data conversion and migration as a mean to holding cadastral information in a standard way to be deliverable across multiple servers for access and sharing.

Enterprise architecture design tools: Enterprise architecture design tools facilitate and support development of plug-and-play enterprise systems and architectures using a web-based foundation. The Open GIS Consortium (OGC, 2003) believes that applications will be based on compositions of services discovered and marshalled dynamically at runtime (just-in-time integration of services). Service (application) integration becomes the innovation of the next generation of e-business. As businesses move more to web services a set of standards is needed to create service oriented architecture. For example for interoperability with external software, the use of web services standards is one of the approaches (Hecht, 2004).

Access and sharing tools: Access and sharing tools facilitate the development of web-based access in a seamless and integrated view. These tools provide recent interoperable sharing techniques, based on international standards like OGC (2003) in realizing simple

interoperability through specifications that are considered also in the ISO International Standard. Access may include the order, packaging and delivery, offline or online, of the data (Nebert, 2004). Once cadastral data of interest has been located and evaluated, using the data management and sharing techniques, access to detailed cadastral data is allowed by web services.

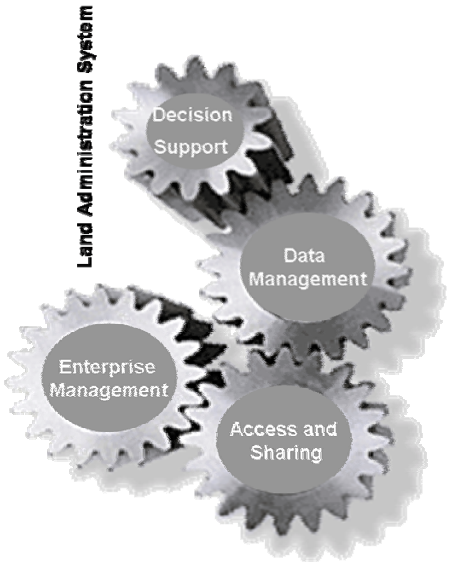


Figure 4 - Land Administration Interoperability Toolkit

Exploitation tools: Exploitation tools are what the consumers do with the data for their own purposes. Decision support and exploitation tools, especially in the land use and land development functions of land administration, facilitate decision-support applications that draw on multiple, distributed cadastral data resources. The initial focus of the interoperability is to improve the quality and accessibility of related knowledge, information, and data.

DISCUSSION

This paper introduced a range of tools to implement the idea of interoperable e-land administration. Within an interoperability toolkit the data modeling tool will play an important role to facilitate interoperability.

The data modeling formulates an effective way of capturing spatial and non-spatial cadastral data. Database design is based on data modeling. Data modeling is a conceptual level of modeling which underpins the design of logical and physical models of the database. The modeling component allows the data catalogue to fit metadata in the proper position whether it is separate or integrated with other data. Also modeling introduces standards for the exchange and conversion of data among the various services for different organizations (Kalantari et al., 2005).

Furthermore a data model is a basic step toward efficient service delivery, because data are defined in the context of business processes. It allows every single process in land administration subsystems to directly influence the core cadastral model. The modeling process should recognize the business processes to mirror them in the reference cadastral model (Kalantari et al., 2005).

A reference cadastral data model which recognizes all of the subsystems requirements will facilitate interoperability in e-land administration. It helps data to be exchanged efficiently without missing data in the process of converting one data model into another. Using the reference cadastral data model, two methods can be proposed for data exchange between subsystems.

The first solution is data oriented. It uses the reference to match the data in the central repository. It allows data conversion in a target subsystem or data configuration before sending to another target subsystem. There have been many efforts to facilitate interoperability using open GIS software which allow clients to read various data formats, but the process of converting data from one format to another is usually followed by data loss. The problems increase when one subsystem wants to add their particular data to the other subsystem database. Furthermore in the huge databases like a cadastral fabric with large amount of attributes linked to it, the process of converting and adding data is time consuming.

A second solution is service oriented. It uses a unique reference cadastral data model for on the fly translation of data. The reference cadastral data model defines the key data elements for linking databases together in order to undertake a process in a particular service. For example the reference cadastral model enables the service to derive full description of a property by on the fly translating and combining land mapping and land registry databases.

CONCLUSION

This paper is the result of an ongoing PhD research project which accepted sustainable development as the central driver for modern e-Land Administration. The modern e-Land Administration system includes four major subsystems: Land Mapping, Land Registry, Land Development and Land Valuation. The huge amount of data exchange among the subsystems increases interoperability issues. The paper introduced the aspects of interoperability and offered a range of tools to facilitate the data and process interoperability in e-Land Administration systems.

Among the mentioned interoperability tools, cadastral data modeling is playing a central role to overcome interoperability issues. The paper introduced two methods for implementing a reference core cadastral data model for modern land administration system. The next step will be an investigation of the advantages and disadvantages of these two methods.

ACKNOWLEGMENTS

This research project is proudly supported by the International Science Linkages programme established under the Australian Government's innovation statement Backing Australia's Ability.

The authors acknowledge the support of the Department of Sustainability and Environment of Victoria, Department of Land Information Western Australia and the Department of Lands New South Wales, and the members of the Centre for Spatial Data Infrastructures and Land Administration at the Department of Geomatics, the University of Melbourne, in the preparation of this paper and the associated research. However, the views expressed in the paper are those of the authors and do not necessarily reflect those of these groups.

REFERENCES

Enemark, S., Williamson, I. & Wallace, J. 2005, 'Building Modern Land Administration Systems in Developed Economies'.

Hecht, L. (2004), 'Observations on the Proposed Standardized Cadastre Domain Model, Where Do We Go From Here?' *Proceedings of Joint FIG Commission 7 and COST Action G9 Workshop on Standardization in the Cadastral Domain*, December 09-10, Bamberg, Germany.

Inproteo (2005), *Definition for Interoperability*, Available: <http://www.inproteomics.com/nwgloshi.html > Accessed on:(May 2005).

Kalantari, M., Rajabifard, A., Wallace, J. & Williamson, I. (2005), 'The Role of Cadastral Data Modeling in e-Land Adminitartion', *Coordinates,* vol. 1, no. 4, pp. 26-29.

Lemmen, C., Oosterom, P. V., Zevenbergen, J., Quak, W. & Molen, P. V. D. (2005), 'Further Progress in the Development of the Core Cadastral Domain Model', *Proceedings of FIG Working Week 2005 and GSDI-8*, April 16-21, Cairo, Egypt.

Ljunggren, T. (2004), 'Moving Focus from Organization to Information', *Proceedings of Joint FIG Commission 7 and COST Action G9 Workshop on Standardization in the Cadastral Domain*, December 09-10, Bamberg, Germany.

Nebert, D. D. (2004), *Developing Spatial Data Infrastructures: The SDI Cookbook*.

OGC (2003), *OpenGIS Reference Model*.

Paasch, J. M. (2004), 'Modelling the cadastral domain', *Proceedings of 10th EC GI & GIS Workshop, ESDI State of the Art*, 23-25 June, Warsaw, Poland.

Radwan, M. M., Bishr, Y., Emara, B., Saleh, A. & Sabrah, R. (2005), 'Online Cadastre Portal Services in the Framework of e-Government to Support Real State Industry in Egypt', *Proceedings of FIG Working Week 2005 and GSDI-8*, April 16-21, Cairo, Egypt.

Rajabifard, A., Binss, A. & Williamson, I. (2005), 'Development of a Virtual Australia Utilizing an SDI Enabled Platform', *Proceedings of FIG Working Week/GSDI-8*, 16-21 April, Cairo, Egypt.

Rawat, S. (2003), *Interoperable Geo-Spatial Data Model in the Context of the Indian NSDI*, International Institute for Geo-information Science and Earth Observation, Holland

Roux, P. L. (2004), 'Extensible Models and Templates for Sustainable Land Information Management Intent and Purpose', *Proceedings of Joint FIG Commission 7 and COST Action G9 Workshop on Standardisation in the Cadastral Domain*, December 09-10, Bamberg, Germany.

Tuladhar, A. M., Radwan, M., Kader, F. A. & El-Ruby, S. (2005), 'Federated Data Model to Improve Accessibility of Distributed Cadastral Databases in Land Administration', *Proceedings of FIG Working Week 2005 and GSDI-8*, April 16-21, Cairo, Egypt.

United Nations (2004), *Guidelines on real property units and identifiers*, New York and Geneva.

WorldBank (2003), *Comparative study of land administration systems*.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

BUILDING TITLES

Andrew Binns, Jude Wallace and Ian Williamson
Research Fellow
Senior Research Fellow
and
Head of Department and Director,
Centre for SDIs and Land Administration
Department of Geomatics, The University of Melbourne
Email: a.binns@unimelb.edu.au

SUMMARY

Arguably, Australia used to lead the world in adapting its LAS to support land parcel marketing. Major innovations of the Torrens systems of land registration and strata titles are copied in many countries. However, because of the pace of change, the capacity of LAS to meet market needs has waned. Vertical villages, time shares, mortgage backed certificates, insurance based products, land information, property and unit trusts and many more commodities now offer investment and participation opportunities to millions. The controls and restrictions over land have become multi-purpose, and aim at ensuring safety standards, durable structures, adequate service provision, land use planning and sustainable development.

The combination of new management styles, computerization of activities, creation of databanks containing a wealth of land information, and improved interoperability of valuation, planning, address, spatial and registration information have begun to allow much more flexibility within land markets and LAS. However, Australian LAS remain creatures of their history of state and territory formation. They do not service national level trading and are especially inept in servicing trading in new commodities. There is now a need for land markets and the supporting LAS infrastructure to service all levels of trading activity, including trading in complex commodities. The importance of this research is demonstrated in Figure 1, "Stages of evolution of a mature land market", below, which shows how modern markets evolve through stages reflecting an economy's ability to commodify abstract and complex products out of land. This will be possible providing people are capable of building technical support systems to define these products and order trading activities to the satisfaction of market participants.

Research within the Centre for SDI and Land Administration is concentrating on the development of a model for LAS to service complex commodity trading, creating a major policy tool to land administrators, market participants and governments. Case studies of land information, and body corporate and building related titles are being undertaken, with the second case study being the area of research this paper concentrates on. Thus far the identification of issues related to plans, especially the capacity to include volumetric spaces in the cadastre, has been the focus.

INTRODUCTION TO BODY CORPORATE AND BUILDING RELATED TITLES

Modern land markets demand intensive and creative land uses. Those countries enjoying highly sophisticated land markets (some 32) must find ways to deliver land more efficiently and to free up opportunities to use land, whether for buildings or for public facilities, such as tunnels, infrastructure and new kinds of ownership opportunities. Governments must also provide all encompassing management capacity whether parcels are represented in the land registry as self owned units, a development is single owned but multi leased in a large building, or apartments are arranged though housing cooperatives or associations, or provided as low income or special housing by government and semi-government agencies. Last century, systems adapted slowly to meet emerging market demands. Now the pace of change, particularly the creation of new kinds of schemes for building use, is accelerating. The building titles and the reality they represent are changing in response, especially as construction methods allow more densely used land and use mixes of work places, residences and recreational facilities.

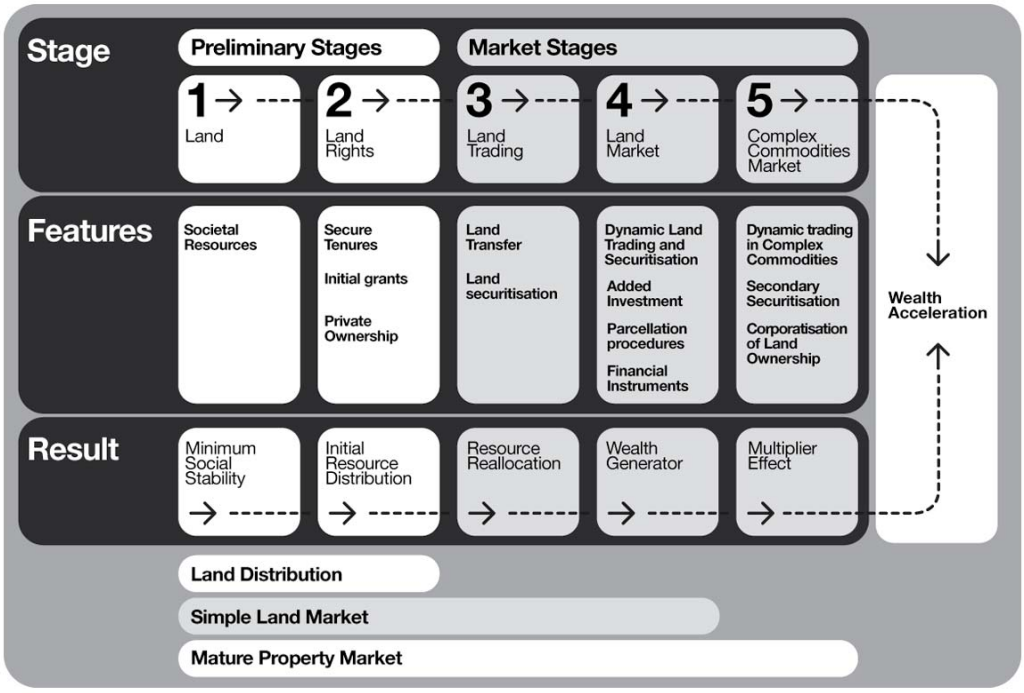


Figure 1 – Stages of Evolution of a Mature Land Market (Wallace and Williamson 2005)

HISTORY

Australia and countries with highly developed land administration systems and highly effective property markets, use a model for titling buildings with three separate administrative frameworks:

- A juridical framework: the legal status of stratified properties and particularly the rights, restrictions and responsibilities of their owners
- A cadastral framework: the capacity of the plans of the entity to be stored in and related to other parcels in the land administration, particularly the land survey system.

- A technical framework: the system architecture (computer hardware, software and data structures) supporting cadastral registration (Stoter, 2004).

While Australian systems evolved through a process of emulation of a principal model, local variations, particularly in the cadastral and technical frameworks, are evident. The basic model for Australian building titles derives from a New South Wales strata title model developed in the early 1960's before computerisation entered the realm of surveying and land registration. The achievement of the NSW model is the conversion of a raw land subdivision system to subdivision of buildings comprising multi storeys and multi purposes. The model is emulated, with various changes, throughout the world. Its generic qualities are most recently described in the Guidelines for Ownership of Condominium Housing produced by the United Nations European Commission for Europe (UN-ECE). The essential ingredients of the model are: separate titles to units; separate title and clear ownership of common property, a management system combining the owners into an organisation capable of appointing a manager of the building and facilitating cost sharing; and a disputes system. For countries with land registration, including Australia where eight Torrens systems provide universal coverage of building titles (though some multi-occupancy buildings rely on company share scheme titles and other out of date systems), these titles need to sit satisfactorily within systems originally devised for managing vacant land.

SURVEY PLANS OF BUILDINGS

Cadastral and technical frameworks are built over time and vary internationally, though an ideal concept of both is well developed in the land administration literature. The cadastre (parcel map) is established as an essential component of modern land administration systems (FIG 1995, Enemark 2005). While modern land markets generate sufficient technical, human and financial resources to build effective cadastres, even the most endowed nation will build its cadastre according to technical, legal, institutional, economic, administrative and social needs at a given time for given purposes. Large areas of low value land will be identified with less reliable tools than high value urban and agricultural land. Building titles, being recent developments, are managed at the high end of cadastral design and technical requirements. Given their relatively late arrival in the history of application of technical tools to surveying, survey requirements for building titles are extremely detailed, technical and expensive.

The Australian cadastral framework was devised to cover two dimensional subdivision and consequently the effective representation of 2D parcels, accompanied by the legal assumption of rights above and below the surface. When in the 1960's, three dimensional parcels arrived, their incorporation into the cadastre was simple and typically involved the identification of plans of buildings by a recognisable prefix of, for instance SP for strata plan, as against LP for lodged plan of raw land. The plans in paper form were then available through the land registration system to diagrammatically represent the parcel as a 2D layout, floor by floor, and included in the parcel map to identify the relationship between the parcel and its surrounds.

Computerisation of land registries took some fifteen years, from the 1980's to about 1995, though some registry data is not yet fully converted. Initially, computerisation involved scanning in of paper plans, usually as image files. Information in this form is relatively easy to keep in digital form and to provide through computers and over intranets and the internet. It is, however, fundamentally inadequate to provide the kind of computer assistance for land administration needed by modern governments and businesses in that

the information is neither interactive nor spatially enabled for multi-uses. The conversion of the cadastre in paper form to a digital cadastral data base makes it useful for modern government and business and facilitates integration of cadastral information with other essential land information. Building a digital cadastre (that is, a map of parcels in a computer system) is the major effort of the land administration systems in the modern world. It follows that smooth and seamless incorporation of digital spatial and cadastral information about buildings into the cadastral and land information systems is therefore even more crucial.

VISUALISATION AND 3D

The importance of incorporating digital spatial and cadastral information about buildings into land information systems is understood to a greater extent when the key concept of "visualisation" is explained. The most simple description is the ability of the computer to reflect the world outside the machine. For the cadastre, visualisation used to involve the replication of the on-ground parcel (Figure 2a, Parcel – above and below land) and road reality as a map or diagram, and in new technology, as images, pictures and layers. Now visualisation needs to show not just land, but the buildings and their legal cadastral reality (Figure 2b, Simple building property – volume bounded in 3D). Easy said, but hard to achieve.

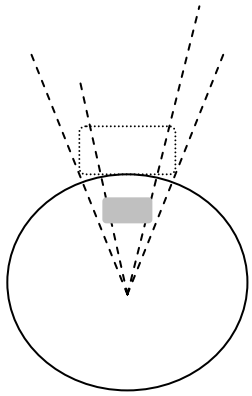


Figure 2a) -
Parcel – above and below land

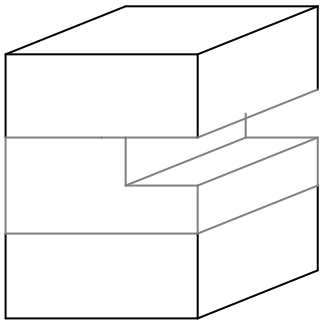


Figure 2b) -
Simple building property – volume bounded in 3D

Perhaps an illustration can assist understanding. Assume governments in Australia have created three basic computerised systems of land and resource management:

- the land registry and the accompanying cadastre. This is one layer of information – usually the surface of the land on which roads and buildings appear.
- the mining registration systems. These locate opportunities to prospect for and mine minerals under the surface of land and sea.
- the geographical datasets held in GIS (topography, soil, contour and many others).

Now government wants to be able to manage land and resources to achieve sustainable development and obviously would be assisted if each of these layers of information could be managed according to a multilayer information management system of some kind. Multi layering would allow us to show the parcel (built environment), mining opportunities and physical characteristics (natural environment) in relation to a place through the same access or system. Achieving this kind of utility requires coordination of the efforts and

systems used to digitise each of the layers. It is a major effort in itself. The geometry and the digital system supporting surveying is fundamentally different from the geographic information systems (GIS). And the exercise has required a new conceptual framework to be created: a spatial data infrastructure (SDI).

Once this is realised, the complexity of the third dimension is apparent. While a digital cadastral database representing the horizontal representation of parcels and building footprints is easy, the inclusion of 3D geo-objects (topologically and geometrically) is a question. While GIS are better at visualisation, they have yet to develop "efficient methods for geometric construction, data structuring, organisation, organisation of 2D and 3D data in one environment, database creation and updating" (Stoter, 2004). At this stage, it is not possible to digitally represent a true 3D cadastre, though building subdivisions are included in the digital base map. The plans are drawn for on-ground, and each layer, with cross-references necessary to comply with regulations. These computer drawn plans are in three dimensions and show volumetric parcels with coordinates needed to demarcate the property. They are held in digital form which ensures they are accessible and printable. But the site and the building footprint appear in the 2 dimensional parcel map: the three dimensions are not integrated in a three dimensional digital cadastre. For buildings with over 50 or so units, the plans are multi-page and difficult to interpret by all but the initiated. This results in uncertainty in practical terms which feeds into high levels of disputes about maintenance and upkeep.

For a cadastre to support interactivity presupposed in an SDI, the 3D information would need to be integrated with the digital cadastral database (or the digital parcel map) and with other 3D information about neighbouring parcels, allowing them to be visualised in one view in 3D and to check how volumetric parcels spatially interact in 3D as to overlap, touch and so on (Stoter, 2004). The 3D geometry would need to be available in the cadastral geographical data set. 3D properties are described by coordinates and edges on drawings. No 3D primitive is used and it is not possible to check if a valid 3D property is established (that is, is the 3D property closed; are the faces planar?). The ability to visualize parcels in 3D would aid in solving complex multi-parcel situations such as those seen within the development of CityLink within Melbourne. Definition of parcels for both the CityLink lease and Crown Grants of surplus land surrounding the lease had to be developed and plans, cross-sections and elevations prepared to define these parcels are extremely difficult for surveyors to interpret and almost impossible for the lay person.

The ability to visualize in 3 dimensions would also aid in creating more effective management of trading activities in complex commodities, as described in Figure 3, Development of complex commodities, below.

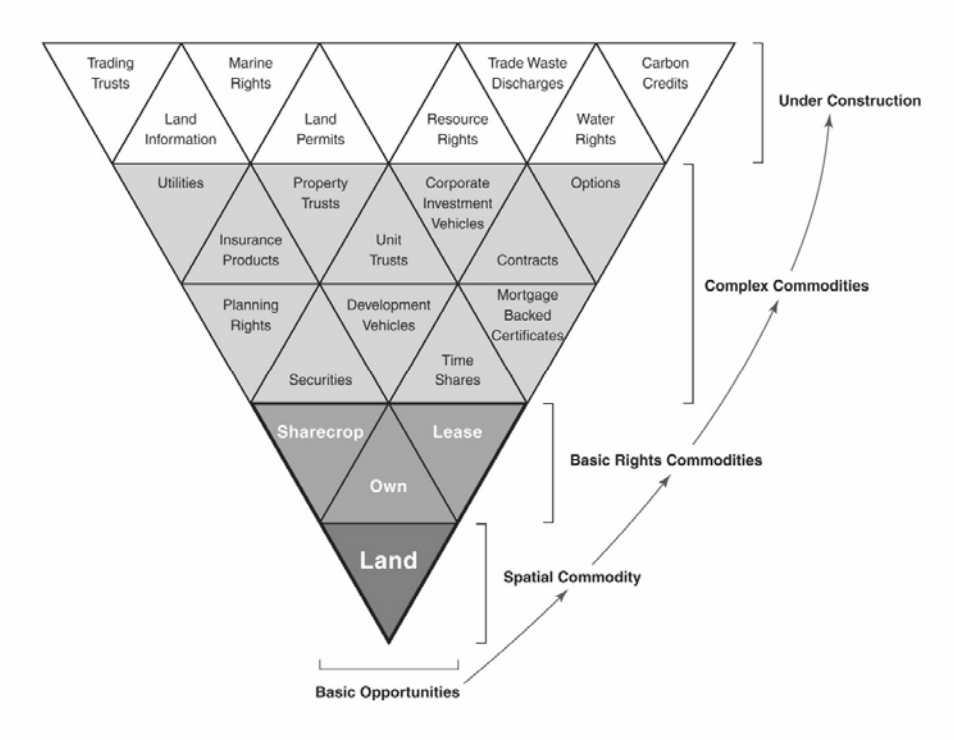


Figure 3 – Development of Complex Commodities (Wallace and Williamson 2005)

These new commodities are being built up over time on the basic land rights of ownership and leasehold but are becoming increasingly difficult to manage successfully in the current land market arrangements. The development of a new paradigm for land administration systems which successfully incorporates spatial aspects will aid in managing these new and complex commodities.

CONCLUSION

Australia is currently seeing a combination of new land management styles, computerization of land information activity and improved interoperability of valuation, planning, address, spatial and registration information. This has led to a much more flexible land market and land administration system. What does not occur very well however is servicing national level trading, especially within servicing trading in new commodities. This paper has focused on the need to spatially enable body corporate and building titles within the sphere of new commodities so that they are more realistically represented in the real world. This would help to ease the complexity of current 3D survey plans and in turn support interactivity and trading of more complex commodities.

REFERENCES

Enemark, S., Williamson, I., and Wallace, J. (2005), Building Modern Land Administration Systems in Developed Economies. Accepted for publication in the Journal of Spatial Science, Australia in the December Issue 2005.

FIG (1995), *FIG Statement on the Cadastre*, International Federation of Surveyors, Canberra, Australia.

Stoter, J.E. (2004), *3D Cadastre*, Geodesy 57, Netherlands Geodetic Commission, www.ncg.knaw.nl

Wallace, J. and Williamson, I.P. (2005), Building land markets. Accepted for publication in the Journal of Land Use Policy.

UN-ECE, (date unknown), *Guidelines for Condominium Ownership of Housing for Countries in Transition,* ECE/HPB.123, 85 pp.

WORKSHOP OUTCOMES

SUMMARY OF DISCUSSION

Key drivers for the model

- Environmental sustainability
- Business efficiency
- Informed decision making
- Technology
- Security / anti-terrorism
- Community expectations
- Risk management
- Remaining responsive to user needs at a whole of government level
- Productivity as a result of IT application
- Environmental needs – monitoring
- Revenue raising through tax
- Meeting public expectations – servicing the citizen

European drivers:

- Environment was the key political driver for INSPIRE
- Agricultural subsidies
- Information technology
- Fraud

Key issues and components

- **Achieving sustainable development:** ICT based LAS does not automatically lead to sustainability.
  - Sustainability is brought about by a mix of factors, LAS is only one.
  - Sustainability must be embedded in a countries culture.
- **Interoperability:** Lack of common understandings impedes debate – legal, inter-community, technical, semantic.
- **Branding/marketing issues:** The terms "land administration", "cadastre" and "SDI" are not useful for selling the vision - politically appealing language is required.
- **People:** A connection to people is missing- the model is dehumanised.
- **Levels of government:** Local government and local communities should play a larger role. How do we integrate three levels of government?
- **Rural vs. urban land:** Rural areas are a greater problem in Australia.
- **Universality of model:** Can we have a conceptual model that resonates across cultures and countries?
- **The role of private sector organisations:**
  - How can they be embedded into the model/paradigm?
  - Do they have a role if they are predominantly economically driven?
- **Market focus:** Current LAS systems of cadastre and land registry are focussed on the land market.
- **Coordinated cadastre:** Spatially enabled cadastre is the key to meeting sustainable development as it relates back to the land owner.

  - LAS needs to cater and build in behaviour elements of people - when designing changes to LAS, what is the behavioural change we are trying to implement?
- **Unbundling of rights:** We need to make sure that this does not threaten sustainability.
- **ICT convergence:** Value of existing systems is underplayed in the model.
- **Processes are important:** Current focus is on entities and institutions.
- **Information needs:** Land administration needs information on both built and natural environments.
- **Institutional issues:** These are still the primary problem.
- **End-user focus:** This is required rather than a technology focus.
- **Indicators/science:** These are missing from the model, as are reporting and evaluation mechanisms.
- **Address information:** This is what the real world uses.
- **Visionary:** The model is conceptually attractive (efficiencies etc.), but is it visionary enough?
- **Data model:** A common data model in the cadastral domain, especially in federated systems, is essential for interoperability.
- **Web services**
- **Standards/shared architectures**
- **Register of interests**

Comparing Europe and Australia

- **Cultural differences:** European approach to land is much closer to that of the indigenous people of Australia.
- **ICT focus:** Australia has high levels of ICT enablement extending to the rural sector.
- **Economic focus:** Australia has a strong focus using economic tools to achieve sustainability (e.g. unbundling) whereas in Europe holistic management and sustainability are embedded.
- **Creating policy:** In Australia the governing parties dominate, whereas, in European countries parliaments are more important.
- **Importance of cadastre:** In Europe cadastres play a far more important role.
- **Buildings:** Buildings and land use are included in European models - this tends to bring people into focus.
- **Legislation and codification:** European trend is to legislate spatial enablement and codify self regulation.
- **Authentic registers:** These are well supported in Europe. Australia does not have these authoritative registers as yet.

Steps to achieving the vision

- Produce a final discussion/white paper for Australia as a potential future policy paper.
- Raise the importance of the debate at ministerial level through a ministerial council of land ministers.
  - Problem cases need identification (e.g. contaminated land) - this will build an argument for government action at the ministerial level.
- Develop a common language - this can be established through further dialogue between stakeholders.

- Consider the marine dimension? Marine cadastral datamodels? What can Europe offer?
- Develop a register of restrictions – critical to achieving sustainability.
- Identify a network of people who should be used as a reference group to provide advice to and receive advice from.
- Involve others – users, other professionals, community.
- Improve government understanding of the impact and scope of the effect of RRRs.
- Build capacity at society, institutional, data process and individual levels – renewable self sustaining cycle.
- Determine what sort of society, quality of life, personally and as a community we want and hence what are the systems/infrastructure needed to deliver this?
- Engage with the intended audience (citizens, politicians and NGOs).
- Consider the social dimension.
- Overcome the institutional silo approach.
- Professional culture clash.
- Maintenance costs.
- Initiate international collaboration/monitoring/standardisation – build the capacity of society, institutions and individuals.
- Build 3D and 4D cadastres.

EXPERT GROUP MEETING ON INCORPORATING SUSTAINABLE DEVELOPMENT OBJECTIVES INTO ICT ENABLED LAND ADMINISTRATION SYSTEMS
9-11 November 2005, Centre for Spatial Data Infrastructures and Land Administration
The University of Melbourne, Australia.

BUILDING A NATIONAL VISION FOR SPATIALLY ENABLED LAND ADMINISTRATION IN AUSTRALIA

Jude Wallace, Ian Williamson and Stig Enemark
Senior Research Fellow, Centre for SDIs and Land Administration;
Director, Centre for SDIs and Land Administration
Head, Department of Geomatics, University of Melbourne;
and
Vice-President of International Federation of Surveyors,
Head, School of Surveying and Planning, Aalborg University, Denmark

SUMMARY

This article provides a sketch of the key issues stemming from the Expert Group Meeting attended by European and Australian experts. It is the first step in building a national land administration vision and is influenced by empirical research on European and Australian approaches to Land Administration Systems. The vision is especially influenced by three trends in global land administration theory and practice, especially during the last five years and include: sustainable development; spatial enablement; and Australian achievements in land administration.

The challenges for modern land administration systems and in modern government are presented including implementing and understanding regulations and restrictions, and changing the nature of ownership. The role of spatial enablement and understanding the potential of *iLand*, the concept of integrated spatially enabled land information available on the Web, are central to understanding the national vision for land administration in Australia. Finally, future directions within technical and operational issues and collaboration and capacity building are presented which build on the outcomes of the EGM and lead into the creation of a new land management model and national vision for spatially enabled land administration.

INTRODUCTION

This article is prepared by the research team for the Project, *Incorporating Sustainable Development Objectives into ICT Enabled Land Administration in Australia*. It builds on the findings from the Expert Group Meeting, of 9-11 November, 2005 held in Melbourne and attended by European and Australian experts. The article is the first step in building a national land administration vision and is influenced by empirical research on European and Australian approaches and their differences. The vision is especially influenced by three changes or trends in global land administration theory and practice especially during the last five years. These are -

1 Sustainable development objectives within land management
2 Spatial enablement technologies
3 Achievements in land administration in Australia.

RESEARCH CONTEXT

The project required a review of land administration trends in developed and undeveloped countries, understanding the issues identified by national and international agencies, and reviewing the trends in information and communication technologies. Background research and the case studies in Denmark, German, The Netherlands and Switzerland in Europe and Victoria, New South Wales and Western Australia in Australia, revealed a much larger capacity for land administration systems (LAS) to service government and deliver sustainability than that identified in existing literature. This was principally because of significant improvements in technological opportunities and a much more practical approach to sustainability issues. The ingredients of this modern context are identified below.

CHALLENGES FOR MODERN LAND ADMINISTRATION SYSTEMS

Sustainable development

Sustainability is the agreed goal for national governments. The 'triple bottom line' of *economic*, *environmental* and *social* sustainability is now expanded with the inclusion of *governance* standards to ensure institutional and corporate ethical performance in the longer term. Implementation of 'quadruple bottom line' sustainable development requires combined activities across the whole of government, private sector and citizens. Careful management of land related activities on-ground, in organisations and in government is crucial for delivery of sustainability. New technologies offer opportunities for reorganisation of land related activities and delivery of targeted land information for government and business decisions to deliver sustainability.

The land management paradigm

Land management is a phenomenon of all societies and underpins distribution and management of their largest asset: their land. For Western democracies with highly geared economies, land management, with a central land administration component, is a major activity of government and the private sector, the foundation of highly geared land markets and delivery of land. The land management paradigm below allows everyone to understand the *sphere of the central land administration component* and how these institutions relate to the historical circumstances of a country and its policy decisions. The paradigm also provides a stable focus for comparison and sharing of national, regional and

international efforts to manage land. More importantly it provides a framework to facilitate the processes of integrating new needs into traditionally organised systems without disturbing the fundamental security these systems provide.

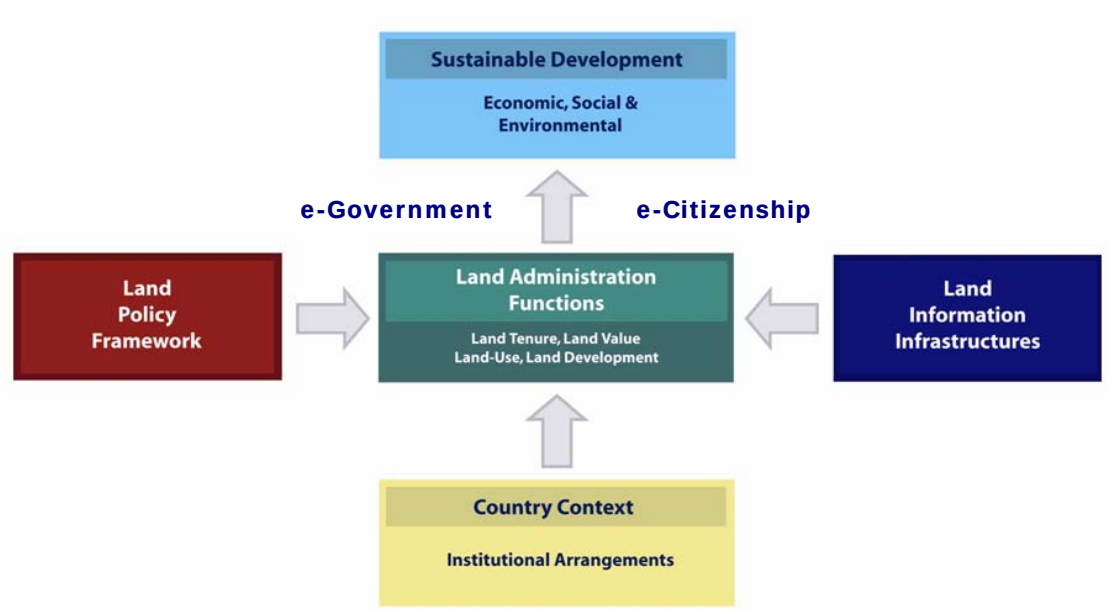


Figure 1 - The land management model (Enemark, Williamson and Wallace, 2005)

Integrated land management

No nation can build land management institutions without thinking about integration of activities, policies and approaches. Cost and overheads of technology provide additional motivations. The rise of new spatial technologies offers exciting opportunities for new approaches. The question facing modern land administrators is then how to proceed to the future.

Land administration

Land administration systems (LAS) started because governments needed coherent and fair tax collection systems, then they developed to service land markets. Their basic functions are to organise land tenures, values, uses and development. Their primary tools are surveying, registration systems, and databases run by government organisations. Land administration systems are now unrecognisable in terms of their antecedents and are highly administrative and technical.

Land administration is now a multi discipline endeavor with a focus on land management, delivery and organisation; it is also providing the supporting framework for trading in complex commodities. An analysis of how modern land markets are able to invent and support a constant stream of new commodities shows how fundamental infrastructure in the prosaic activities of tenure, use, development and value underpins these wealth accelerating activities (Wallace and Williamson, 2006).

The cadastre

For Australians, the cadastre is a new, but simple to understand, concept: it is a map of the parcels and land arrangements now available in digital form in computers showing how a society organises its land into useable pieces with interconnecting roads and services (Figure 2). It was developed by digitising the old paper survey plans and maps, making them fit, and by generating new parcels through much more accurate modern processes.

Fitting the old records with the new is ongoing and varies in each system. In Europe cadastres are much older and their functionality is much more extensive. Their age makes them understandable to their communities and they include much more information, including buildings.

The cadastre is at the operational core of land administration systems. Modern digital cadastres are much more central to modern governments because they allow computers to accurately identify where a feature, such as a street or a house, is on the globe. They therefore change computerised data into intelligible, people-friendly information and present it in visual (picture) formats. By adding geocoded addresses, cadastres can show how parcels of land are arranged into properties and businesses. Imposing aerial images (photos or satellite images) in the equivalent scale allows people to look up pictures of their homes and farms to show current and historical uses. In some jurisdictions, cadastres are survey accurate (ACT, south western Western Australia, in urban and peri-urban New Zealand). In others (Victoria, NSW), they are generally not. For Australia, the necessity of survey accuracy in the cadastre is frequently debated because it is expensive, relative to our land mass. In Europe, the long history of surveying, meticulous standards of on-ground surveying, public respect for and understanding of surveying and close density land uses have long ago ended the debate. For high value land, survey accuracy in the cadastre is a national asset.

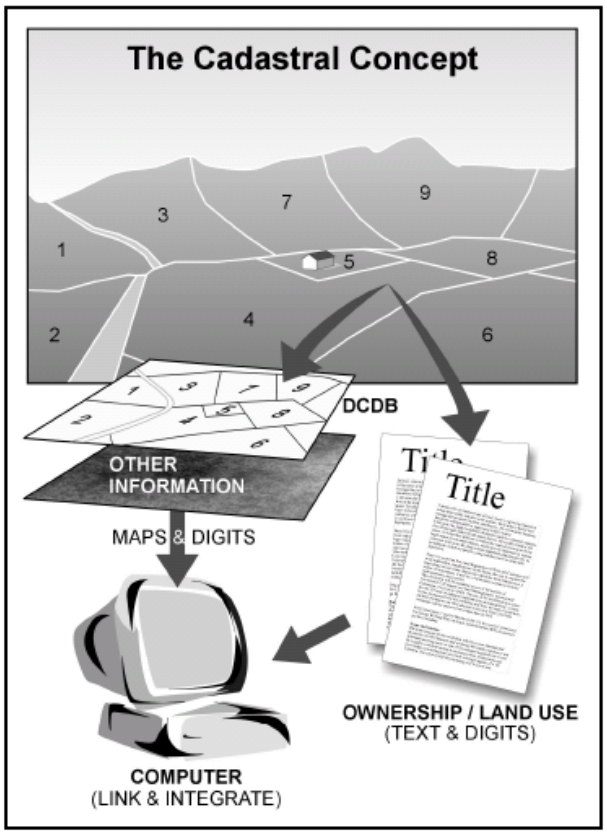


Figure 2 – The Cadastral Concept

The unique capacity of cadastres to provide the people friendly layer of land information makes them the layer that no modern land administration system can do without. They are nevertheless expensive to build and to maintain. This is why they must be "built once, and used many times". They must also be cleverly designed to meet the needs of modern governments concerned about sustainable development.

Changes in land administration

Since 1990, land administration in modern democracies emerged from a technical focus to engage professionals from the disciplines of engineering, economics, political and social sciences, law and computer technology as international organisations and national governments struggled to deliver land and food security and to build land markets.

The most important changes in LAS were driven by technology, principally the move from paper records to computerised systems. In future, geographic information systems, spatial data infrastructures, multi-purpose information, alignment of information about the built and natural environments, and layering of aspatial information with the stable framework of location data will create new opportunities.

In creating this dynamic new future, the previous concentration on institutions of government will be widened by engagement of utilities, spatial scientists, and other businesses in the construction of land information products. The transitions are shown in Figure 3 below.

Figure 3 - IT in LAS

This figure shows a potential future for modern land administration, called *iLand*. It emphasises the dynamism in people to land relationships that need much more modern management tools and approaches than the standard land administration approaches built in the days of relational data bases and small capacity computers. Given the technological trends, governments are moving from web enablement of information needs, to *eLand* where information is much more interoperable, accessible, and where services and processes are managed in the internet environment. *iLand* takes this to the next stage in which government organisation of processes and information utilises the new and emerging technologies in spatial recognition. *iLand* requires a comprehensive approach to using spatial enablement throughout government, and especially in land administration tasks, similar to that shown in Figure 4 below.

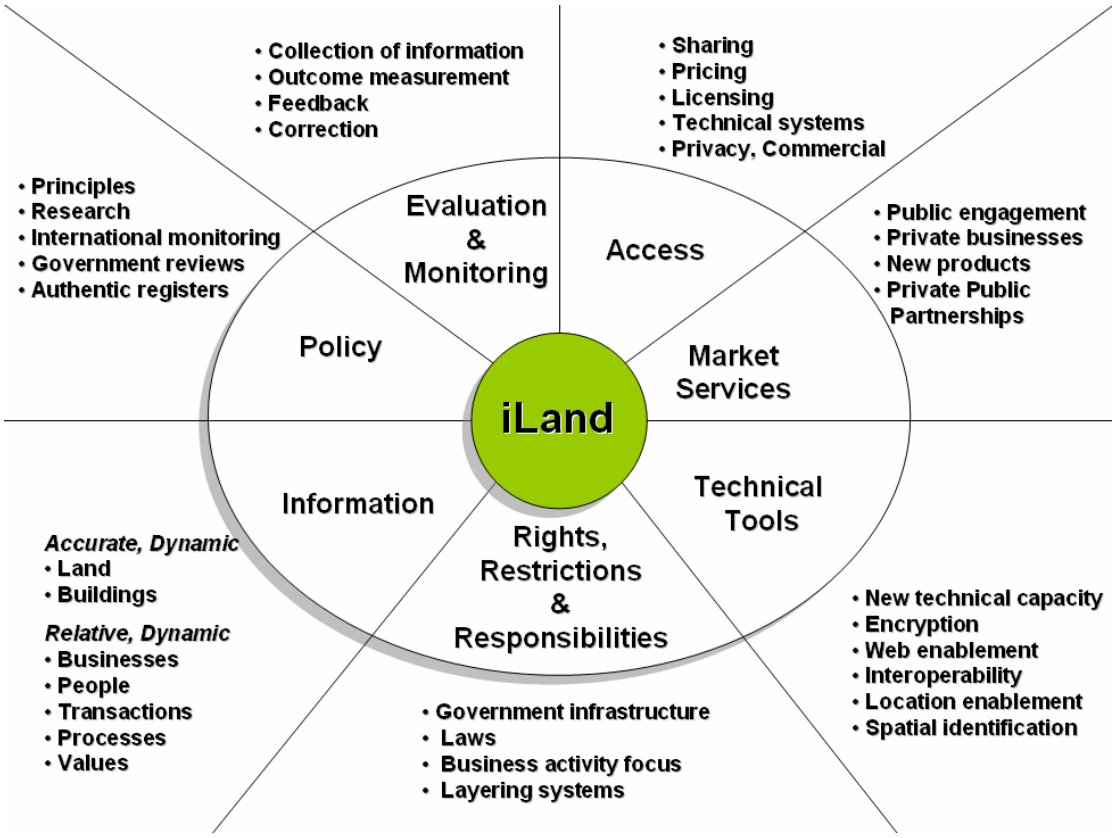


Figure 4 - The *iLand* vision

The *iLand* vision is where government information systems are spatially enabled, and the "where" or location provided by spatial information is regarded as a common good made

available to citizens and businesses to encourage creativity, efficiency and product development. This makes spatial information, which describes the *location* of objects in the real world and the *relationships* between objects, into both an enabling technology and an enabling infrastructure for modern society. While relying on the technical skills of the professionals in the computer world, and the experts in land identification in surveying and geography, *iLand* essentially services the needs of everyone else, including governments as they seek to implement land policy and deliver sustainability. The current issues facing government identified below will be much better addressed by this infrastructure.

CHANGES IN MODERN GOVERNMENT

Implementing and understanding regulations and restrictions

Land uses over time must be managed to mitigate long term deleterious impacts. Australian problems of erosion, salinity and acidity are documented. Over time, attempts to manage these shared impacts by regulating tree clearance, water use, chemical use, building standards and so on led to very great increases in the amount of law, regulation and standards applying to land based activities. This is a world wide experience. Calls for inclusion of restrictions on land in LAS and transparency of government are common and international. Australian examples are evident at parliamentary levels. The idea of including "all restrictions in the land register" was a first-grab solution. New technology now offers more alternatives. Modern registries are adapting to integrate these new opportunities into their traditional functions.

Changing the nature of ownership

Nations are building genuine partnerships between communities and owners, so that environmental and business controls are mutual endeavors. Rather than approach them as restrictions, the nature of ownership is redesigned to allow owners opportunities within a framework of responsible land uses for delivery of environmental and other gains to all. The Australian mining industry provides typical examples of collaborative engagement of local people, aboriginal owners and the broader public. The National Water Initiative and the National Land and Water Resources Audit build in the realisation that activities of one land owner affect others. The development of market based instruments (MBI) such as EcoTenders is an Australian attempt to build environmental consequences into land management. Australia's implementation of "unbundling" of land, to create separate, tradeable commodities is now strongly established. These separate commodifications of land based opportunities are built into existing land administration systems as far as possible, but no comprehensive analysis of their impact on property theory is available.

For the Europeans, the social responsibilities of land owners have a much longer heritage, with the exemplar provision in the German Constitution insisting on the land owner's social role. The nature of land use in The Netherlands, given 40% of the land mass is below sea level, presupposes high levels of community cooperation and integrates land ownership responsibilities into the broader common good. The long history of rural villages in Denmark and public support for the 70% of Danes who live in rural areas also encourages collaboration.

Whatever the mechanism, modern land ownership has taken on social consequences, at odds with the idea of an absolute property owner. Australia and Europe approach and manage the social nature of land in very different ways. While Europe is generally approaching land management as a comprehensive and holistic challenge requiring strong government information and administration systems, Australia is creating layers of separate

commodities out of land and adapting existing LAS as much as possible to accommodate this trading without a national approach.

New trading commodities – unbundling land

Demands on traditional systems increase when commodification (or commoditization in the US) is extended beyond land ownership. In Australia, the process is known as "unbundling" – separation of the new tradeable products separate from interests in land itself. Biota, carbon credits, planning and building permissions, and water and others require similar infrastructure to permit trading. In some cases, the new product is integrated into existing land registration programs, or into similarly designed systems.

From the European perspective, where unbundling is unfamiliar, the important issues are to retain and extend capacity to deliver sustainable development within these separated markets and to provide administrative frameworks which permit holistic management of the nation's most valuable resources.

Building cognitive capacity and competencies

Engagement of beneficiaries in modern land markets requires high levels of understanding about and trust in activities, products and services. The ability of a nation state to provide administrative systems that achieve public confidence in the operations of land markets is relatively rare. Only about 30 nations of the world do this very well. Achievement of trust and education of participants in land markets is the unrecognised but remarkable outcome of land administration in Australia and Europe. In terms of delivery of good governance and civil peace, the comparison between societies in these countries and others in the world is stark.

The capacity of LAS to deliver services which feed back into the democratic functioning of their nations needs to be recognised. The public role of LAS is often forgotten, despite the importance of this consequence of effective administration.

Equitably and efficiently taxing land and collecting relative land information

All developed countries rely on land driven taxation streams. Vigorous land markets and the development of complex commodities require much more sophisticated systems of land taxation, stamp duty on transactions and ownership taxes. These systems depend on information about individual owners, times of purchase and sale, values and prices on purchase and sale, expenditure during ownership, trust interests, land uses, and other variables. While the core information is the unchanging information about the land parcel, governments now rely on a range of additional information that is highly varied and relative to situation. This relative information is the key to land tax, income tax, capital gains tax and goods and service tax activities; and to national welfare systems. The collection and maintenance of this information currently depends on self reporting and database organisation. However, new opportunities exist for spatially enabling systems to assist management of relative land information.

Supporting complex markets

Insurance, corporation and banking operations in nation states developed separately from land administration. This was understandable, given the history of paper based land administration systems. However the computerisation and spatial enablement of land registers, cadastres and related information (valuation, planning and buildings and development activities) create far more opportunities to build information systems capable of servicing these other essential commercial spheres. In European countries land registration systems provide much more information to mortgage providers than is occurs

in Australia. Capacity to provide information to the insurance industry is also underdeveloped.

Managing permissions and licences

Government management of and assistance to business has increased since WWII. Information needed by business and the public includes permissions, licences and approvals as well as restrictions. A georeferenced business address file, corporate operating and registered offices, business types and licences is already under consideration in Australia in the Public Sector Mapping Agency (PSMA). Australia's capacity to service local business is recognised as high and the nation does well on regulatory comparative analysis (World Bank Report, 2004).

Improving participation by business and citizens

State, territory and local governments increasingly provide information about planning initiatives, citizens facilities and other activities electronically, through initiatives generically called eLand. Nationally, the Australian government increasingly uses Web based systems to provide services in taxation, welfare, and information.

The major Australian effort in *eConveyancing* is a fundamental change from mere delivery of information central to *eLand* initiatives, to interactive service provision across sectors of land administration and banking via the Web. The change is potentially as fundamental as Internet Banking was to the banking sector. This pioneering change reflects wider government use of the Web to inform and engage citizens in decisions.

Australian land management has multiple examples of interactive land management programs, with Western Australian shared land information platform, SLIP, in the Department of Land Information, providing an exemplar example. CSIRO, GeoScience Australia and PSMA provide highly successful examples of programs, indicating imaginative and collaborative digital solutions to information and service problems.

SPATIAL ENABLEMENT

Understanding the potential of *iLand* and spatial enablement requires an appreciation of how spatial enablement works. On one standard, spatial enablement is just one form of interoperability. It is however far more energetic and offers opportunities for visualisation, scaleability, and user functionality. The capacity of computers to place information in on-screen maps and to allow users to make their own enquiries has raised the profile of spatial enablement. Thousands of new applications of this technology (mobile phones, vehicle tracking, digital cameras, and intelligent systems in asset management) are developing annually. These rely on the underpinning of spatial information in cadastres and large scale topographic maps (such as the large scale topographic map of The Netherlands).

The benefits of spatial enablement of the core cadastral layer are -

- Maintenance and sharing of the core information layer – once created it is used many times – already used in thousands of applications
- Attachment of information to images of parcel and property configurations
- Accurate identification about the place or location of one activity in relation to other places in ways that are understandable by ordinary and non-technical people
- Capacity of businesses and citizens to understand, interrogate and manipulate information in the computer
- Inclusion of layers of geo-referenced information in the computer systems, despite their distinct sources, systems and owners, and achieve interoperability between the layers

- Integration of government information systems, such as SmartTag of the Victorian Government
- Provision of seamless information to institutions and government
- Incorporation of aspatial and relative information into maps permitting the location of that information to be realised and visualised
- Ultimately managing information through spatially enabled systems, rather than databases.

Spatial enablement offers land administration a revolution equivalent to the conversion of paper files to digital systems of twenty years ago. The concept of *iLand* was developed to assist people to understand the capacity of spatial information to deliver new services and to assist better land information management. *iLand* will be a central component of new land administration systems.

FUTURE DIRECTIONS

These contextual influences, particularly unbundling land and water interests and development of complex commodities, put new pressures on Australia's LAS framework, both conceptually and institutionally. Simultaneously, new technologies for organising information, visualising information and allowing users to build their own versions of systems to suit personal needs will impact on organisation of geospatial and georeferenced information and its source agencies. The core activities of land registration, planning and valuation will have more significance than ever before. Taking into account the views of international and Australian experts in the Expert Group Meeting, specific directions for the future are summarised below.

Issues in sustainable development

The extensive use of ICT in LAS will not automatically lead to sustainability. Whole of government approaches are needed. The most crucial factor in delivery is the cultural understanding of why sustainability is important and general agreement on how to achieve it. To achieve a comparative international focus, reflecting the cross-jurisdictional nature of sustainability issues, an agreed model or paradigm of land management was proposed and critically reviewed. The key ingredient, country context, highlighted the largest observable differences between modern European democracies and Australian counterparts.

The European approach to land is based on social responsibilities of individual land owners. The owners are regarded as temporary managers rather than absolute owners. Australian efforts focus on economic tools (especially "unbundling" of interests in land) while Europe focus on holistic management for inter-generational sustainability and for maintenance of a strong and dedicated rural population charged with land management responsibilities. From the European perspective, Australia needs inter-jurisdictional capacity for holistic management, especially because of the scales of challenges, sparsity of its populations, and hence very limited human capacities. Technical solutions are even more essential to compensate for the relative thinness of people skills.

Australia has a special advantage in that issues of marine management have stimulated a regional approach to marine cadastre as a management tool for the Asia Pacific region. While it was not a focus, it is paramount importance for Australia. Similar inter regional approaches feature in Australia's treatment of water scarcity and quality issues.

Professional, organisational and government issues

Europeans use parliaments to create land policy for citizen implementation and in contrast to Australia where governing parties and high level bureaucrats predominate in policy identification and implementation. Europeans are used to protracted, discursive and participatory processes in policy articulation and implementation. The extended role of surveyors in Europe reflects the social value attached to land and related professionals. Surveyors and spatial engineers are among the leaders in national and regional land policy making and, as a result, national LAS institutions have clearly defined international roles.

The influence of the European Union as a coordinating agency is evident and has no Australian equivalent. EUROGI and INSPIRE are significant influences on national policy, institutional functions and selection of instrumental tools. Agricultural sustainability is a strong political, social and economic driver in Europe, understood by urban and rural populations. Cultural absorption of key LAS tools, particularly surveying and the cadastre, and the much broader information base in cadastres, make it easier for Europeans to move into spatial data infrastructures, SDI, than Australians.

The engagement of senior policy makers in LAS is therefore more difficult in Australia with its constitutional rigidities and three-tiered government structure. Despite this, Australia has made significant national and international advances in the field. Leadership, so essential in shaping the future, is available. the Prime Minister's research priorities (5 December, 2002) identify spatial information as one of the new economic drivers The role of the private sector in driving spatial information awareness is evident and increasingly recognised (in NSW, for instance, by being included within the regulatory framework). The work of the inter-jurisdiction and national agencies is well known and creating significant opportunities for both government and private sectors. Of these, GeoScience Australia, PSMA, and CSIRO have acknowledged records. Initiatives among the traditional agencies are also significant: *eConveyancing* would not proceed without national cooperation among the registries and banking sector.

Encouragement of private sector engagement in the social and environmental, in addition to economic, aspects of sustainability by spatial industries is needed. The much broader role undertaken by land policy experts and surveying professionals is demonstrated by their work in international land projects, especially in developing countries. This record is relatively unknown. However, these efforts have identified new land administration tools for better deliver sustainability in the absence of established institutions. These new tools rely on social assessment, adjudication of disputes, and participatory record keeping systems using images rather than formally defined cadastral parcels. They provide interim measures which analogously can be applied by highly developed economies in management of new commodities.

The Australian academic research heritage is also significant. The Centre for Spatial Data Infrastructures and Land Administration at The University of Melbourne has relied for a decade on project funding from state and federal governments for innovative and successful LAS and technical research. Much of the future design and identification of suitable technological innovations for government use comes out of these research activities. In contrast, the European LAS institutions themselves provide significant leadership in future design, backed up by academic influence and activities.

Technical and operational issues

The language of technical discussions substantially inhibits understanding among non-technical people. While land administration is now clearly multi-disciplinary, it still

operates in a world of closed semantics. Meanwhile, efforts aimed at creating data models and "authentic" registers (national scale registers for people, businesses, properties, vehicles and so on) need much wider support.

In this environment of language and communication issues, the achievements in new technologies are important. These achievements can increase the level of political and public interest in LAS and its possibilities. Australia's significant achievements, such as SmartTag of Department of Sustainability and Environment in Victoria and the geo-coded national address file (GNAF), result in a much wider audience.

At the same time, more technical and less understood initiatives remain essential. Of the many now being investigated in Australia, cadastral modelling as a universal method of facilitating data interoperability, including 3D (height) and 4D (time) dimensions, offers potential for seamless presentation of land information.

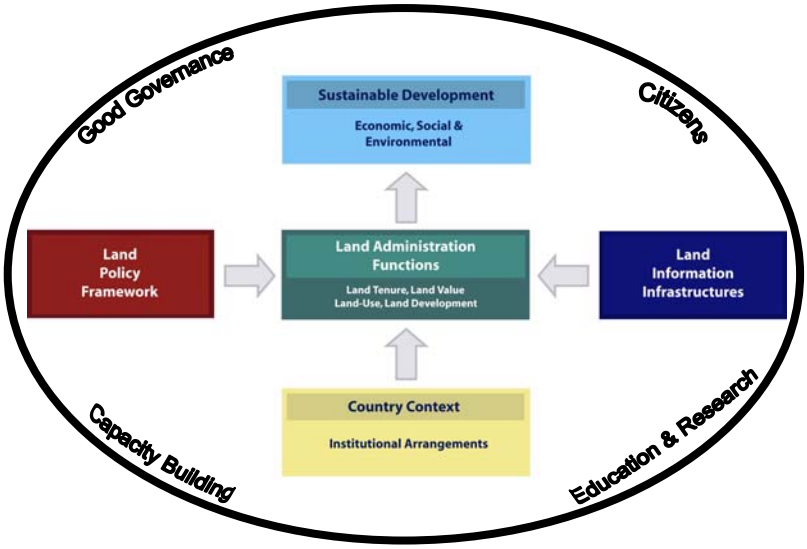
The missing link: the public

Given the need to demand drive, (that is respond to users' needs) rather than supply drive, change, engagement of the public in the decision process is essential. Sometimes a network of appropriate people through reference groups, or engagement of stakeholders in decision processes, is appropriate. Meanwhile, identifying new business needs as change drivers produces publicly satisfying results, as the Western Australian SLIP program demonstrates.

Australia has not yet introduced comprehensive monitoring and evaluation of its efforts to deliver sustainability, though the National Land and Water Resources Audit uses a national monitoring and evaluation framework. Though Global Reporting Indicators (GRI) are available, their systematic implementation in LAS does not occur in the state and territory jurisdictions. In the GRI environment, engagement of the public is axiomatic. To incorporate this wider perspective, the next stage of the paradigm is represented in Figure 5 below.

Collaboration and capacity building

Collaborative and collegiate exploration of the future paths is necessary. While Europeans enjoy considerable opportunities for these activities, Australia offers fewer forums. Those that exist, such as the annual conference of Registrars of Title, and professional group meetings and conferences are invaluable and successful. But more opportunities for structured and broad-based collaborative efforts are needed.



- **Land**: holistic term including property as an asset and natural resources
- **People**: interact with land administration system through rights restrictions and responsibilities
- **Sustainability**: facilitated through good governance in LAS
- **Innovation**: achieved through continuous monitoring and evaluation

Figure 5 – Next stage of the Land Management Vision

CONCLUSIONS

Meanwhile, while LAS functions of land registration and tenure, valuation, planning and development, are the institutional core of successful economies, these functions will undergo changes as they adapt to the new policies of sustainable development, demand driven processes, acceleration in take-up of spatially enabled systems, and the historical and cultural realities. The influences are graphically described in the figure below. How a particular jurisdiction responds will depend on the understanding of the vision by its leaders. The diagrammatic presentation of a land management vision that incorporates the new land administration model below (Figure 6) was developed out of the Expert Group Meeting's work.

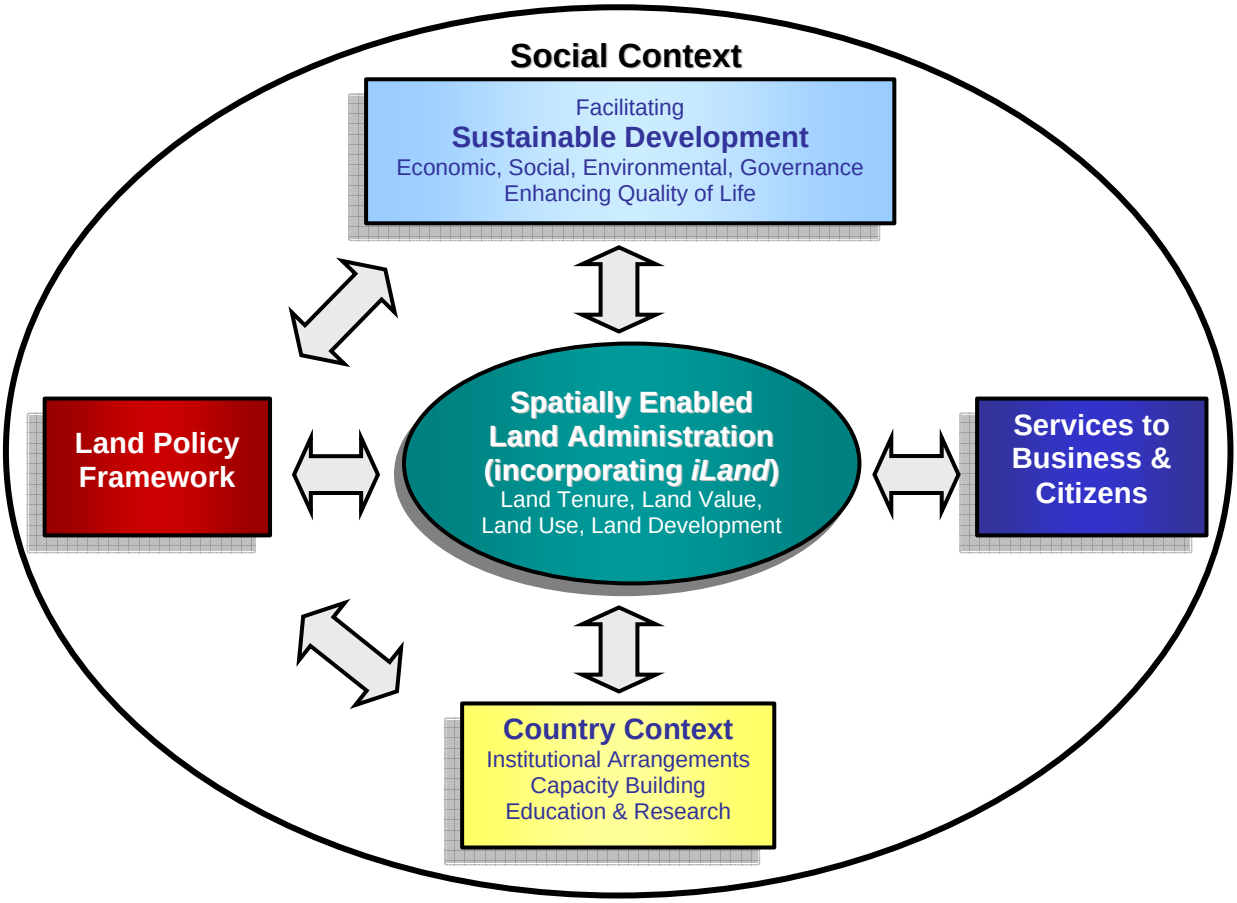


Figure 6 – Land Management Vision

The idea is that spatial enablement of land administration systems managing tenure and registration, valuation, planning and development will allow the information generated by these activities to be much more useful – in other words *iLand*. First, the achievement of sustainable development goals will be easier to evaluate. Adaptability and useability of modern spatial systems will encourage much more information to be collected and made available. The map-mashing trend following Google Earth and other major international applications shows a high public take up and popularisation of spatially enabled systems. For governments, building a suitable land policy framework will be assisted by better information chains. The services available to private and public sectors, and to community organisations should commensurably improve. Ideally these processes are dual: with modern information and communication technology, the engagement of users in design of suitable services, and the adaptability of new applications should increase and mutually influence. The global initiatives are the starting point, but in a national case, modifications to suit the particular context will be built.

The new land administration systems of the future will be local, regional and global in their capacity.

ACKNOWLEDGEMENTS

This article is part of a large project called "*Incorporating sustainable development objectives into ICT enabled land administration systems*", and is supported by the International Science Linkages programme established under the Australian Government's Innovation statement Backing Australia's Ability, and by the Department of Sustainability and Environment in Victoria, the Department of Land Information in Western Australia

and the Department of Lands in New South Wales. It draws on the collegiate creative efforts of staff, students and professionals engaged in and supporting the Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, University of Melbourne. Any errors and infelicities are entirely the authors.

REFERENCES

Enemark, S., Williamson, I. and Wallace, J. (2005), "Building Land Administration Systems in Developed Economies", accepted for publication in Journal of Spatial Science, December issue.

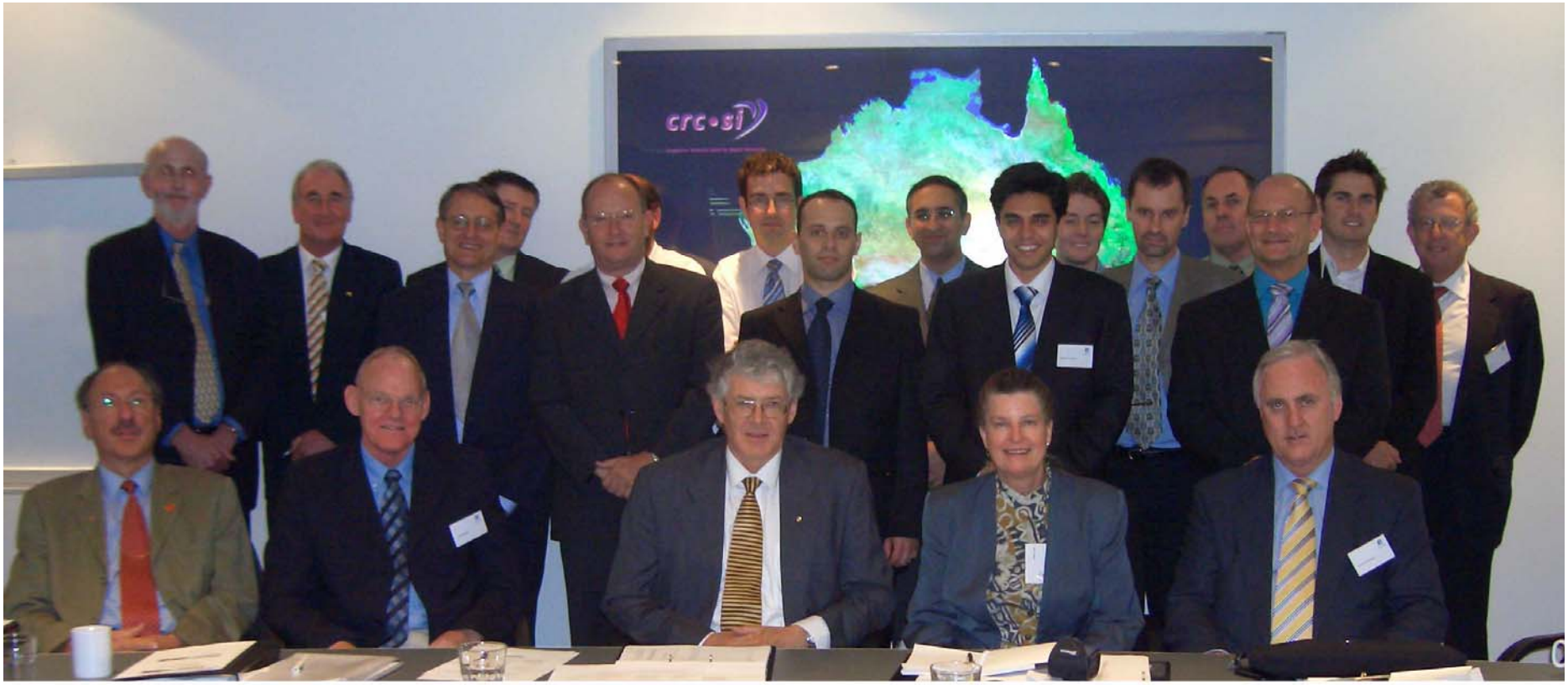
Wallace, J. and Williamson, I. (2006), "Building land markets", Journal of Land Use Policy, (publication pending)

EGM PARTICIPANTS

Mr Rohan Bennett	PhD Student, Department of Geomatics, The University of Melbourne, Australia
Mr Andrew Binns	Research Fellow, Department of Geomatics, The University of Melbourne, Australia
Mr Ian Lloyd	Director, Land Equity International, Australia
Mr Barry Cribb	Manager Land Boundary Services, Department of Land Information, Western Australia
Prof Stig Enemark	Vice President FIG, Professor Department of Surveying and Planning, Aalborg University, Denmark
Ms Barbara Flett	Register of Titles, Department of Sustainability and Environment, Victoria, Australia
Mr Steve Jacoby	General Manager, Information Policy, Department of Natural Resources and Mines, Queensland, Australia
Mr Mohsen Kalantari	PhD Student, Department of Geomatics, The University of Melbourne, Australia
Prof Bas Kok	Director Netherlands Council for Geographic Information (Ravi) and Professor Delf University of Technology, The Netherlands
Dr Peter Holand	General Manager, Spatial Industry Information Access and Facilitation Branch, Geoscience Australia
Prof Holger Magel	President FIG, Professor of Land Management, Technical University Munich, Germany
Mr Brian Marwick Australia	Manager Spatial Information Services, LogicaCMG,
Mr Hossein Mohammadi	PhD Student, Department of Geomatics, The University of Melbourne, Australia
Dr Abbas Rajabifard	Senior Research Fellow, Department of Geomatics, The University of Melbourne, Australia
Peter Ramm	Spatial Information Infrastructure, Department of Sustainability and Environment, Victoria, Australia
Mr John Rickard	Executive Director, Land Victoria, Department of Sustainability and Environment, Victoria, Australia

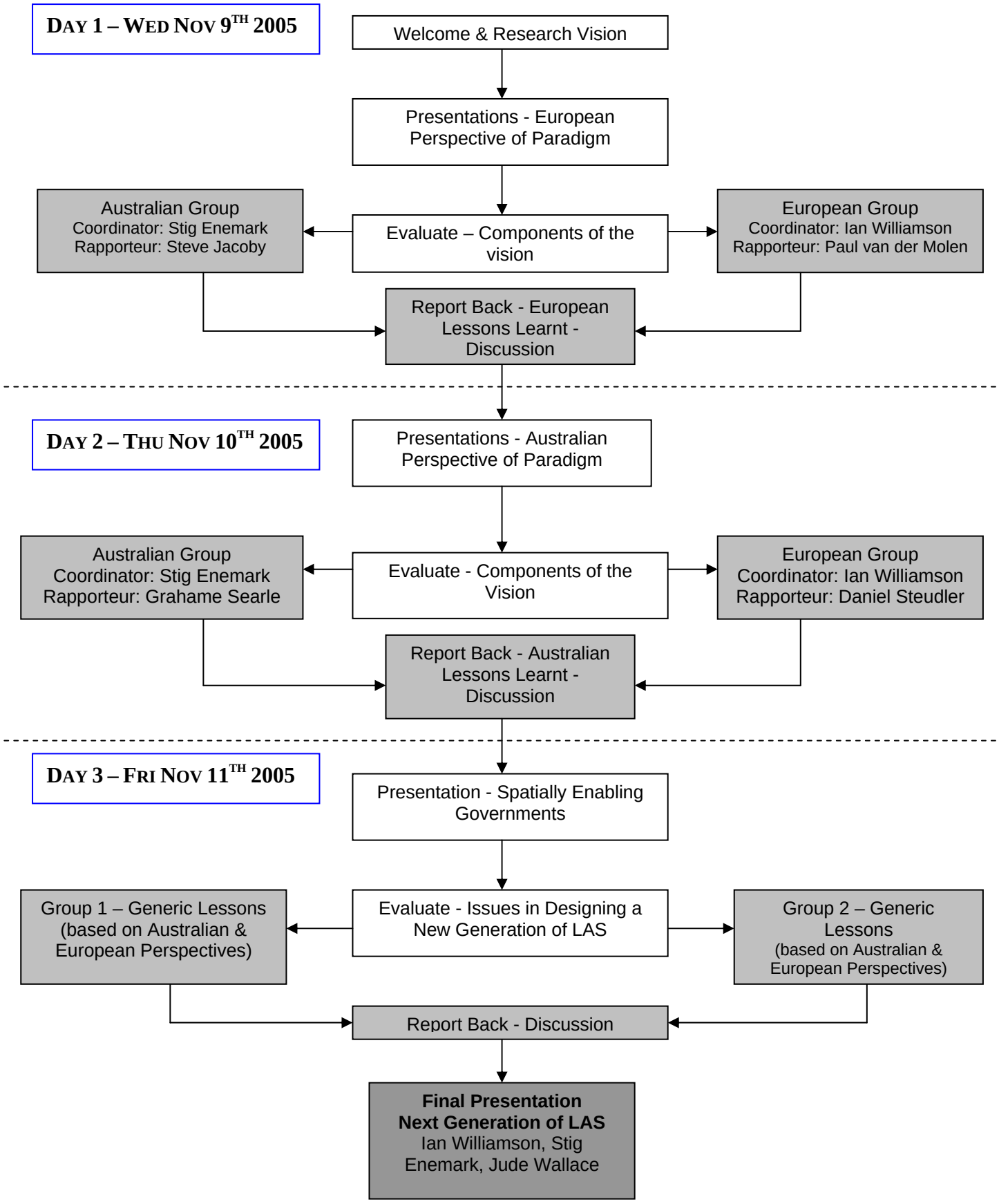
Mr Graeme Rush	General Manager, Land Management and Use, Department of Natural Resources and Mines, Queensland, Australia
Dr Daniel Steudler	SwissTopo, Berne, Switzerland
Dr Grahame Searle	Chief Executive, Department of Land Information, Western Australia, Australia
Elizabeth Thomas	Spatial Information Infrastructure, Department of Sustainability and Environment, Victoria, Australia
Prof Paul van der Molen	Director of Kadastre International, Professor in Cadastre and Land Management, International Institute for Geo-Information Science and Earth Observation (ICT), The Netherlands
Ms Jude Wallace	Senior research Fellow, Department of Geomatics, The University of Melbourne, Australia
Mr Warwick Watkins	Director General and Surveyor General, Department of Lands, New South Wales, Australia
Prof Ian Williamson	Professor Surveying and Land Administration, Director of the Centre for SDIs and Land Administration and Head, Department of Geomatics, The University of Melbourne, Australia

EGM PARTICIPANTS



Standing: Peter Holland, Barry Cribb, Brian Marwick, Peter Ramm, Paul van der Molen, Grahame Searle (hidden), Steve Jacoby, Hossein Mohammadi, Abbas Rajabifard, Mohsen Kalantari, Rohan Bennett, Daniel Steudler, Ian Lloyd, Graeme Rush, Andrew Binns, Bas Kok
Sitting: Holger Magel, Stig Enemark, Ian Williamson, Jude Wallace, Warwick Watkins

EGM PROGRAM


DAY 1 – WED NOV 9TH 2005
Welcome & Research Vision
Presentations - European Perspective of Paradigm
Australian Group
Coordinator: Stig Enemark
Rapporteur: Steve Jacoby
Evaluate – Components of the vision
European Group
Coordinator: Ian Williamson
Rapporteur: Paul van der Molen
Report Back - European Lessons Learnt - Discussion
DAY 2 – THU NOV 10TH 2005
Presentations - Australian Perspective of Paradigm
Australian Group
Coordinator: Stig Enemark
Rapporteur: Grahame Searle
Evaluate - Components of the Vision
European Group
Coordinator: Ian Williamson
Rapporteur: Daniel Steudler
Report Back - Australian Lessons Learnt - Discussion
DAY 3 – FRI NOV 11TH 2005
Presentation - Spatially Enabling Governments
Group 1 – Generic Lessons (based on Australian & European Perspectives)
Evaluate - Issues in Designing a New Generation of LAS
Group 2 – Generic Lessons (based on Australian & European Perspectives)
Report Back - Discussion
Final Presentation
Next Generation of LAS
Ian Williamson, Stig Enemark, Jude Wallace

PUBLICATION SPONSOR

Department of Lands

Reliable from the ground up

The New South Wales Department of Lands represents knowledge, heritage, and responsible land management. Since we documented the first State land records, we have continued as the guardians of all land information in New South Wales. Today, with new technologies and greater expertise in the field, we are a world leader in land information and management. ***Reliable from the ground up***

Our Land and Property Information Division (LPI) is an internationally recognised 'one stop shop' for all of your land administration needs. Services within LPI include land title registration, property information, valuation, surveying and mapping. The property datasets, built and maintained by LPI, incorporate land titles and plans, valuation information, survey control data and mapping and spatial information - including aerial photography. This information provides business, government and our community with an up-to-date snapshot of every part of New South Wales.

1 Prince Albert Road
Queen's Square
Sydney NSW 2000

(612) 9228 6666

http://www.lands.nsw.giv.au

Leading land administration practitioners and academics from Australia, Denmark, The Netherlands, Germany and Switzerland met in Melbourne from 9-11 November 2005 to refine a model for the next generation of ICT and spatially enabled land administration systems.

Land administration systems are impacted by cultural, political and legal settings, and by technology. This expert group meeting aimed to share Australian and European experiences and develop a vision and model for future land administration systems that could:

- service the needs of governments, business and the public,
- utilise the latest technologies,
- service rights, responsibilities, restrictions and risks in relation to land, and
- deliver much broader information about sustainable development.




Department of Lands
Victoria
The Place To Be
Department of Land Information
Government of Western Australia

This project is proudly supported by the International Science Linkages programme established under the Australian Government innovation statement, *'Backing Australia's Ability'*