

## **Land Administration for sustainable development**

**Ian WILLIAMSON, Australia, Stig ENEMARK, Denmark, Jude WALLACE, Australia  
and Abbas RAJABIFARD, Australia**

**Key words:** land administration, sustainable development

### **SUMMARY**

For more than three decades, Ian Williamson, Stig Enemark, and Jude Wallace have been fascinated by land issues. Five years ago Ian and Stig decided to document their lives' work in the land-related field. Both have a strong cadastral background with Ian having strength in institutions, particularly in the English speaking world, and Stig bringing knowledge of European systems with a focus on land management. They recognized the need for a strong legal perspective, which was provided by Jude, who has spent a lifetime working as a land policy lawyer. All recognized the need for solid technical support, with the expertise provided by Abbas Rajabifard, who has many years of experience in spatial data infrastructure (SDI) and geographic information systems (GIS). The end result is a book titled "Land administration for Sustainable Development" with all authors taking responsibility for the entire text. After a five year journey the book was published by ESRI Press in early 2010.

This paper overviews the philosophy of the authors as they explore the concept of land administration for sustainable development. The result is a practical treatise with a strong and universal theoretical foundation that explores the systems that administer the ways people relate to land. The authors believe their experiences are equally of use to both less developed and developed countries. This global context necessitated a holistic view of land administration as a central component of the land management paradigm. The authors have used this paradigm as the theoretical basis for delivering a holistic approach to LAS in support of sustainable development. While the authors recognize that all countries or jurisdictions are unique and have their own needs, they propose ten principles of land administration that are applicable to all countries.

Key themes promoted by the authors include the adoption of a toolbox of best practices for designing LAS with general, professional, and emerging tools that are tailored to specific country needs. Also, there is a focus on using common land administration processes as a key to understanding and improving systems. The authors explore the relationship between land administration and land markets, the central economic driver for most countries. The authors conclude by emphasizing the importance of land administration to the spatial enablement of society, where government uses place or location as the key means of organizing information related to activities ranging from health, transportation, and the environment to immigration, taxation, and defense.

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## **1. INTRODUCTION**

For more than three decades, Ian Williamson, Stig Enemark, and Jude Wallace have been fascinated by land issues. Five years ago Ian and Stig decided to document their lives' work in the land-related field. Both have a strong cadastral background with Ian having strength in institutions, particularly in the English speaking world, and Stig bringing knowledge of European systems with a focus on land management. They recognized the need for a strong legal perspective, which was provided by Jude, who has spent a lifetime working as a land policy lawyer. All recognized the need for solid technical support, with the expertise provided by Abbas Rajabifard, who has many years of experience in spatial data infrastructure (SDI) and geographic information systems (GIS). The end result is the book titled "Land administration for sustainable development". It is written collaboratively with all authors taking responsibility for the entire text. After a five year journey the book was published by ESRI Press in early 2010. This paper overviews the philosophy of the authors as they explore the concept of land administration for sustainable development. It presents some of the highlights within the book. The authors believe the result is a practical treatise with a strong and universal theoretical foundation that explores the systems that administer the ways people relate to land.

## **2. THE CONCEPT**

Imagine a country without any basic administration of land – their key asset. Imagine that tenure to land and property cannot be secured, and that mortgage loans cannot be established as a basis for property improvement and business development. Imagine that the use and development of land is not controlled through overall planning policies and regulations. And imagine a slum area of 250 hectares with more than 1 million inhabitants lacking the most basic occupation rights and without basic water and sanitary services.

Land administration systems (LAS) are about addressing these problems by providing a basic infrastructure for implementing land related policies and land management strategies to ensure social equity, economic growth and environmental protection. A system may involve an advanced conceptual framework supported by sophisticated ICT models as in many developed countries; or it may be through very fragmented and basically analogue approaches that are found in less developed countries.

Until 2008 the developed world often took land administration for granted and paid little attention to it. But the global economic collapse has sharply focused world attention on mortgage policies and processes and their related complex commodities, and on the need for adequate and timely land information. Simply, information about land and land market

processes that can be derived from effective land administration systems plays a critical role in all economies. The above are examples of the issues that motivated the authors to write “Land administration for sustainable development”.

The collective vision was to write a practical book with a strong and universal theoretical foundation that explored the systems that administer the ways people relate to land. This cannot be done successfully without a major focus on building the capacity of people and institutions. Building and maintaining these capacities are at the heart of modern land administration.

An overall theme in the book is therefore about developing land administration capacity to manage change. For many countries, meeting the challenges of poverty alleviation, economic development, environmental sustainability, and management of rapidly growing cities, are immediate concerns. For more developed countries, immediate concerns involve updating and integrating agencies in relatively successful land administration systems, and putting land information to work for emergency management, environmental protection, economic decision making, and so on.

The objective was to write a book that was equally of use to both less developed and developed countries. This global context necessitated a holistic view of land administration as a central component of the land management paradigm. The book offers this paradigm as the theoretical basis for delivering such a holistic approach to land administration systems in support of sustainable development. While the book recognizes that all countries or jurisdictions are unique and have their own needs, the book promotes ten land administration statements that are applicable to all.

Land administration is not a new discipline. It has evolved out of the cadastre and land registration areas with their specific focus on security of land rights. While the land management paradigm is the central theme of the book embracing the four land administration functions (land tenure, land value, land use, and land development), the role of the cadastre as the engine of any land administration system is promoted throughout.

The book develops several themes that make it stand apart from other books on the subject. The most important involves the adoption of a toolbox of best practice for designing land administration systems that are tailored for specific country needs. This is based around general, professional and emerging tools. Also, there is a focus on using common land administration processes as a key to understanding and improving systems. And the book explores the relationship between land administration and land markets, the central economic driver for most countries. The book concludes by emphasizing the importance of land administration to spatial enablement of society.

The authors hoped to write a book that could be easily read and understood by non experts in the field, politicians and senior government officials, as well being of interest to students, land administrators and land related professionals. The authors acknowledge that a “picture is

worth a thousand words” and include many photographs, pictures, diagrams and figures throughout.

Within this paper we include highlights from the book including the ten principles of land administration, the land management paradigm, the cadastre as an engine of LAS, LAS issues in the next decade, and the challenges ahead.

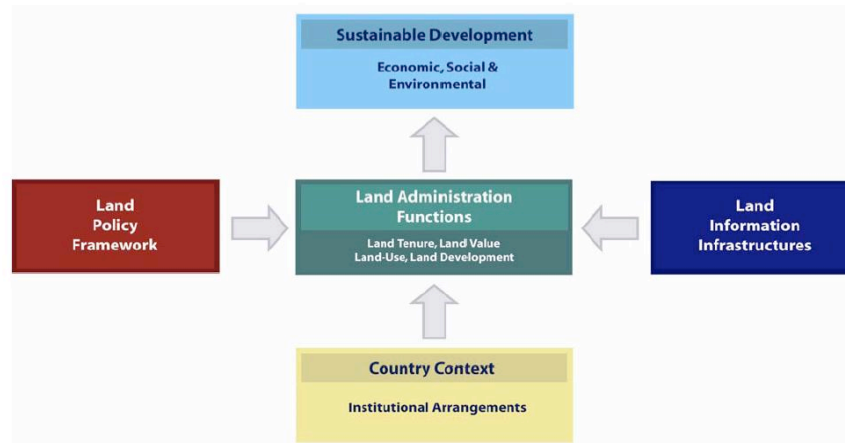
### **3. THE LAND MANAGEMENT PARADIGM**

The cornerstone of modern land administration theory is the land management paradigm in which land tenure, value, use and development are considered holistically as essential and omnipresent functions performed by organised societies. Within this paradigm, each country delivers its land policy goals by using a variety of techniques and tools to manage its land and resources. What is defined as land administration within these management techniques and tools is specific to each jurisdiction, but the core ingredients, cadastres or parcel maps and registration systems, remain foundational. These ingredients are the focus of modern land administration, but they are recognised as only part of a society’s land management arrangements.

Consolidation of land administration as a discipline in the 1990s as described earlier reflected the introduction of computers and their capacity to reorganize land information. The UNECE viewed land administration as referring to “the *processes of determining, recording and disseminating information* about the ownership, value and use of land, when implementing land management policies”, (1996, emphasis added). This information paradigm served to focus LAS design on information for policy makers, reflecting the experiences of computerization of land administration agencies after the 1970s. This focus on information remains, but the type and quality of information needed for modern circumstances have changed dramatically. Thus the need to address land management issues systematically pushes the design of LAS towards an enabling infrastructure for implementation of land policies and land management strategies to support sustainable development. In simple terms, the information paradigm needs to be replaced by a paradigm capable of assisting design of new or reorganised LAS to perform the broader and integrated functions now required.

This new land management paradigm is described in Figure 1. The paradigm provides the reason for reengineering agencies and their processes to deliver policy outcomes by more holistic and integrated task and information management, rather than merely managing land information for their internal purposes. The paradigm enables LAS designers to manage changes in institutional arrangements and processes to implement better land policies and good governance by identifying a conceptual framework for understanding each system. In theoretical terms the paradigm identifies the principles and processes that define land management as an endeavour. It recognizes that in practice, the organizational structures for land management differ widely between countries and regions throughout the world, and reflect local cultural and judicial settings of the local country context. Within the country context, land management activities may be described by the three components: land policies, land information infrastructures, and land administration functions in support of sustainable development.

The paradigm, as represented by Figure 1, invites designers of LAS to build systems capable of undertaking the core functions of tenure, value, use and development to specifically deliver sustainable development, in addition to implementing national land policy and producing land information. While sustainability goals are fairly loose, the paradigm insists that all the core LAS functions are considered holistically, and not as separate, stand-alone, exercises.



**Figure 1.** The land management paradigm (Enemark 2004)

Land management is broader than land administration. It covers all activities associated with the management of land and natural resources that are required to fulfil political objectives and achieve sustainable development. Land management is then simply the processes by which a country's resources are put into good effect (UNECE 1996). Land management requires inter-disciplinary skills that include technical, natural, and social sciences. It is about land policies, land rights, property, economics, land use control, regulation, monitoring, implementation, and development. The concept of land includes properties, utilities, and natural resources, and encompasses the total natural and built environment within a national jurisdiction, including marine areas.

Land management activities reflect drivers of globalization and technology. These stimulate the establishment of multifunctional information systems, incorporating diverse land rights, land use regulations, and other useful data. A third driver, sustainable development, stimulates demands for comprehensive information about environmental, social, economic, and governance conditions in combination with other land related data.

Land policy is simply the set of aims and objectives set by governments for dealing with land issues. Land policy is part of the national policy on promoting objectives such as economic development, social justice and equity, and political stability. Land policies vary, but in most countries they include poverty reduction, sustainable agriculture, sustainable settlement, economic development, and equity among various groups within the society. Policy implementation depends on how access to land and land related opportunities are allocated. Governments therefore regulate land related activities, including holding rights to land, supporting the economic aspects of land, and controlling the use of land and its development. Administration systems surrounding these regulatory patterns facilitate the implementation of

land policy in the broadest sense, and in well organized systems, they deliver sensible land management and good governance.

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 processes related to 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, increasingly important, land development (implementing utilities, infrastructure and construction planning). The functions interact to deliver overall policy objectives, and they are facilitated by appropriate land information infrastructures that include cadastral and topographic datasets.

Sound land management requires operational processes to implement land policies in comprehensive and sustainable ways. Many countries, however, tend to separate land tenure rights from land use opportunities, undermining their capacity to link 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.

All countries have to deal with the management of land. They have to deal with the four functions of land tenure, land value, land use, and land development in some way or another. National capacity may be advanced and combine the activities in one conceptual framework supported by sophisticated ICT models. More likely, capacity will involve very fragmented and basically analogue approaches. Different countries will also put varying emphasis on each of the four functions, depending on their cultural basis and level of economic development.

In conclusion, modern land administration theory requires implementation of the land management paradigm to drive systems dealing with land rights, restrictions and responsibilities to support sustainable development. It also requires taking a holistic approach to management of land as the key asset of any jurisdiction.

#### **4. TEN PRINCIPLES OF LAND ADMINISTRATION**

Despite the uniqueness of local systems, the range of cognitive frameworks about land, and difficulties in transferring institutions, design of robust and successful LAS is possible. The ten land administration principles in Table 1 below set boundaries for designers, builders and managers of LAS to help them make decisions about their local system. Overall, the statements are written with the goal of making establishment and reform of LAS easier. The statements implement the modern philosophy in land administration to develop and manage assets and resources within the land management paradigm to deliver sustainable development. They are universally applicable. Countries at early stages of development will not be able to use the full array of technical options or specialist skills, but they can improve their land management through appropriately designed LAS.

The statements reflect a holistic approach for any LAS, and focus on sustainable development as the overriding policy for any national system, irrespective of whether a country implements

property institutions, communal land arrangements, or socializes its land. They highlight the importance of information and participation of people. They set the framework in which the historical development of familiar ingredients, like cadastres and land registries, can be meshed with recent innovations, particularly incorporation of social tenures, new complex commodities appearing in highly organised land markets, and the technical potential of spatial information.

1. LAS	LAS provide the infrastructure for implementation of land polices and land management strategies in support of sustainable development. The infrastructure includes institutional arrangements, legal frameworks, processes, standards, land information, management and dissemination systems, and technologies required to support allocation, land markets, valuation and control of use and development of interests in land.
2. Land management paradigm	The land management paradigm provides a conceptual framework for understanding and innovation in land administration systems. The paradigm is the set of principles and practices that define land management as a discipline. The principles and practices relate to the four functions of LAS, namely land tenure, land value, land use and land development, and their interactions. These four functions underpin the operation of efficient land markets and effective land use management. “Land” encompasses natural and built environment including land and water resources.
3. People and institutions	LAS is about engagement of people within the unique social and institutional fabric of each country. This encompasses good governance, capacity building, institutional development, social interaction and a focus on users, not providers. LAS should be re-engineered to better serve the needs of users, such as citizens, governments and businesses. Engagement with the society, and the ways people think about their land, are core. This should be achieved through good governance in decision making and implementation. This requires building the necessary capacity in individuals, organisations and wider society to perform functions effectively, efficiently and sustainably.
4. Rights, restrictions and responsibility	LAS form the basis for conceptualising rights, restrictions and responsibilities (RRR) related to policies, places and people. Rights are normally concerned with ownership and tenure whereas restrictions usually control use and

ies	activities on land. Responsibilities relate more to a social, ethical commitment or attitude to environmental sustainability and good husbandry. RRR must be designed to suit individual needs of each country or jurisdiction, and must be balanced between different levels of government, from local to national.
5. Cadastre	The cadastre is at the core of any LAS providing spatial integrity and unique identification of every land parcel. Cadastres are large scale representations of how the community breaks up its land into useable pieces, usually called parcels. Most cadastres provide security of tenure by recording land rights in a land registry. The spatial integrity within the cadastre is usually provided by a cadastral map that is updated by cadastral surveys. The unique parcel identification provides the link between the cadastral map and the land registry, and serves as the basis of any LAS and the land information it generates, especially when it is digital and geocoded. The cadastre should ideally include all land in a jurisdiction: public, private, communal, and open space.
6. LAS are dynamic	LAS dynamism has four dimensions. The first involves changes to reflect the continual evolution of people to land relationships. This evolution can be caused by economic, social and environmental drivers. The second is caused by evolving ICT and globalisation, and their effects on the design and operation of LAS. The third dimension is caused by the dynamic nature of the information within LAS, such as changes in ownership, valuation, land use and the land parcel through subdivision. The fourth dimension involves changes in the use of land information.
7. Processes	LAS include a set of processes that manage change. The key processes concern land transfer, mutation, creation and distribution of interests, valuation and land development. The processes, including their actors and their obligations, explain how LAS operate, as a basis for comparison and improvement. While individual institutions, laws, technologies or separate activities within LAS, such as property in land, a land registry, a specific piece of legislation or a technology for cadastral surveying are important in their own right, the processes are central to overall understanding of how LAS operate.
8. Technology	Technology offers opportunities for improved efficiency of LAS and spatial enablement of land issues.



	The potential of technology is far ahead of the capacity of institutions to respond. Technology offers improvements in the collection, storage, management and dissemination of land information. At the same time developments in information and communications technology (ICT) offer the potential for the spatial enablement of land issues by using location or place as the key organiser for human activity.
9. Spatial data infrastructure	Efficient and effective LAS that support sustainable development require a spatial data infrastructure (SDI) to operate. The SDI is the enabling platform that links people to information. It supports the integration of natural (primarily topographic) and built (primarily land parcel or cadastral) environmental data as a pre-requisite for sustainable development. The SDI also permits the aggregation of land information from local to national levels.
10. Measure for success	A successful LAS is measured by its ability to manage and administer land efficiently, effectively and at low cost. The success of LAS is not determined by complexity of legal frameworks or sophisticated technological solutions. Success lies in adopting appropriate laws, institutions, processes and technologies designed for the specific needs of the country or jurisdiction.

## 5. THE CADASTRE AS AN ENGINE OF LAS

The land management paradigm makes a national cadastre the engine of the entire LAS, underpinning the country's capacity to deliver sustainable development. The role of the cadastre as the engine of LAS is neutral in terms of the historical development of any national system, though systems based on the German and Torrens approaches, are much more easily focused on land management than systems based on the French/Latin approach.

The cadastre as an engine of LAS is shown diagrammatically in Figure 2. The diagram highlights the usefulness of the large scale cadastral map as a tool by exposing its power as the representation of the human scale of land use and how people are connected to their land. The digital cadastral representation of the human scale of the built environment, and the cognitive understanding of land use patterns in peoples' farms, businesses, homes, and other developments, then form the core information sets that facilitate a country building an overall administrative framework to deliver sustainable development in a country.

The neutrality of the paradigm in terms of any actual national cadastral approach is emphasized by showing how all the three formal approaches used throughout the globe are capable of feeding into a national spatial data infrastructure, and then into sustainable

development. Wherever the cadastre sits in a national LAS, ideally it should assist the functions of tenure, value, use, and development. In this way, within the LAS, the cadastre or cadastral system become the core technical engine delivering the capacity to control and manage land through the four LAS functions. They support business processes of tenure and value, depending on how the cadastre is locally built. They identify legal rights, where they are, the units that form the commodities, and the economy related to property. These cadastres are much more than a layer of information in national SDI.

## Significance of the Cadastre

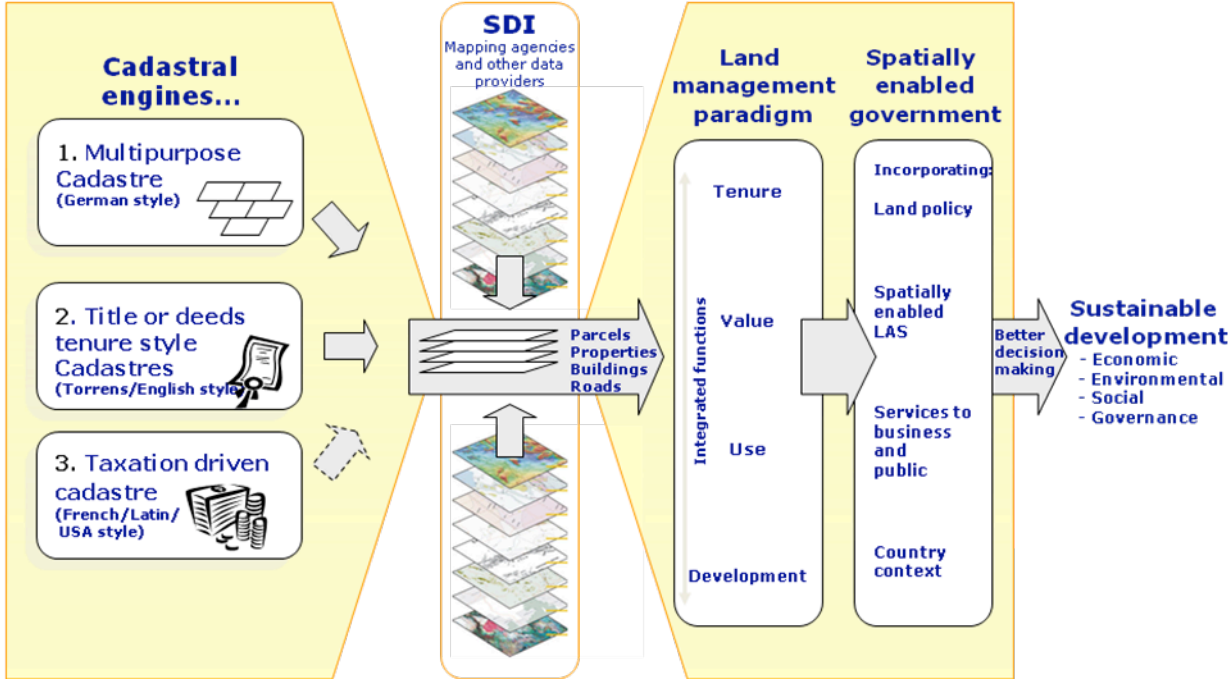


Figure 2. The cadastre as an engine of LAS - the “butterfly” diagram (Williamson and others, 2010)

While these connections are usually thought of as computer generated, even in manual systems, cadastral information about parcel attributes and their unique identifiers is able to be used throughout the four land administration functions to implement the land management paradigm, and to deliver efficiencies for government service and businesses. The requirement that this vital information should be created once and used many times underpins the identification of the cadastre as the authoritative register of parcel information, an idea appropriate for any formal system, whether digitized or not. In this way, the paradigm provides a foundation for eventual digital conversion of emerging LAS processes for countries about to embark on upgrading their system.

The diagram demonstrates that the cadastral information layer cannot be replaced by a different spatial information layer derived from geographic information systems (GIS). The unique cadastral capacity is to identify a parcel of land both on the ground and in the system in terms that all stakeholders can relate to, typically an address plus a systematically generated identifier (given addresses are often duplicated or are otherwise imprecise). The core cadastral information of parcels, properties and buildings, and in many cases legal roads, thus becomes the core of SDI information, feeding into utility infrastructure, hydrological, vegetation, topographical, images, and dozens of other datasets.

The diagram is a virtual butterfly: one wing represents the cadastral processes, and the other the outcome of using the processes to implement the land management paradigm. Once the cadastral data (cadastral or legal parcels, properties, parcel identifiers, buildings, legal roads, etc) are integrated within the SDI, the full multipurpose benefit of the LAS, so essential for sustainability, can be achieved.

The body of the butterfly is the SDI, with the core cadastral information sets acting as the connecting mechanism. This additional feature of cadastral information is an additional role, adding to the traditional multipurpose of servicing the four functions. This new purpose takes the importance of cadastral information beyond the land administration framework by enlarging its capacity to service other essential functions of government, including emergency management, economic management, effective administration, community services, and many more functions. In advanced systems, integrated cadastral layers within a jurisdiction's SDI ideally deliver spatially enabled LAS to support the multipurpose of tenure, use, value and development. However building this kind of interaction between these four functions is not easy. The historic institutional silos, separate data bases, separate identifiers, and separate legal frameworks need to be reorganized. For most countries this presents another major land administration challenge.

## 6. LAS ISSUES IN THE NEXT DECADE

Among the many issues that future LAS will need to address, a number stand out as key challenges or limitations that must be addressed if LAS are to achieve their full potential.

- 1) *Land governance* - Land governance means the spatial dimension of governance that relates to land, property and natural resources. It is the governmental side of land management. The control and management of physical space is the basis for the distribution of power, wealth, opportunities and human well being. The key challenges of the new millennium are clearly listed already in the international public arena. They relate to climate change; food shortages; energy scarcity; environmental degradation; and natural disasters. These issues all relate to governance and management of land. Land governance is a cross cutting activity that must be addressed holistically thereby confronting all traditional LAS.
- 2) *Urban growth* – According to UN-Habitat, 2007 marked the year when the majority of the world's population now resides in urban areas as distinct from rural areas with urbanisation increasing. In parallel, the number of people living in poverty in urban slums in very dangerous health and environmental conditions is increasing. Current LAS strategies have not been able to stabilise rural land sufficiently to slow this trend.

Solutions must be found to reduce, or at least control, the divide between the have's and have not, and all the other consequences that flow from this scenario. Simply, new LAS tools must be developed to accommodate this urban growth.

- 3) *Tools to administer the continuum of tenures* - While individual private rights will continue to be an important component of future LAS, the focus must change to new tools to administer the wide range of tenures that are being recognised from simply short term occupation to full ownership. Administering the continuum of tenures and having tools that allow tenures to evolve over time are central to the next generation of LAS.
- 4) *Tools to manage RRR* - the concept of “land” is evolving. The unbundling of rights is occurring in formal systems to accord more with how informal or traditional systems work. At the same time governments worldwide are accelerating their legislative and regulatory frameworks by creating legal restrictions and responsibilities on land to support sustainable development. In most developed countries, the number of statutes that have a spatial footprint and impose some restriction or responsibility on land has grown to unmanageable proportions. A common approach to managing these RRR used to rely on land titles offices or land registries. However today less than 1% of these RRR are managed through this approach. New and innovative LAS tools are required if these statutes and regulations are to have any chance of achieving their objectives.
- 5) *LAS to capitalise on technology* One of the major challenges for LAS worldwide is to “catch up with technology” or “capitalise on the promise of technology”. There have been rapid developments in spatial and GIS technologies over the last decade. However most LAS have failed to capitalise on these opportunities. While the inability of current LAS tools and strategies to address urgent global issues is obvious, the power and promise of spatial technologies offer hope for the global poor. Modern LAS can play a key role in eGovernment and eDemocracy. Spatial technologies can break down historic institutional silos through data sharing and inter-operability within an SDI environment. Virtual jurisdictions, cities and societies offer exciting options and challenges. The power of location and place to revolutionise the way governments do business through spatial enablement is also opening up. Spatial technologies are at the heart of this new LAS evolution and the range of LAS tools now being developed.
- 6) *Institutional catch up* – LAS need to evolve to reflect changes in the people to land relationship. Unfortunately one of the biggest limitations to capitalising on the new and innovative tools offered by modern LAS to support sustainable development is the historic institutional arrangement of key agencies into separate silos. Still today, in both the developed and developing world, the historic cadastral and LAS silos, and topographic and geographic information silos, continue to compete and stall innovation and development. Only when the parcel layer is available can land information layers be efficient and effective. Efforts to rebuild road, property, and ownership layers outside registry and cadastral systems to give power to GIS are both fallible and expensive. If sustainable development is to be a reality, countries need to model and measure the impact of human activity (typically measured or evidenced by the cadastre) on the natural environment (usually represented by the national geographic information data base or national mapping).

## 7. THE CHALLENGES AHEAD

Land administration is about land management, but this cannot be done successfully unless the major focus is on building capacity of people and institutions. This is far from simple because our understanding of the nature of land has dramatically changed. What was thought of as a simple physical thing is now understood as inter-related bundles of opportunities used by ever-evolving groups of people for different purposes, coupled with a complicated array of inter-dependent responsibilities and restrictions. Land administration functions now need to include the “unbundling” of land, separation of resources out of land, and creation of complex commodities in land. These arrangements depend on sound and predictable administration and additionally on the cognitive capacity of the public to understand and utilise them. Building and maintaining these capacities is at the heart of the modern land administration. The sensitivity of policy makers and development aid experts to the cognitive realities of the intended beneficiaries of a LAS has vastly improved the design of projects and systems in recent years, but there is still a long way to go. The sustainable LAS is one that is owned by, and responsive to, its intended beneficiaries. Simply the land administration strategies of the past have only been marginally successful and then only for 20% or so of the world’s countries. New approaches and strategies are demanded.

Land administration in most countries involves a systematic approach to providing infrastructure to manage the normal processes related to delivering land and managing land markets. An analysis of which countries in the world are capable of providing this infrastructure suggests only about 40 or so of the 193 countries in the world can do this satisfactorily.

In most countries, the luxury of a normalised and reliable infrastructure is not available. Paradoxically, land administration in these countries must seek to deliver even broader objectives - managing the world’s entrenched problems of population growth and movement, burgeoning urban slums, depletion of land quality, accelerating poverty, and backing up post-conflict peace. Countries with the least ability to manage their land have the most desperate need of a basic LAS infrastructure to achieve governance goals and sustainable development, yet they are least able to build one. This paradox is not easy to solve, particularly as a world view of the land administration discipline indicates that each country must approach its land questions within its local historical and institutional framework and rely on its capacity to deliver good government.

Recent positive improvements in delivering LAS are heartening. Globalisation, spatial technologies, and the attractions of formal land markets are improving consistency and effectiveness in building infrastructure and transferring know-how. The influence of the simple numerical and quantitative comparisons in the World Bank’s Doing Business Reports on Registering Property cannot be underestimated. Moreover, the maturity in land administration theory and practice has encouraged new ideas and approaches about how to build essential infrastructures to suit local contexts. Thus land administration has evolved from merely a science of land measurement to become a broad approach to land management. The idea of land as a mere physical object has been replaced by better appreciation the cultural values and cognitive meanings of land. Basic administrative competence over land

and resource management is now seen as a foundation for leveraging wealth generation by regularising an open-ended series of opportunities to build, develop, transfer, mortgage, unbundled interests and rights and manage social transitions among owners. Systems that respond to these new demands will look very different from the technical frameworks built by heritage systems. LAS increasingly is called on to manage transition to peace after conflict and to repair damage of earthquakes and tsunamis. Stabilising land is not only about measurement: it is about social, institutional, technical and governance tools.

Even in the developed world where there are well established LAS, the focus for most is still on supporting simple land trading with little attention, if any, on supporting sustainable development. While these LAS in the developed world have the best chance to capitalise on their established infrastructures, surprisingly few are grasping the opportunity to use their rich land information resources to spatially enable their societies. For most their biggest constraint still remains their institutional silos.

No country can leave land management to ad hoc and unplanned responses. The tool box approach described in this book allows responses to be coordinated in an inherently flexible way. While the array of tools described provides a structure for decision makers, tools constantly change. One of the most significant changes is the move away from a focus just on technical tools. Future LAS design will focus on land governance, capacity building and reflecting the broad cognitive understanding about the roles land plays in society and the economy, in addition to technology, irrespective of the level of development of the country. LAS in the future will be integrated with associated government functions, deliver well organised information for policy makers and business investment, guaranteed security of all tenures, not just those based on the traditional land market.

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## NOTE

This paper is based on extracts from the book “Land administration for Sustainable Development” by Ian Williamson, Stig Enemark, Jude Wallace and Abbas Rajabifard 487 pages published by ESRI Press Academic, Redlands, California, USA.

## BIOGRAPHICAL NOTES

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Jude Wallace is a land policy lawyer who is a senior research fellow at the Centre for Spatial Data Infrastructures and Land Administration, University of Melbourne, Australia. Her specialties range from improving the most modern land administration systems to developing pro-poor land strategies.

Abbas Rajabifard is a professional land surveyor and chartered engineer who is an Associate Professor and Director of the Centre for Spatial Data Infrastructures and Land Administration, University of Melbourne, Australia. He is President of the Global Spatial Data Infrastructure Association.

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