

INSIGHT



Real estate registration and cadastre

Global

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Preface

Following requests from a number of professionals, and with support from co-authors Tony Lamb, Romyana Tonchovska and Robin McLaren, **Real Estate Registration and Cadastre. Practical Lessons and Experiences** was published as an eBook in February 2020. In the following seven months, it was shared or downloaded almost 2,000 times from 115 different countries. The eBook focuses on practical experiences in projects establishing, and making sustainable, real estate registration and cadastre systems in countries that need to make changes or establish their systems for the first time. The intended audience for the eBook are the departmental heads, government authorities, financing partners and consultants that are trying to help improve or establish real estate registration systems and cadastre for the benefit of the population and it is focused more on those countries that are developing or transitioning their economies and social fabric rather than the established, richer countries found in Europe, North America or Australasia.

RICS invited me to produce a shorter version as an insight paper that builds on the knowledge, understanding and wisdom found in the eBook. The eBook provides much of the basic theory, many empirical examples and a detailed annex with a literature review. This RICS insight paper focuses on the underlying understanding that led to the success of the projects in the multiple countries where the work was undertaken.

For detailed examples and 'stories', **see the original eBook.**

I asked the authors of specialist chapters from the eBook to prepare the relevant sections of this insight paper. My thanks to: Tony Lamb for preparing section 4 on the legal framework; Romyana Tonchovska for preparing section 6 on IT systems for cadastre and property registration; and Robin McLaren for preparing section 7 on land information services.

Gavin Adlington

Author biographies

Gavin Adlington, MSc, Cert Ed, FRICS, has developed a unique breadth of knowledge and understanding of all matters relating to land registration and cadastre systems, especially with regard to the successful implementation of projects involving mass systematic registration of title and the establishment of institutions that can successfully manage real estate registration and cadastres. He has worked in 46 countries on projects in this sector and visited another 20 in order to assess their operations. He has worked primarily for the World Bank for the last 24 years of his career.

Tony Lamb is a property lawyer from Australia. After working at the land registry in Sydney for 12 years, he has worked in more than 30 countries developing the legal framework for land registration. He has worked for the World Bank and United Nations and has published several books and papers on the law and land registration.

Rumyana Tonchovska is a Senior Land Administration-Information Technology Officer of the Food and Agriculture Organization of the UN (FAO), based in Rome. She has practical experience in 26 countries across Eastern Europe, Asia and Africa in design, development and implementation of large scale, complex information systems for land tenure, indirect taxation and building Spatial Data Infrastructure. Rumyana is leading various innovations to support countries to make better use of the available data and technologies.

Robin McLaren is director and owner of Know Edge Ltd – a UK-based, independent management consulting company formed in 1986 specialising in land policy, land administration and the application of geospatial information. He is a prominent consultant in land administration and works extensively with United Nations agencies, World Bank and the EU on land policy, land reform and NSDI programmes and is on a mission to ensure that land professionals are delivering appropriate land administration services to the citizen.

1 Introduction to real estate registration and cadastre

1.1 Context

Why is it that some countries progress socially and economically, while others seem to deteriorate? Some countries have vast amounts of natural wealth (such as the oil and mineral reserves of Venezuela and Nigeria), yet the benefits are not apparent to the majority of the population. Hernando de Soto in his book *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*, puts it down primarily to an inability to establish a sound legal framework and property rights registration system that allows all members of society, even the poorest, to utilise the resources and capital that is available in their homes and land to better effect. The land they own is effectively dead capital with a value far greater than any other assets or the assistance provided through the international community to poorer countries since 1945, when the United Nations and the associated International Monetary Fund and World Bank came into being.

There are many examples where improved property registration systems have contributed towards improving the economic and social wellbeing of the population in the countries of the former Soviet Union and the former Socialist block of Central and Eastern Europe. Starting from a poor base after the collapse of the socialist economies in the early 1990s, people gradually developed new businesses, often using small loans from banks and improving their income and living standards. They began to be able to afford school fees and health care, etc. They really valued the title documents they had been given, as it gave them confidence that it was their property and that any improvements and developments would not be taken from them. When going to the banks for loans, the title deed or certificate convinced the bank that the applicant was local, had roots in the community and would not abscond. The title was often used as collateral to register a mortgage even for small sums. By the end of the projects we often saw transaction numbers at the registry office increasing by 100% per year and the value of money borrowed vastly increased. In one of the poorer countries, Kyrgyzstan, the population went from not being able to get credit at all, to over US\$1.3 billion in loans through mortgages – a figure that was equivalent to 23% of their GDP. In that project they also regularised over 660,000 informally constructed buildings and registered the property rights for the occupants (see **Kyrgyz Republic – Land and Real Estate Registration Project**).

There are other important issues that keep many countries poorer than they need to be, such as war and internal conflicts, a lack of the rule of law, corruption, dictatorial rule or mafias, but the lack of secure property rights and a registration system that helps government to manage land effectively and facilitates the use and benefits to society is a key issue. In those countries that have established and maintained successful real estate registration systems, the improvements are usually part of a bigger national reform aimed at improving the economy, eliminating corruption and improving the wellbeing of the population. The leadership from the government at a senior level is crucial. Apart from the former socialist block in Europe and Central Asia,

programmes for registering property rights that have seen great success over the last 30 years include many in South East Asia (like South Korea, Thailand, Singapore and Malaysia) and some in the middle east (like the UAE and Oman). There are few elsewhere, with Rwanda being a standout example of success in Africa. The improved property registration systems, as one part of their major reforms, have helped improve the national economy and helped lift many out of the poverty trap. Although establishing an effective cadastre and registration system will not make the economy work and provide social benefit on its own, the failure to have such systems makes it much more difficult to improve economic development and social cohesion.

Real estate is registered for two good reasons:

- 1 governments need to know who lives where and who owns what so that they can manage land resources optimally and for taxation purposes, providing income to help run the government. We often focus on the 'tax' part, but a good government needs to know who lives where and who owns what so that they can provide the services that are needed to society, such as garbage and sewerage disposal, provision of utilities, and the location of schools, transport networks, social services and hospitals, etc.
- 2 the business community and public need to know with clarity who lives where and who owns what so that they can be secure when buying, selling, leasing, mortgaging or otherwise dealing with real estate. This is needed both if wanting to stay on the land and not be removed by another person or group (for tenure security) and if dealing with the real estate safely and securely for business purposes or to change habitation.

Many countries in Europe, plus the USA, Canada, Australia, New Zealand and others, already have existing and efficient registration systems. They continually change as new technology, new needs of society and the demands of integrated government in the digital age have to be addressed. This insight paper focuses on those countries that need to fix or change systems that currently do not work as well as they should, and for those that want to include **all** of the population in their systems because too many are excluded. It is assumed that they have decided to do this and commence a project, whether funded by the government entirely or partially through external funding.

1.2 The customer is always right

The customs and morals of society are reflected in the law. In many jurisdictions over the last century, changes affecting capital and corporal punishment, women's rights and LGBTQ+ rights have changed dramatically. In all aspects of law, the law must serve the people and not be used to restrict them or subjugate them. Over the last half century the laws affecting the registration of property rights worldwide have changed considerably in order to cope with vastly increased demand, incorporate the latest technology and provide quicker and simpler services. Some countries have not made these changes and find that systems that used to work well no longer do so. For example, the laws and procedures for registering property in South Africa have barely changed since the end of the Apartheid era (in the early 1990s) and most of the population do not use the official systems when transacting with real estate (for more detail, see the publication *Untitled: Securing Land Tenure in Urban and Rural South Africa*).

A registration system is only useful if everybody uses it. The objective is for the government to be able to govern and for the public to feel secure in their property rights, all contributing towards the better social and economic fabric of the country. If the government fail to establish

systems that work well, then the economic and social benefits expected will not occur, but the public will get on and do what they want to do anyway, it will just not necessarily be legal or formal. For example, I have come across several socialist states or post-socialist states where people have only use rights and are not allowed legally to sell those rights. Therefore, they buy and sell informally. Similarly, in countries with a history of customary or indigenous rights I have often seen that land has become scarce, and therefore very valuable, and residents act as if they are owners and the customary roles of the community begin to be ignored or overridden. In such cases informal dealing in real estate predominates and the income to government through taxes, fees and income tax is foregone and prevents them from providing the services to the community that they ought to provide. The owners suffer through lack of security and a prevalence of disputes and fraud, lack of access to formal credit at reasonable rates and a low property value compared to those with clear title.



Figure 1: Example of an informal real estate agent handling informal sales, rentals, renovations and access to credit – in a shanty town near Cape Town, South Africa. (© Collen Masango)

Informal businesses develop and flourish

There are many places across Africa and Asia where there is inadequate provision for housing and people build shanty towns or develop large informal settlements. In others, the construction permitting process is slow, expensive or corrupt and building occurs informally and sales also occur informally.

If the public do not use the system, or do not trust it, then it will fail and the economic and social benefits that it is supposed to provide will not occur. It is important to always view the system being provided from the perspective of the customer – this is fundamental.

In order to ensure the system is acceptable, use the **SCARF** acronym:

Simple to understand and utilise.

Cheap so that it does not deter people from using it.

Accessible and easy to use either through a local office or local conveyancer or notary.

Reliable so people have complete trust in the system.

Fast so people have their services provided quickly and efficiently.

1.3 Economic and social benefits

The link between real estate registration and economic growth has been made for many years, with The Economist on 29 May 2003 stating that 'land and property markets, including construction, may contribute as much as 15 per cent to GDP in a developed economy'. In the UK there is approximately US\$5 trillion in the value of housing and US\$2 trillion in the value of commercial properties. The **National Association of Home Builders** estimates that the contribution from housing is 15–18% of GDP considering professionals working in the real estate sector and various rents, etc. This probably rises to over 20% when commercial property is included. Mortgages registered at the Land Registry in England and Wales amount to over US\$1.2 trillion (Land Registry Business Strategy for 2017 to 2022). This is a huge amount of investment that has an enormous impact on the economy as a whole.

There have been criticisms in the past that focusing on the economic benefits of real estate registration projects can have the unintended consequences of harming already marginalised groups or communities because their access to land and use of resources is curtailed. There are also areas where 'land grabs' have occurred because many of the population did not know their rights and unscrupulous people claimed the land for themselves. There has been a lot written about this, especially with respect to people with customary rights or grazing rights who lost land because there was no written record. There have been many reported cases worldwide where women had access to and use of land and did most of the farming, but when the time came to put the name of the owner on the title document, it was a man that was registered. These types of examples might come from practices or projects that were badly implemented and should not deter us from 'doing it right'.

1.4 The surveyor's role

It is an anomaly that most property registration projects I have come across are led by surveyors, planners, GIS specialists or similar, when the function is essentially a legal activity that is supposed to lead to legal clarity and consequent economic and social benefits. I think this is because of the nature of surveyors (or technical people in general) that tend to be proactive and try to get tasks finished quickly and efficiently. A mass systematic registration project fits neatly into that category. Although it is a generalisation, the legal fraternity are more often focused on analysing and resolving issues or disputes that are brought to their attention – and of course their income is generally much higher so that it would be unusual for them to take the necessary income reduction to work full time on such projects.

Surveyors often do make good team leaders, but in a project involving real estate registration it is important to keep all aspects in mind – especially that the survey work and the cadastral

mapping is provided in support of the legal, social and economic objectives that have to be achieved. There should be no disruption of the ongoing ability for the public to register property rights while a national project is being implemented and it is fundamental that **no harm is done** to the vulnerable communities, real estate market, existing owners that are happily enjoying their ownership rights with no disputes with neighbours, etc. Owners should not be expected to pay for something they have not requested (a new title document) or to provide long lost building permits or proof that electricity bills are paid. The work programme, including the precision with which services are provided, should be **fit for purpose** (see **Fit-For-Purpose Land Administration: Guiding Principles for Country Implementation**) keeping in mind that most owners are content with a wall, hedge, stream or road edge as a boundary and do not need or want centimetre level coordinate accuracies.

Courts around the world give precedence in boundary issues in a similar way to that established in New South Wales, Australia (see Appendix A: References). In order of importance:

- 1 Natural boundaries – such as rivers, streams, range of hills, etc.
- 2 Monumented lines – such as a line of trees, a fence, hedge, wall or line between concrete markers, etc.
- 3 Old occupation that is long undisputed – as recognised by neighbours and/or appears clear on the ground.
- 4 Abuttals – as recognised by neighbours or as defined in the documents produced by adjoining properties.
- 5 Statements of length, bearing and direction – as shown on plans, through coordinates, etc.

While keeping the primary objective of registering property rights in mind, the surveyor will also be considering the wider use and significance of the cadastre to try and ensure that the information provided (usually digitally) meets the needs and requirements of society as a whole. This is further explored in section 7 and is shown in Figure 2.

Significance of the Cadastre

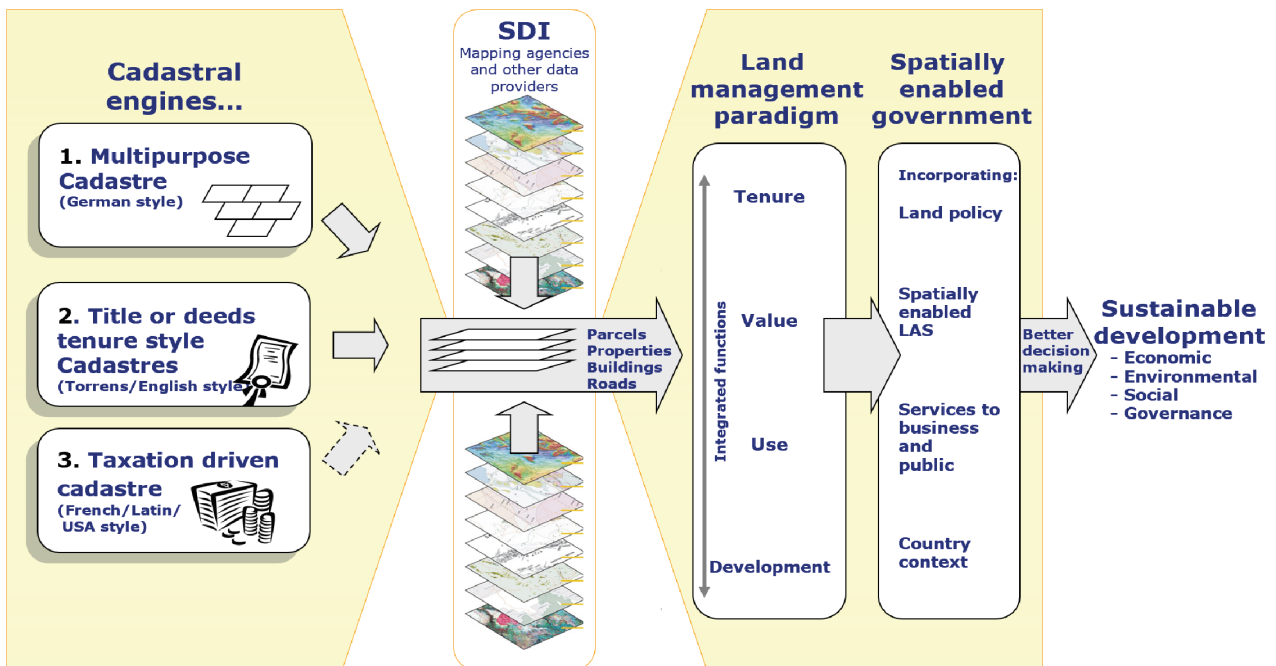


Figure 2: Significance of the Cadastre. Land Administration for Sustainable Development. (Williamson, Enemark, Wallace and Rajabifard, 2010)

1.5 Key summary

Registration and cadastre systems are only part of the full needs and requirements that benefit the economic and social well-being of society. It is like one cog in a well-oiled machine for good governance, but without that cog the machine will not function effectively. Although many systems have failed in the past and it is both complex and time consuming to 'fix' systems that are dysfunctional, it is worth the effort to 'do it right' as the benefits are substantial. Historically, the management and professional skills required to establish or 'fix' a registration and cadastre system has required people of a very high calibre and focused commitment from government.

2 Understanding the context and the challenges

2.1 Context, constraints and overall objectives

When being asked to help reform or improve a property registration system it is important to show respect to senior officials in that country. It is most likely that you will be working with senior government officials, heads of departments and others within those departments or the private sector.

If you are coming from another country to help in the real estate registration and cadastre sector, there is a lot of investigation and research that should be done beforehand. The basics about the country's history, topography, protected areas, cultural background, politics, etc. is important for giving context. The research should include a review of the government's main political and reform agenda, especially focusing on anything that might impact the real estate sector. Often the government will have a five- or ten-year vision or plan with targets that need to be reached. Real estate registration and cadastre may not be specifically mentioned, but all economic or social activity requires land and (very often) buildings, so the register of property rights and the cadastre will be implicated. It is important to spend time researching appropriate laws, regulations, institutional structures, issues the country faces in the sector and the plans or recommendations that have been made in the past.

If you are a resident of the country much of the information above will already be known, but you (as well as the visitor) should also know about the real estate registration and cadastre practice and experiences in other countries, especially those that are successful and have a similar legal background. It is common that government officials will ask how other countries approach the same problems and what they did to solve those problems.

The next stage is to understand the problem from the client's perspective, and to appreciate who the client is. The driving force behind the request to resolve land tenure or real estate market issues may be one or more of several issues:

- **Economic** – the economy is not functioning well, with the real estate market being weak or informal. In this case it may be necessary to initially focus on urban areas where the real estate market can make the biggest difference.
- **Food security** – population growth or issues relating to climate change have led to agricultural production being constrained or a need for the land to be more productive. Land titling may help to give people the security and access to credit that may be needed to improve productivity.
- **Conflict** – land is becoming scarce because of population growth, there are conflicts between established users (such as those who have regularly used land for pastures or as forest lands), and maybe land is taken without adequate compensation for large investment projects. Land titling with an additional focus to improve legislation and practice may give

land users more security. If there is armed conflict, either with other countries or internally or through terrorist networks, there is little that can be done from a land titling perspective until law and order is restored. However, the root cause of many armed conflicts is often related to land access and ownership, and land experts could become involved as solutions are prepared.

- **Land degradation, invasions and social welfare** – population growth, climate change and the normal desire to maximise personal income can all lead to land shortages and a desire to utilise marginal lands or protected areas. This can lead to removal of trees that result in flooding or erosion, forcibly taking land from vulnerable or marginalised groups and, in the extreme, desertification. There are many challenges and it is essential that both the land and the vulnerable groups are protected.
- **Inefficiency** – a failure to make necessary changes to registration systems and procedures as times change (such as in post-colonial countries), low salaries for staff and corruption can lead to registration and cadastre being non-functional or severely constrained. The courts or the offices of local government officials may then become clogged with land disputes. This can drive change because of social discontent, leading politicians to want to improve the situation. Inefficiency may also be linked to the drive for change based on the economic, food security and conflict reduction issues the government is trying to address.

If the person that requested help is a senior government official or the head of a department responsible for the cadastre or registration office, there is a good chance of success. The champion within government is probably the most important person needed to make the improvements needed. If the person is a politically-appointed individual, there may be only a short window of opportunity to start making an impact and seeing a difference during their tenure and it will be important to show results quickly – often before the next election.

Once the constraints and what the country requires are understood, it is useful to summarise this clearly, laying out what problem is being addressed, the longer term goals and the activities that could lead to specific outputs and the short-term impacts (within the period of a project) and the outcomes that may come in the medium-term after a project is finished. A useful tool for this is the Theory of Change (TOC), which will act as a guide into the actual interventions that are necessary. A sample of a TOC is found in Figure 3 and is adapted from work the author has previously undertaken.

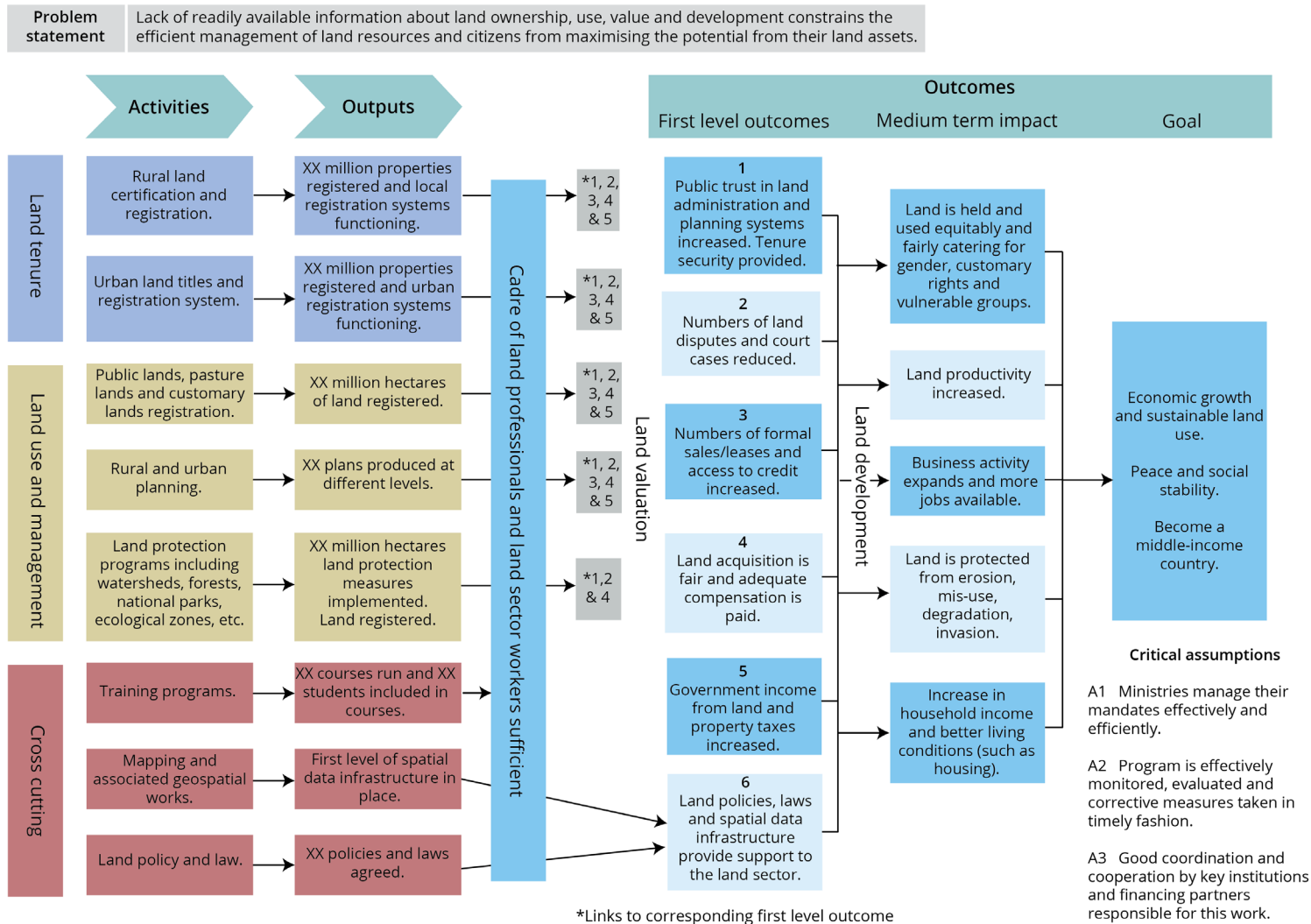


Figure 3: Theory of Change. Showing a possible set of activities and outputs that might lead to 'first level outcomes' by the end of a project. The medium-term impact and the goals will come later and are also usually reliant on other interventions in other sectors

2.2 The team and the preparations for a project

In order to suitably prepare for a project there are key issues within the country to investigate. One of the most contentious, the most common, and the one that is rarely referred to is also the one that has the most impact: corruption. Land and the buildings on the land is usually the most valuable asset a person has. It is a requirement for their business to function or is their home. The organisations responsible for registering property rights are usually monopoly organisations. In order to obtain 'facilitation fees' it is necessary that the system is the opposite of the 'SCARF' principle previously highlighted in section 1 as no-one will pay a facilitation fee if the existing system is simple and it takes only a day or two to register. The 'real life' situation can be assessed by talking with the key stakeholders, such as lawyers, surveyors, bankers, real estate agents, civil society organisations and the general public. This is essential. It can also be clearly seen if there are problems when visiting offices and seeing how they operate, including whether the public or their professional 'facilitators' are allowed into the offices; finding piles of old files waiting for action; and seeing queues of people waiting to meet officials behind closed doors.

It is important to assess the legal framework and all the procedures used when registering for the first time or for transactions, including the involvement and work being undertaken by cadastral surveyors, real estate agents and mortgage providers.

The first stage is the situation analysis. The following specialists are needed:

Team leader

Dependent on skill sets, this person will undertake the political economy analysis; assess clients' interest and willingness to make change; meet with other financing partners and civil society organisations or specialists working in the same area; find out the real goals and objectives of both the key government officials and the financing partner that commissioned the work and ensure that all the team meet their obligations.

The team leader, or one of the team members, will need to assess what government policies exist in the land sector and the current status of the real estate market in terms of sales, leases, mortgages, inheritances registered, etc. in order to see if they are commensurate with what would be expected in a country of a similar size. It may be that a written policy document exists, but more often there is not.

The officials within the country generally know what they want to achieve, and they will have laws from which the policies can be derived. However, it is likely that additional policies will need to be developed (addressing things such as informal settlements, regularisation of informal constructions or modernising record keeping in customary land areas). Consideration must be given to the on-going sustainability of any system that is to be put in place, taking into account revenues that can be generated and whether it will be possible to retain the level of competent staff required to run an efficient registration and cadastre system. Outsourcing, concessions and Public Private Partnership arrangements could be considered – if the local private sector capacity exists.

Land lawyer

It is fundamental to understand what the law says and requires. Despite all the technology and complexity involved in improving registration systems, it is fundamentally a legal activity

designed to protect property rights and facilitate real estate market activity and economic development based on those legal rights – so this initial study is foundational. There will be regulations, instructions and guidelines that have been published and these must be assessed. If the land lawyer has registration office experience then they can assess how the registry office functions, talk with members of the legal profession and other key stakeholders involved in the sector (such as the banks), and find out the limitations of both the law and the practice. The lawyer will need to complete an assessment about what can be achieved under current legislation and assess what may need to change to fulfil all objectives of the programme. I have rarely found that existing laws cannot be used; problems are usually with interpretation of the law and with implementation of the regulations. As it can take years to approve a policy document or change a law, it is far better to work with existing laws and include a programme for amendments in the reform programme.

A lawyer who is experienced in registration work will be required. A key consideration will be whether there needs to be a national programme for systematically registering all properties and, if so, how this can be completed while ensuring that the daily on-going registration of transactions can continue and be improved.

Note that an experienced land lawyer is required. Lawyers who have a corporate or tax law background may not have adequate experience for a registration project.

Geospatial specialist or surveyor or similar

This person will need to assess the current mapping systems and the geodetic network (national coordinate systems and the basis for survey work); the way in which boundary surveys are conducted; private and public sector capacities; licensing of persons permitted to do cadastral survey work; the institutions responsible for surveying, mapping, control networks and remote sensing; and the linkages with other agencies and local authorities that utilise geospatial information. It is very common that a continuously operating reference network (utilising satellite-based position fixing, such as GPS) will need either to be utilised or to be put in place. If there is a national spatial data infrastructure (NSDI), or work underway to prepare an NSDI, then the specialist will assess this and ensure that any proposals or work planned are in conformity.

IT specialist

A competent IT specialist will need to assess the technology and software in use. A review would cover all levels of centralised and decentralised systems and the networks that link the different offices, their databases and their processes. An assessment of the telecommunications networks nationwide will need to be made. Often the government will have e-government initiatives and international/national standards that must be adhered to and the specialist will have to check and assess these to make sure that any intervention recommended will meet those needs. The sustainability of these systems is crucial for business continuity, so the support arrangements and resourcing need to be investigated. This is a critical area for any project in the modern day and needs focused attention by very competent experts. Working with the legal and survey specialists, an analysis of the quality and currency of any data in existing systems must be undertaken.

Social scientist

It is important to identify those people who are excluded or marginalised by current practice and to find out what their needs are with regard to property rights, security of tenure

and the ability to pass on to descendants those properties they own – whether they have registered rights or not. Would there be anything in proposed project plans that might affect marginalised communities or vulnerable groups? What safeguards need to be put in place? How should changes to systems and their rights be communicated to them and how will feedback and information be gathered from key stakeholders? If work is being funded by a foreign government or development bank, there will almost certainly be documented safeguard standards that have to be met before funding is released and these will need to be taken into account. It is in this phase of work that the social scientist is needed so that the technical and professional team members can take these issues into account.

For a first visit, a period of about ten days to two weeks is needed for this work. After this it may be necessary to bring in specific specialists for specific tasks, for example (not a complete list):

- a geodesist capable of preparing documentation for establishing a reference network
- a valuer because, for example, the lack of valuation expertise was affecting the best use of government property assets or optimising tax collection
- IT-related technical specialists because of the complexity of existing or planned IT systems, such as a database management specialist, a telecommunications specialist, a networking specialist, a web designer, a business systems analyst, IT systems auditors, or a GIS specialist (these are all different skills not usually held by one person)
- a public awareness and communications specialist because the changes will be major and public information and support are essential
- an economist/financial specialist to ensure that systems being established are viable and sustainable
- a trainer because training needs are substantial and complex
- a town or rural planner
- a Public Private Partnership specialist if there is a likelihood that the government wants to partner or outsource registration services
- a company to undertake a social survey or a similar study – maybe regarding the use of customary land or for gender equity or for understanding the informal market and informal construction, etc.
- a monitoring and evaluation specialist for complex projects
- a procurement specialist
- a financial management specialist.

A basic principle when a project is complete and deemed successful is that everything will continue to work well even after any advisers, financing partners or bilateral donors have left.

2.3 Key summary

If the team coming to help implement a registration and cadastre programme is coming from a different country, there are some key things to keep in mind:

- **Keep the needs of the country in mind** – the team are there to help implement a programme that the government wants in line with their own policies by providing the highest level of managerial and professional expertise that is internationally available.

- **Respect your counterpart** – government officials, technical specialists and persons in the private sector within the country are busy people with important work that they do on a daily basis. Ensure comprehensive research is done beforehand and avoid writing long reports that take a long time to read or assimilate.
- **Do no harm** – it is fundamental not to disrupt the current ability of the public to register property following transactions as new systems are put in place and to ensure that the rights of customary or indigenous right holders, marginalised or vulnerable communities are in no way harmed by programmes put in place. Indeed, they should be helped and protected by the new systems.

3 Implementing and sustaining a programme of reform

3.1 The nine Cs

In order to establish or improve a registration and cadastre system there is a huge programme of work and activities to be concluded and outcomes to be achieved. It is a complex management task and the quality of that management is more likely to lead to success than all the detailed technical or procedural approaches put together. When managing such a programme there are various parts of the project that must be in place and need attention, displayed here as the nine Cs:

- 1 Champion** – the key person who will make the project successful.
- 2 Corruption** – the most common problem to be resolved.
- 3 Customer** – the person who benefits and the main focus when establishing new systems.
- 4 Computing** – the technology that will make it all work.
- 5 Consultants** – specialists who will provide advice, support or complete tasks.
- 6 Cadastral survey** – the method of uniquely identifying and showing the parcels.
- 7 Communications** – how to inform stakeholders and the public of what is being done.
- 8 Capacity development** – the need to build institutions and train staff.
- 9 Continual adaptation** – ensuring the system continues to work after the project is finished.

3.1.1 Champion

The champion who is found in country is by far the most important and influential person leading to the success of a project. With the right champion, the job is already half done. Usually, the most effective champion is the department or agency head within the country. To be effective, the champion must be dedicated and want to achieve results. It is critical to have good, experienced professionals in the team to give advice and warnings when an approach might not work, for example, because it failed in another country or is technically not feasible. However, it is also important to appreciate that political imperatives will direct an approach and they must be accommodated, and that often the champion will have a greater understanding of what can realistically be accomplished in their own country than some foreign advisers.

Sometimes there is no champion, or the champion is reassigned during a project and the replacement is not so keen on their predecessors' projects. It happens often. If there is no champion, more regular visits and the action list become very important. Review progress on each aspect of the project at each visit, and then prepare and agree an action list and associated project plan that the agency will need to adhere to. The action list guides the agency (or agencies) step by step through the reforms needed. At future visits, the action list can be checked against actual accomplishments and a new action list prepared. If the actions are not

concluded, then sufficient pressure should be applied by senior stakeholders until the actions are implemented.

3.1.2 Corruption

This is a highly sensitive subject. Standard project documentation often refers to ‘increasing transparency’ and remains silent on this key issue of corruption and bribery. When working in the land sector, **it is far more likely that corruption exists, and it must not be ignored.**

A study titled **Working Paper 04/2011 Corruption in the Land Sector** by Transparency International and the United Nations Food and Agriculture Organization (FAO) in 2011 concluded that land issues were the third most corrupt service provided by governments worldwide after the police and the judiciary.

When visiting a registration office and the main stakeholders, these are some indicators that something might be wrong:

- If the law or regulations require a lawyer or surveyor to be licensed or qualified (as in most countries) and they produce a document or plan that is only a few pages long, then it should only take a number of minutes to check that all is in order. If there is a high volume of applications to register it may take a couple of days to deal with them, but there is no reason it should take weeks or months unless the office is grossly inefficient or corrupt. Either way action is needed (see below).
- The most common corruption method is that ‘intermediaries’ are required to follow up on applications for registration and it is these people who pay the bribes and arrange for transactions to be registered. A queue of people waiting to see the registrar is a key example of this in practice.
- If the office premises are cluttered with files on desks and piles waiting to be dealt with, it could be because they will not be dealt with until a client or intermediary comes to ‘facilitate’ action.
- If the legal profession or notaries claim that people prefer to go to the office themselves rather than having the lawyer or notary submit the documentation (as in most countries with efficient systems) then it could well be because the lawyer or notary will not pay the necessary bribes or take the necessary time to visit the offices, so it is left to the client.
- Stakeholders may say that there is corruption – although it is surprising how often they do not admit it even when it is obvious. This may be because they have been working in the sector and do not want to admit that they have been participating.

Actions that might help deter corrupt practices

- Ensure back offices are secure with coded entrance numbers, surveillance cameras, etc. Take action when someone is found inside the ‘back office’, who should not be there.
- The public reception area should be large and without barriers that would block the view of all customers to the activities at the reception desks.
- The reception clerk should just have a check list of documents and receipts to be presented and then pass the documentation to another member of staff who has no contact with the applicant and will then start the approval process.
- A separate counter should be used for payments only, with official receipts given.

- If a member of the public or a notary needs to meet an official checking the documentation, then a separate office (without barriers that would block the view) should be assigned in the public area. Appointments should be made to see the official and records kept.
- Files held waiting for clarification from an applicant should not be held back for more than a day or two. If there is no response in this time the application should be rejected with the reason behind the rejection stated. The applicants can re-apply once they have resolved the problems.
- Public notices giving information about fees, time frames for completing examination of documents and confidential telephone numbers or email addresses for making complaints should be clearly and prominently displayed.
- A 'ticket' system for applicants is useful for busy offices.
- As the office is gradually computerised it should be possible to design the business processes so that it is clear to managers who processes certain documentation. Thus, if some illegal action occurs, the culprit can be found more easily. The system can also track the processes and time frames so that delays are flagged to the manager.
- E-conveyancing, through electronic lodgement of documents, makes corrupt practices more difficult, especially if accompanied by time schedules for processing applications or automation of the examination process. A system for electronic lodgement can be prepared quickly (a few weeks) and need not wait on a major system for registration that may take years to develop.
- Open access to data through searches at minimal cost enables people to check transactions that might have occurred.

3.1.3 Customer

Author insight

I recall a meeting in an Eastern European country where I once referred to the registration system as providing a service to its customers. The legal expert from the registration office appeared surprised by this and replied, 'We don't have customers; we have applicants that come to us because the law says they must.' The attitude was that they were doing a great favour in considering applications and providing answers.

A couple of years later, in the same country, a deputy minister referred to the registration system as the need to ensure that they provide a useful and valuable service to the public, because that is what they expect from the people they elect.

That country now has a terrific, customer friendly, registration service.

The staff of the registration office need to be friendly, helpful and competent. The quality of service encourages people to use it, which in turn does not discourage people from going through an arduous process that they would rather avoid. This helps if people want to upscale to get larger housing, thus making more affordable housing available to others, and encourages people to invest, build or further develop because they trust the system.

Author insight

In one Central Asian country where we implemented a project, the local banks almost never lent money using property as collateral in the early years of the project.

At the end of the project, I went back to the same banks and they had a mortgage department in place dealing with customers every day. When asked about their lending portfolio, they said it was mainly small loans (but some large ones too) for short periods of a couple of years. I asked why their portfolio had grown so much and why they made the effort to register small loans like that. Their response was that the person coming for credit had to have a viable business plan, but the title document told them that the person was local and had roots in the community, which made them less of a risk. Also, it was so simple and cheap to register a mortgage that they just did it, because it gave them that extra bit of security.

If people are borrowing in large numbers for business purposes, that gives some indication that the system is helping build the economy and that the customer is satisfied.

3.1.4 Computing

Many years ago, forward-looking land registries were quick to assimilate a certain amount of computing that involved word processing to create standard documents, databases to keep records and make searches, and the technology to compute survey work and create digital records of plans and certificates of title. However, the systems that have been built over the last 15 years or so, tend to be complete, integrated systems that include a process with checks and balances for the whole system, plus linkages with the cadastral survey and with other government bodies, often adhering to government-led standards and the Land Administration Domain Model (**ISO 19152** from 2012) or the Social Tenure Domain Model that was more recently produced through the Global Land Tenure Network.

Every project I have been involved in for the last 25 years has included an IT activity and the development of a system. These have varied greatly from PC-based local systems in the early years to more centralised and sophisticated ones, but the common trend is that they are always difficult to implement, take far longer than originally envisaged, and are much more complex than anyone thought they would be. The lessons learned in just the computing area are huge and it is so common for an IT system to fail altogether.

See section 6 for further details on this topic.

3.1.5 Consultants

Consultants should know both the technology and good practice, but also know **why** the technical rules and standards were put in place historically, **what** needs to change in the modern environment and **how** they should be adapted or modified to cater for the needs in a different country given the financial, personnel and time constraints that apply to that country. Consultants should be able to apply best practice and come up with innovative solutions given the country context, funding and time frames. Here are some regular pitfalls:

- It is not necessary to provide long reports outlining basic information such as a description of the country, demographics, topography, etc., a description of how things work now and the problems being encountered. While it may be useful for the manager of the company

or organisation that hired the consultant, it is not very useful to the department heads and specialists in the country concerned as they will likely know this already.

- Avoid statements such as ‘the government should ...’ as this is often not helpful unless it also includes the resources they would need to do this task including:
 - the department or unit within government and the responsible person who would make sure that the activity happened
 - the personnel required and their qualifications
 - equipment or other resources needed
 - cost estimates and where the money would come from
 - time frames and
 - the actual terms of reference for doing the task.
- Consultants should be able to offer advice based on a breadth of international experience and having achieved results in the past. Consider the following things when checking a CV:
 - Ensure that the candidate has undertaken similar work before, i.e. developed a working IT system, completed a mapping programme and produced the maps, been licensed to operate as a cadastral surveyor and undertaken surveys, worked in a registration office, implemented a successful training course, etc.
 - Ensure that the candidate has several years of practical experience, has worked in several countries and will not just be offering the solutions from their own home country.
 - Check the countries where the consultant has worked, and the duration of the support provided. Several years working in a country is evidence that their work was appreciated.
 - Ensure the consultant is a good team player and can integrate into a diverse set of team members.
 - Check the quality of the consultant’s written skills in the language required.
 - Make sure that they are truly independent and have no conflicts of interest.
 - Check the references as this is usually just a phone call and worth taking the time to do.
- In most cases, a detailed terms of reference is required with clear instructions about:
 - what needs to be investigated and where the investigations must occur
 - who they should meet
 - who they will report to and
 - the deliverables and the time frame for the deliverables.

It is also usually advisable to start with an inception report produced after a week or so (dependent on the size of the task) in which the consultant will provide their assessment of the situation and the approach for concluding the study or advice that will be given. Both the consultant and the person hiring the consultant should stick firmly to the terms of reference and if anything changes or the full extent of the situation encountered was not known, then they should immediately inform the other party and agree the changes. This is a safeguard for both sides.

3.1.6 Cadastral survey

The location of a property is fundamental to knowing whether all land is covered and to ensuring that the same piece of land is not registered to different people. In cases of dispute or when a new owner wants to see the extent of the land they purchased, inherited or rented it is important to be able to relocate the boundaries, and for this reason a description or a plan is usually attached to the deed or transfer document. For most people a fence, hedge, boundary marker or other physical feature is enough. The arguments then become about the levels of precision with which measurements should be made and the accuracy of the end result. Note that these are different things –the position of a fence post at the corner of a field can be measured precisely to within a few centimetres, but if the fence post is not actually on the boundary or the point that is being measured from is incorrect, then the recorded boundary will be inaccurate.

It should be considered that whereas the cost and time frame for doing the survey work can be justified in a case-by-case basis for individual properties, it is a different situation entirely when a project for systematic registration is taking place and millions of properties need to be identified, surveyed and registered in a reasonably short time frame.

See section 5 for more detail on the cadastral survey.

3.1.7 Communications

A registration system is only useful if people use it. For this to happen, the **SCARF** principle needs to apply (see section 1), as the system must be free of corruption and sufficiently accessible for people to accept it and utilise it. There are many countries in Africa where the wealthier use systems that have been left behind by the powers that colonised them, but most of the population cannot use the system because of its complexity and costs. If new systems are put in place and a mass programme of registering properties is included, then the public needs to be aware and be supportive. Funding for public awareness campaigns and providing local information and support become essential. It is a very important part of the programme if it is to be successful, so the communications activities must be budgeted accordingly.

A full engagement strategy is required to ensure that every stakeholder is identified and communication to them is customised, clear and meaningful. As a first stage the key stakeholders, such as the legal professions, banks and real estate agents, need to be included in seminars or conferences and informed through contributions in their professional magazines, laying out the plans and timetables. Others, such as chambers of commerce, legal aid organisations, and non-profit organisations that would be interested, should be included. It is imperative that the public know what changes are occurring and why, and what goals and timelines of the project or programme are envisaged. A series of explanatory flyers, brochures and posters should be made available showing the key messages, actions to be taken and benefits that will accrue. Direct correspondence by post and through social media is necessary when the specific location in which the member of the public lives is being targeted for registration work. Other examples of successful communication programmes can be found in chapter 4 of the eBook **Real Estate Registration and Cadastre. Practical Lessons and Experiences**.

3.1.8 Capacity development

If there are major changes occurring then the staff and any external support required, such as short-term contract employees, will likely need their skill base and overall understanding enhanced. Assuming that the project leading to the new system has been decided, a human resources strategy now needs to be developed. The first step is complete a 'situation analysis', to see what currently exists. The number of staff in each department or unit, their functions, qualifications, ages, salary levels or grades, need to be recorded. The second step is then to assess what staffing requirements will be required for the new or changed organisation. For this, a clear understanding of the proposed technology to be used will be needed as transferring from paper-based or simple computerised systems to a major automated system with fewer offices and e-conveyancing possibilities will entail a lot of changes and new skills. It will also be necessary at this stage to know or agree what level of outsourcing of services might be likely. The human resources strategy must be augmented with a clear 'change management plan' as staff will need to support and be comfortable with the changes happening in their life. It is important to be sympathetic of those whose careers and lives will be affected.

If it is agreed that some services (such as notaries, valuers or surveyors) require licences to operate, then that must be included in the training.

Author insight

In many projects we included the establishment of a training centre and person responsible for training within the project management unit to make sure that this important subject was given sufficient weight. In other cases, all training was outsourced.

In one Eastern European country the government agreed that this would include the equipping and support of nine different universities so that they could provide all the training needs.

In another country a unit was established to set up and conduct a very detailed distance learning programme and all staff had to go through set courses in order to be allowed to practise in the particular function to which they were assigned.

Capacity development is fundamental because there is little point in making reforms that cannot be maintained. It is not only for the project activity, but also the institutions or entities directly involved in implementing new systems that must receive training.

3.1.9 Continual adaptation

Ensuring continuity requires the ability to change as needed. Some of the higher income countries continually amended their ways of working. Their laws and their institutional structures will have changed many times over the years, and it is certainly something that each new government considers as they are elected for their term. During the course of managing a project, focus should always be on the establishment of a sustainable efficient organisation that no longer needs outside support. If the project has achieved its objective and the financing partner, bilateral donor or consultants are no longer needed then it has been successful.

Thus, continuity really requires flexibility and to be able to respond to changing situations and to modify the registration system and cadastre to suit the changed circumstances. It also is likely to involve institutional change. A project may be needed because the responsible agency has

maybe not kept up with client demand (whether the client is a government or the public), and it is critical that the institutional changes are made that will enable continuity.

This may involve:

- amalgamating cadastral and registration agencies into one organisation for more efficient management and conformity of records
- becoming self-financing so that investments in technology can be made and staff can be paid market rates and avoid potentially corrupt practices
- outsourcing tasks to the private sector or
- becoming an autonomous agency that reports to a government ministry but is otherwise independent.

3.2 Key summary

There are nine key areas to address and complete if the project is likely to succeed. A project can be deemed as successful if the customers (users) are satisfied with the new system and if the system continues to operate successfully with no need for foreign support, funds or guidance in the foreseeable future.

4 The legal framework

4.1 Introduction

The legal framework is a foundation for land registration work. The following approaches to firstly reviewing the existing situation and then developing the laws on registration and related topics is derived from work in over 30 countries on enhancing that foundation, with the aim of bringing greater efficiency to the operation of the registration systems and increased accessibility for the people to those systems.

4.2 Overview of laws

It is essential to understand the legal context in which you are operating – in advance – to deliver secure outcomes in the most efficient manner. This generally means carrying out a thorough review of the existing laws and, at the same time, formatting any necessary amendments or new laws to improve the situation. It is a good idea to work with a local lawyer who knows the system and who can explain what happens in practice.

The constitution: it is the starting point for almost all legal systems because it sets the basic rights and duties, as well as the organisation of government. Take note of points such as the separation of powers, private property rights and their protection, taking of private land for public purposes, equality of citizens (gender, ethnicity, religion, etc.) and privacy protection. It is usually difficult to change a constitution so work within the framework that the constitution sets. Make the most of the positive provisions within it.

Land administration laws: the next step is to review the set of laws, which are often named codes (such as the land code and civil code), that establish the basics of real property relations. Each country takes a different approach but look out for rules on what are the rights of owners, how land can be sold, leased and mortgaged, if there is any interface with customary or indigenous laws, and how parcels are defined. The law on deeds or title registration comes next as it is a foundation law. There are also likely to be laws on cadastral surveying and surveyors, apartments, spatial data and also e-signature and e-documents. These and the law on compulsory acquisition of private land for public use should be considered as part of the overall assessment.

Land sector laws: if time permits, the laws on land reform and consolidation, land administration and management, public sector administration and public land management could be reviewed. Where there is only a small linkage with land titling, the chances of making changes to such laws will be limited but it is useful to know the wider context.

Laws of general application: there is an overlap (sometimes large, sometimes small) between the land laws and other laws, such as those on family, divorce, gender equality, inheritance and also the laws on dispute resolution, which include the courts, administrative review and alternative forms of dispute resolution, such as mediation. Here, too, the prospects of making

changes to such laws is small but they will inform the work and how problem cases can be dealt with.

Dual or multiple legal systems: these present a special challenge but being unaware of other legal approaches within a country, particularly approaches based on religion or different concepts of what is property, can result in misunderstandings and failures. Cultural awareness will aid the work and, conversely, a failure to make provision for local cultural practices will slow down and frustrate most aspects of the work.

When reviewing laws, what is missing might be just as important as what is included! It is a challenge to review laws as they are often long and difficult to read, but the greater challenge is deciding what has been missed out. Have a list of essential matters that are expected to be found in the law **before** starting to read it. As you go, you can check off each point.

4.3 Drafting a new law or amendments to existing laws

Once the starting point in the legal framework has been established, focus on what needs to be changed (if anything). Is a new law required or a set of amendments? Can the gaps be filled by regulations? There can be many policy decisions to be made but policy makers often leave it to the lawyers to make these decisions in the belief that they are minor matters. Often the most effective approach is to draft a law or set of amendments to get the ball rolling and then let people object. People often don't know what they want, but they usually know what they don't want.

It is a good idea to work with what already exists, at least at the beginning. It might take a few years to draft, negotiate and adopt a new law, which means that things will be on hold until then. Better to take the existing laws and make improvements through regulations or work manuals, while at the same time drafting the new law. Not only does this permit work to start but the practical experience of using the existing law will feed into the drafting process.

There are various technical guides that will help with identifying issues and then drafting provisions in a registration law, such as listed in the eBook **Real Estate Registration and Cadastre. Practical Lessons and Experiences**, including the **FAO Technical Guide number 9** at pages 49–52. The many diagnostic tools (and resulting country reports) that are available also indicate what a law needs to address.

In drafting the laws, listen to people on the ground and check assumptions with them – how will things actually work? Drafting should be an iterative process, with feedback from the specialists and consumer representatives informing the next draft. It is also useful to focus on the common cases rather than the exceptions. Much time is taken up with how to deal with the problem cases and ignoring the great majority of cases that could be easily and quickly registered. Try to keep discussions on track and focused on how the great majority of the population could benefit.

4.3.1 Commonly contentious issues

There are some issues that seem to arise in every country and that take up a lot of time and discussion.

Parcel areas: there are commonly arguments between lawyers, administrators and surveyors about areas stated in deeds (which are sometimes purposely overstated or understated, and often just an estimate) and the measured areas (which vary from survey to survey). Which area is right? Administrators often want to guarantee areas without thinking through the financial consequences of doing so.

Privacy and access to information: expect a range of opinions on how private the land records should be, which will be derived from the broader cultural and legal environment of the country. It is rare to find people agreeing with full access to all land information, due to privacy concerns, so a balance between the two will need to be struck. Fortunately, there is a range of responses that can achieve many or most of the benefits of open access without threatening privacy concerns too much.

Customary and informal rights: recognition of the non-written rights based on custom, tradition or informal arrangements will give rise to more debates and disagreements. Often, the default position is to recognise only formal, recorded legal rights to land but in doing so, the rights of many people will be missed, and they may even be disadvantaged. Land registration should capture all legitimate rights whether they have been recorded or not so provisions in the law must be flexible enough that they allow all types of evidence to be admitted for consideration.

Dispute resolution: there should be a special focus in the law on resolving disputes without going to court, preferably using several levels of review and mediation, although with the ultimate recourse being through the courts. Commonly, there are existing dispute resolution systems in place, whether traditional or government-sponsored, and these can often be utilised.

Corruption: the land sector is well known for corruption so expect many vested interests to resist change for the better. Nonetheless, the law should incorporate provisions that introduce or enhance measures to deal with corruption through transparency, accessibility and accountability.

Gender: while the rights of women are often protected by laws, women can face numerous disadvantages to acquiring and having their rights formally recorded. Consequently, special efforts can be required in the law to address the disadvantages and barriers that women face. It can sometimes be difficult to have women's issues addressed in law, however, there are still possibilities in regulations, practice manuals and guidelines, and information and education campaigns. Similar difficulties can be expected when addressing disadvantages of ethnic or religious minority groups.

Transitional and consequential provisions: when moving from one law to another, it is necessary to describe how the new law affects rights and duties arising from the prior law. Commonly, however, laws simply state that the new law overrides the old law, leaving those who have to implement the new law at a loss as to how to treat existing rights. A clear statement at the end of the new law should give clear directions.

4.4 Implementing the law

Regulations and technical directives: drafting regulations should go hand in hand with drafting legislation so that nothing is missed or forgotten. The law should also permit the registration authority to issue technical directives, which cover the details of technical matters

and are binding on the users of the system. These can be quickly and easily changed as procedures or technologies change.

Manual, publicity and training: it is a good idea to get the lawyers who were involved in drafting the law (and might also have been involved in pilot work) to assist with preparation of an operations manual, any publicity or information campaigns, and the training of staff. The lawyers should have a good understanding of what they have drafted and the intent behind it. At a minimum, they should review manuals, publicity materials and training guides to ensure that they accord with the law.

Continuous reform process and budgets: drafting a law is a major exercise but no one ever gets it right the first (or even the second) time. It is common for a law to require several amendments before it is fully workable, particularly as experience in implementation reveals new or unexpected issues. And even after a law is in good shape, changes in the economy, society and other laws will make it necessary to continue the revision and updating process. It will be important to maintain legal expertise and support, as well as to create a climate that accepts and promotes a continuous reform and improvement process. To support this process, there should be a small but adequate budget included each year for policy development and legal drafting.

4.5 Final thoughts

There is no best way to do something when it comes to land registration legal frameworks. Different approaches around the world have been equally successful in delivering secure, reliable and accessible records of land and its associated rights and right holders. So, when reviewing or amending a law, focus only on the points that really cause a problem. There is no need for a law to mimic the law of your home country for it to be effective. Of course, other laws are useful to identify points that need to be addressed and how they might be addressed, but allow each country to take its own path.

4.6 Key summary

There are various challenges that lawyers will encounter when attempting to develop the legal framework for a more efficient and effective registration system. The insights for anyone undertaking this task are:

- Do your due diligence in advance of your first visit to a country. Find, read and assess all the relevant laws.
- Get a local lawyer to help.
- Consider not only what the laws say but what they don't say – what is missing.
- Start with the constitution (obviously) and see how you can work within its parameters. Then review the other land related laws and also the laws of general application, such as civil law, family, divorce and inheritance laws.
- Take extra care where there are multiple legal systems.
- In developing the legal framework, try to work with what you have at first, while at the same time working on substantial reforms (if they are necessary) that will take time to be considered and adopted.

- There are plenty of materials around on how to deal with legal issues and draft laws well. You just need to look for them.
- There will be many contentious topics, such as parcel area discrepancies, dispute resolution, corruption opportunities, gender issues, customary and/or informal rights. So expect many arguments and discussions, which are often time-consuming.
- Don't forget the transitional and consequential provisions in a law.
- Reality check the draft with people who know how the system works or should work. And focus on the more common cases, not the unusual or unique cases.
- Try to draft the regulations in parallel with the new law or amendments so that nothing is missed and you do not lose valuable time.
- Expect up to three iterations of the law to be adopted before it takes a final form.
- There is no single best way to do something, so have an open mind.

5 Boundaries and the cadastral survey

5.1 Introduction

Boundaries, boundary markers and surveys have been necessary for identifying properties and their ownership for centuries. The primary purpose of describing or surveying a boundary is so that the location of that boundary can be found when someone is unsure of the extent of the land (such as a new owner) or there is a dispute. From earliest days, deeds that record transfers of ownership always included a description. This is sometimes in simple terms such as the name of the property or its address, and sometimes by 'metes and bounds', where the 'metes' specify the distance and direction of a boundary and the 'bounds' describe the boundary itself or the abuttal with someone else (e.g. running along the main road or adjacent to the field owned by Mr X). It is now more usual for a registered plan to be included, with reference to markers that exist at corner points and/or coordinates of the corner points.

Boundaries change with time. Stream or river routes change, and roads or paths get moved. Hedges grow and expand in size, and treelines can move as old trees die and new ones sprout. Sometimes a boundary feature is moved (often unintentionally) when a fence is replaced, or the original markers get displaced or lost, and natural development occurs that effectively moves the boundary as was once known to a new place. Sometimes a fence erected for other purposes, such as keeping animals in an enclosure, becomes a boundary unintentionally. In many countries there is a prescription period, usually something between 10 and 30 years, so the land within any commonly accepted boundary location that had not been challenged and was occupied peacefully in an uninterrupted manner could be acquired through adverse possession. The laws for claiming these prescriptive rights vary considerably by country.

In the case of disputes, the surveyed land and measurements are just one piece of evidence. It varies by country of course, but priority is usually given to what was publicly accepted. If the previous owner can be found, and they clearly describe or point out what was transferred, then this is clear evidence. If neighbours have accepted the position of a boundary for many years then this is also clear evidence. Next in priority come the markers that show the boundary, including the walls, fences, hedges or pathways or the monuments that have always been accepted by the local population. Follow descriptions in the deeds, and, finally, the details on the plans and the coordinates are taken into account. In fact, it is all just evidence that a judge will consider. However, it seems that the intention of the original parties, common usage and public acceptance as understood by physical features on the ground are the most critical factors. (See example for the New South Wales standard text, *Legal Aspects of Boundary Surveying as Apply in New South Wales* by Hallman in Chapter 1.)

5.2 Boundary survey for a registration system

Most countries already have established systems for boundary survey work, at least for urban areas and major farms, because historically people have obtained legal documents to their rights and some description of the property and its boundaries are included. Whenever a piece of land is divided, consolidated with another plot or assigned by government, a new survey will need to be undertaken. It is likely that other previously surveyed plots will exist nearby and the location of these will need to be checked to make sure that the new plots do not overlap with the pre-existing plots. (If the property involves the sale of the whole piece of land it is usually optional for the buyer to have a survey done and they generally would not if the boundaries are clearly seen when inspecting the property.) In many countries only a government surveyor or a person licensed to carry out surveys are permitted to do so.

Occasionally it is necessary to conduct a complete registration of title or revise an existing cadastre that is out of date or no longer matches the legal records in a deeds or title registry. The processes of surveying individual or a few properties on an 'as needed' basis is usually requested by the owner, who pays the fee for the survey. Systematic registration of all properties in a defined area on a mass scale is usually instigated by government bodies in order to improve social stability and the economy or so that taxes can be collected on an equitable basis or land use can be better regulated. The survey methodologies required for creating individual plans of a single property or multiple property development (involving from one to a couple of hundred properties) and that used for a registration on a mass scale that might involve millions of properties will require different methodologies, purely because of cost and time constraints. It is increasingly common for countries to require a systematic registration of all properties and property rights as part of their good governance initiatives, enabling and encouraging real estate markets to work more efficiently, reduce disputes and have the information needed for optimising land usage and land management. The World Bank alone have been involved in 74 such projects between 1997 and 2019.

If a new system is being put in place, especially if a new Register of Title is being introduced and properties are to be registered for the first time, it is normal for a (cadastral) index map to be produced. This will provide a clear mapping of every parcel of land to ensure that it is uniquely defined and identified with a unique number. There should be no overlaps or unexplained gaps between parcels. The parcel of land should also be uniquely linked with one legal record that describes the legal rights to that property. In this instance, it is most common that a set geographical area is declared to be subject to registration (usually under a law that specifies how this is to be done) and all properties in that location are to be registered. The book **Fit-For-Purpose Land Administration** describes how systematic registration was completed for Rwanda, Ethiopia and Kyrgyzstan, primarily using aerial photography methods and simple ground checking. In fact, the same (or very similar) methodology has been utilised for most mass registration programmes that were a success since the 1960s. This included almost the entire post-socialist block of Eastern Europe and Central Asia (including the former Soviet Union) covering some 300 to 400 million properties in a period of about 20 years using 'fit for purpose' methodologies.

A government or licensed surveyor usually oversees the type of work mentioned above. As the 'systematic registration' approach requires hundreds, or even thousands, of field workers, the people actually working in the field would be trained for the purpose in a few weeks and then sent out to do the work. The government or licensed surveyor would then just oversee its

completion. It is often thought that the survey side of a systematic registration project is the most difficult, time consuming and expensive part. In fact, this is not usually true. Time is taken to publicise, check the legal documents and the 'root of title' together with any encumbrances (such as mortgages and rights of way). Time is also required to visit every property to make sure that the person being registered is the true legal owner and agrees that the rights and the locations of the boundaries (often demarcating them with a marker or paint when unclear) are correct. The survey is the easy part, unless the methods for doing the survey are badly chosen – and not 'fit for purpose'. In fact, it is common now for a boundary position to be surveyed in a few seconds using GNSS equipment by the person that has agreed the boundary with the owners and demarcated the point on the ground.

5.3 Surveying methodologies

In modern day surveying, with the right equipment a corner point of a property can be measured in a few seconds to within a few centimetres of accuracy. There have been various 'revolutions' in survey work that have gradually made the work faster and easier. The very early work would have used ropes of a certain length, wooden poles and rough angle measurements. Towards the 18th century, more sophisticated equipment was introduced and the use of coordinate systems when countries were building national cadastres and more accurate survey measurements were being made. This required the use of theodolites to accurately measure angles, special tapes to measure distances for 'controlling' surveys and various other pieces of equipment like plane tables, compasses, chains, optical measurements using vertical staves, etc. A lot was not standard, for example, a 'rod' (straight piece of wood used to measure field boundaries) might be a certain length in one municipality, but a different length in another. The survey methods and equipment used were really designed to give a rough measurement so that the physical feature marking a boundary (line of trees, fence, stream, rock, brick pillar, etc.) could be found.

In the middle of the 20th century, equipment was accurate enough to relocate a boundary with any degree of accuracy. National coordinate systems became more common and equipment was more accurate.

5.3.1 Revolutions in surveying methodologies

First revolution – aerial photography

The first instance of using aerial photography to undertake systematic registration of title was in Kenya in the 1960s. Owners were required to plant hedges so that aerial photography could be flown and the boundaries plotted from the imagery. Malawi in the 1970s and other countries, including Thailand in the 1980s, used similar photogrammetric methods for their programs.

For systematic registration, it became normal because it was far cheaper and faster than measuring every property on the ground.

Aerial imagery has a very important and useful function in quality control – it is immediately clear and apparent by overlaying a cadastral plan on a photomap if the plan is incorrect. If the boundary lines drawn on the plan do not match the physical location of the property on the ground as visible on the photomap, then they are probably wrong.

Until recently, it was too expensive and slow to use photogrammetric methods for recording property boundaries unless many thousands of properties were being surveyed at the same time. Very experienced and specialist surveyors were needed to oversee this work.

Second revolution – electronic distance measurement (EDM)

The first equipment came out in the late 1950s, but even in the 1970s it was still very expensive and specialised equipment, and it required a separate theodolite to measure angles.

It made survey work quicker and more accurate. It also coincided with a time in which national coordinate systems were common and there would be a requirement for all surveys to be linked to that system. More sophisticated computing systems were also introduced that drastically reduced the time it took to do all the calculations necessary to complete surveys. The total station, which combined in one machine the angle measurements, distance measurements and more computing power, came into common usage in the 1980s. This made survey work even quicker.

However, it was still very complex and specialist equipment.

Third revolution – global navigation satellite systems (GNSS)

Also known as GPS (in the USA), GLONASS (in Russia), BeiDou (in China) and Galileo (European Union).

The equipment was initially very expensive and required two sets; one to be established on a known base station and the other to be used as a rover, linking to the base station.

GPS only came into full use after President Clinton opened the system fully for public use (without degrading the signals) in 2000. Prior to this, the signals were deliberately degraded for public use and the accurate signals could only be utilised by the military. Since then, the cost of GNSS have been gradually reducing and they are being used more frequently. Continuously operating reference networks have been established so that a central provider (often the government) provides the known base station information country-wide and companies or individual surveyors only need to utilise rovers to get real time survey coordinates.

The big advantage is that it is no longer a requirement to have triangulation pillars on hill tops, correct measurements for slopes or reduction to sea level, or to make lots of complex calculations to ensure that resultant coordinates are correct. It is a black box technology that provides an answer quickly.

Fourth revolution – drones

Drones are used to undertake aerial surveys of small areas quickly and with great accuracy and new LiDAR systems that generate accurate 3D images from equipment that can be mounted on a helicopter, car or drone.

High resolution satellite imagery provides aerial images that are precise enough for locating boundaries with sufficient accuracy for even high value urban areas, and can be purchased from a library of records or ordered online.

The software prints the map, including all boundary features that were visible, without much user interface and employs automated recognition software that can recognise boundaries, buildings and many other features.

Figure 4: Revolutions in surveying methodologies

Author insight

It should be noted that photogrammetric methods are not always the best answer. In the Caribbean in the late 1960s through to the mid-1980s, major programmes for systematic registration primarily used compasses and tape measures to measure properties (as in Turks and Caicos, British Virgin Isles, Anguilla, Antigua, St. Lucia, Cayman Isles.) The vegetation is so thick in these tropical countries that images from the air do not help. When I visited St. Lucia in 1991, they described how they had prepared their index maps from compass and tape measurements without destroying the banana groves that covered the countryside. They had differentiated on their index maps between boundaries that they were sure about because owners had been present and the 'provisional' boundaries produced when the owners could not be present and they had to estimate where they thought the boundary was located. The provisional boundaries were drawn using a dashed line. Once a new survey was completed, they would just erase the dashed line and replace it with a solid line. They had no problems with the boundaries produced in this way.

5.3.2 Why licensed surveyors are needed

Licensed surveyors can oversee a larger number of assistants who do the measuring, however, the licensed surveyor still has some very important roles:

- The property descriptions in deeds and cadastral maps could have been prepared using any of the methods referred to above at various times in history, and it is important to appreciate the origin of the surveys so that decisions about where the boundaries are, or should be, can be made by understanding the context.
- New surveys will often abut, and maybe overlap, with old surveys. It is very common that the original deed or title was issued many years ago and subdivisions have been made since then. Tracing the history of title and the subdivisions and whether current usage fits with older documentation may create issues that need to be solved through agreement and following legislation. Principles of mediation may be required and there are set ways of creating new agreements about boundary locations between parties. The licensed surveyor would normally have to pass examinations showing their understanding of land laws and to have been apprenticed to a licensed surveyor for a couple of years, therefore, they should know how to deal with disputing neighbours. Land is a very valuable asset and mistakes can be very costly to correct.
- The modern licensed surveyor is often also required to ensure that properties conform to town planning legislation and planning layouts, and to deal with other professionals, such as engineers, putting in roads (that have to meet road reserve criteria) or pipelines, understand the wayleaves for utilities, easements (such as servitudes) and licenses that are relevant, and then to ensure that the boundaries and records reflect all these things.
- The licensed land surveyor understands 'errors' and where they come from. There are always errors in survey work. There can be gross errors (mistakes), random errors (small errors from normal survey work and equipment used that may be positive or negative and effectively cancel each other out over the survey work period) and systematic errors (errors, usually in the equipment). A very simple example of a systematic error is if a tape measure has been distorted through long usage and has stretched. Then every measurement would be recorded as too short. Surveys can never be perfect and systematic errors always exist because of something in the equipment or surroundings.

- There have been many new innovations in surveying methods over the years – but they often have limitations. Licensed surveyors should know what these limitations are. For example, when GPS equipment began to be used some 20 years ago, I came across people using handheld GPS to record boundaries, when this equipment could only record a point to 20 meters. However, they were using it for boundaries that were only ten metres wide and did not know that this was not appropriate. Google Maps and other satellite-based imagery is very useful for recording boundaries, but it must be recognised that some do not rectify for errors from slope or sea level, unless specific additional corrections (or rectification) is applied. If the satellite image has large value spatial resolution then accuracy may not be sufficient, but the expert needs to know this. (Spatial resolution refers to the size of the smallest feature that can be detected by a satellite sensor or displayed on a satellite image. It is usually presented as a single value representing the length of one side of a square. The 0.3 metre resolution of Worldview 4 images may be usable in locations where the 5 metre resolution in the older SPOT or RAPIDEYE satellite images are not.) There is nothing wrong with using any form of technology or the use of approximate boundaries, but it is important to know what you get as a result and what reliance you can place on the result.
- Licensed surveyors must have integrity and they can often identify when something irregular has occurred. They can be held accountable and disciplined for fraud or falsification of documents.

Licensed surveyors are effectively now managers rather than measurers. Apart from ensuring that cadastral survey work meets the legal and functional requirements, they are increasingly involved in wider discussions. This is especially true as countries develop their spatial data infrastructure and integrate the information and services provided by other agencies. For example, if aerial photography is being flown for a systematic registration of title programme, then the ministry of agriculture or water department or disaster risk management unit should be included in discussions as the specifications are developed, so that the funds expended can be shared and provide greater benefit. Town planners and local government authorities would be other key users. Also, there can be implications for methods used during systematic registration. For example, in Kenya the idea of planting hedges and taking aerial photographs of the landscape was good from a surveying perspective, but there was a lot of criticism about how it changed the landscape and reduced the farmland available and also the flexibility of land use that had previously been possible. In the central region of Malawi they used dambo edges as boundaries (a dambo is a wide valley comprised of wetlands that often flooded during the rain season), but the location of the edge of a dambo could be indistinct on the ground by tens of metres. In more recent times this land has become very valuable for market gardening and grazing and that has created tensions between the community and the owners of the adjoining land. The surveyor needs to take these issues into account too – looking to the future as well as the social and practical implications of the work they do.

5.4 Key summary

Boundary surveys are just one task in support of a person's need to ensure that their legal rights in a registration system are protected. The survey is not an end in itself, it is required for a specific purpose in support of a legal need - or sometimes the need for a taxation or a planning programme. The survey must be fit for the purpose of the task it is supporting, taking into account the costs, time and funding available. Systematic mass registration programmes

organised by governments covering millions of properties will require different methods and approaches than individual boundary surveys or surveys for land development projects requested by a private client.

Boundary surveys themselves can be simply and easily performed using 21st century technology, and while less experienced staff members can complete the measurements, the licensed surveyor can focus on the professional needs to understand the history and reliability of measurements associated with properties previously surveyed. It also remains a task of the surveyor to understand legal documentation, requirements of associated laws relating to registration of property rights, planning or other requirements for infrastructure and the link with other professions. Where projects involve implementation of major reforms for societal benefit (as described in this insight paper) the licensed surveyor is likely to continue to play a leading role.

6 IT systems for cadastre and property registration

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The views expressed in this publication are those of the author(s) and do not necessarily reflect the views or policies of the Food and Agriculture Organization of the United Nations.

6.1 Introduction

It is often challenging to implement an information technology (IT) system for property registration and cadastre. The World Bank investments in IT for property registration and cadastre in their Europe and Central Asia region exceeded US\$900 million over the past 20–25 years (56% of the overall investments in land projects in that period – US\$1.6 billion). Innovative technology contributes to better governance of land tenure through improved services from efficiency, effectiveness and transparency, and supports the decision-making process in response to natural disasters, including the COVID-19 pandemic, limiting opportunities for corruption, improved accountability, accessibility, equity and cost perspective, making those services more affordable for all.

Nowadays, the available technology can generate huge amounts of data in a short period of time, which previously would have taken a year or longer. Computing capacity and cloud technology are increasing, connectivity is improving. However, establishing a well-functioning IT system has never been an easy and straightforward process. This section provides considerations for planning a new IT system, design, development and implementation, and issues related to sustainability and the use of emerging technology.

6.2 Initial considerations

6.2.1 The IT system is just a tool

If the processes are complicated, the IT system will not simplify them automatically, unless the legal framework is changed to introduce simplified procedures and allow access to data and e-services, using the advantages of the automation. If the data are poor, missing or inaccurate then the system development does not fix that unless specific additional interventions are made to correct and improve the data quality. If corruption is a problem and the office staff do not want to deal with that then they will find ways to retain their bad practices. There may consequently continue to be backlogs, long waiting time at the offices, unclear rules, mistakes in data, etc.

6.2.2 Political will is critical

A champion is needed at a high-level. Leadership, management skills and capacity follow on from that.

See more on the role of a 'champion' in section 3.

Author insight

I was visiting one of the cadastre offices in Belgrade, Serbia at the end of 2018 and I talked to a customer, who was waiting to register a mortgage. This was her fourth visit to register the mortgage and she blamed the office for corruption. The head of the office, who was next to me explained that this was the official procedure. Changes occurred soon after that and in early 2019 the notaries had been authorised to register mortgages online after a new law was passed, the operational procedures were changed, the IT system was modified, the staff at the registration offices got digital signatures – end-to-end digital mortgage registration!

The Federal Service for State Registration, Cadastre and Cartography of the Russian Federation (Rosreestr) is the largest property registration and cadastral authority in the world. One of their first big achievements was to start accepting applications for the issuing of extracts (copies of property registration and cadastre certificates) by any office for the entire territory of Russia or online. Rosreestr introduced a Trust Line for direct reporting on corruption and other irregular cases and a Single Help Line (Call toll-free within Russia) for legal advice offering a 24/7 help desk, covering nine time zones.

6.2.3 Corruption and IT systems

As mentioned in the previous sections, land is the third most corrupt sector globally (see **Working Paper 04/2011 Corruption in the Land Sector**). The IT systems increase transparency and that often negatively affects the interests of powerful people. This transparency could be achieved by putting data online or through the workflow, which gives detail at any step in the process where the documentation is and for how long it is kept at that step, or to provide information about some other blockage that may have occurred.

Author insight

In one of the Eastern European countries, the IT system was successfully implemented after several unsuccessful attempts to do so. Soon after the launch of the online access to information, a severe, negative media campaign started against the agency and the IT system. A high-level person was behind the scenes attempting to sabotage the new IT system.

6.2.4 One size will not fit all

The IT systems for property registration and cadastre differ from country to country, because of differences in the legal framework, institutional arrangements, policies, locally suitable technologies, local capacity, data structures and culture. Each country has its own challenges and priorities. Most of the countries in the world have digital records, maintained by IT systems with varying levels of complexity, different data structures and different technical platforms. It is not an exception to find that there are several IT systems with different data structures in use in the same country. In some cases, where only one IT system is in use, different offices are using the system in different ways or are using different versions.

6.2.5 Why do system implementations often fail?

There are few limits to what technology can achieve today. If the system design follows good international practices and standards, the technical platform can be changed and migrated with limited cost and time.

There are various reasons for IT systems failure, such as poor communication, unclear requirements or often changes of the requirements, unrealistic expectations, poor project and contract management, lack of senior management support and several others. Consider that the implementation of an IT system for property registration and cadastre is increasing transparency, which can affect the interests of powerful groups who have been benefitting from the way that the old systems are working. Personal experience in implementing complex IT systems for property registration and cadastre over many years has shown that an incremental approach worked better than implementing huge IT systems in one single contract. Another serious issue frequently faced is the limited institutional capacity to manage complex IT systems development, and then manage their implementation and maintenance.

6.2.6 Big does not mean better

Experience has shown that systems that are developed internally or through local contractors are more successful than major contracts from big international suppliers. However, the sustainability of the system must be considered before starting the development. Sufficient local capacity to manage the software development and to continue the ongoing development, modify systems as demand changes and to be affordable to maintain the software are all key considerations. If the system is developed in a modular approach, then each module can be implemented once it has been fully tested and piloted.

6.2.7 IT project management

IT project management has been problematic in most of the countries where I have been working. Most of the managers, and even the staff assigned to manage the software development, did not have a good understanding of even one project management methodology. The IT experts often speak a technical language, which managers do not understand, and the managers will either ignore them or blindly trust them, which is wrong in both cases. A project management methodology should be established and a clear management structure, including independent quality assurance and quality control.

If the design and development of an IT system looks too abstract, think about the steps in building a new house, as there are lots of similarities between the steps in building a house and building an IT system (see Table 1).

Building a house	Building an IT system
Step 1: Preparation <ul style="list-style-type: none"> – conceptual design – detailed design, bill of quantities 	Step 1: Preparation <ul style="list-style-type: none"> – analyses/conceptual design – detailed TS, cost/time estimation
Step 2: Tendering/contracting	Step 2: Tendering/contracting
Step 3: Construction and supervision	Step 3: Design/development/implementation and supervision
Step 4: Final acceptance	Step 4: Final acceptance
Step 5: Warranty and maintenance	Step 5: Warranty and maintenance

Table 1: Similarities between building a house and building an IT system

6.3 Important systems/subsystems and modules

6.3.1 Data model

The data model is as important as the foundation of a house. Once there is a general scope of the system, the design of the data model can begin. As the **ISO 19152:2012 Geographic information – Land Administration Domain Model** (LADM) was published in 2012, most probably the existing digital data are not in line with this standard. A senior expert with experience in LADM will be required to assess the existing data models and design a new one to cover the scope of the IT system. A local expert will also be needed to work with the senior expert to test the new data model in order to make sure that the existing digital data can be migrated into the new one. This will require some modifications of the new data model. Therefore, testing the data model with the migrated old data is important. Once the new data model is developed and tested, the old IT systems can be upgraded to the new data model and plan the design of the new modules and systems.

6.3.2 Document management system (DMS)

Start with the simplest modules, for example, a DMS using off-the-shelf products, including open source (there are many available). That will allow there to be a central database of all applications and all decisions made. This was successfully implemented in Serbia as an intermediate solution, starting with a web based centralised DMS for all incoming applications and issued decisions, interoperable with the old systems, used for the back-office operations. If it happens that not all offices have internet access, the smaller offices can operate as front offices, taking and giving analogue documents from/to the clients and sending the analogue documents to a larger office or send scanned documents, using different technology. This was successfully introduced in Russia, long before the unified IT system was implemented.

6.3.3 Module for notaries and other legal professionals

Notaries and other legal professionals are key users of the IT system and the development of a simple module for submission of digital requests for information and submission of applications in digital format should be considered as a priority. It could initially cover the simplest processes, which will lead to fewer visits to the offices and faster and better service provision. In Albania, the notary module was designed jointly by the chamber of notaries and the property registration agency and the software developed by an IT expert in a very short time. The data submitted in digital form by notaries and legal professionals are usually of good quality; the applications can go directly to the back office for approval.

6.3.4 Module for surveyors

Surveyors are key users of the IT system and the development of a module for surveyors to submit the cadastre records in standard digital format should be considered as one of the priority modules. Surveyors usually prepare their cadastral records in digital form, but submit all information in analogue form, or sometimes in both analogue and digital form, but not in a standard structured format.

Author insight

In Ukraine, the time for processing an application for registration of a new parcel went down from an average of a month and a half to 21 minutes. It is not always necessary to change the law to make the submission of digital reports and plans obligatory. It is a question of training surveyors.

In Croatia, the submission of digital reports and plans online was introduced in January 2019. In the following March, 52% of all cadastral reports and plans nationwide were submitted online and by September digital submission had reached 62%.

6.3.5 E-government

E-services can be offered long before the system is ready. For example, it can be agreed with the notaries and legal professionals to send the requests for extracts electronically or a simple e-service can be developed for digital extracts for information (not digitally signed, if this is not possible). Payment can be agreed on a monthly basis or by opening a bank account, where clients can deposit money as credit for future use of services. If an e-government portal/e-gateway exists, the authentication, payment and interoperability can be used with other systems, if available. It is always good to coordinate the IT system design and development with the office in charge of e-government.

6.3.6 Interoperability with key registers and systems

This is very important for data quality, office efficiency and service delivery. Mistakes are always possible the addresses and names of citizens or businesses are typed manually. If there are existing digital registers, plan interoperability with the property register and use their structure in the data model, especially the Civil Register, Business Register and Address Register. The property registration and cadastre system should be interoperable with the e-government portal and the National Spatial Data Infrastructure Geoportal, if it exists. The data from the property registration and cadastre systems are needed by many government and municipal

authorities, courts and others and, therefore, it is important to set up a standard for property registration and cadastre, based on the international standards, including **ISO 19152:2012: Geographic information – Land Administration Domain Model** (LADM).

6.3.7 Cybersecurity

The e-government agency is usually responsible for ensuring the cybersecurity of the network and the e-government data centres, and for setting up the government standards for cybersecurity. There is a need for development and implementation of a cybersecurity strategy/policy and action plan, covering: people, processes and technologies. The monitoring of the implementation of the cybersecurity action plan is very important, as well as the regular update of the cybersecurity strategy, as the technology is developing so fast; new viruses and cyber-attacks can be detected every day, not forgetting people and companies who have access to the systems and data.

6.3.8 Gender identity and age disaggregated data

The IT systems for property registration should provide gender identity and age disaggregated reports per cadastral zone and nationwide. The best way is to link the property register with the Civil Register of individuals (if available in digital form) from where gender identity and age information could be obtained, and disaggregated reports produced. In cases where the Civil Register is not digitally available or cannot be linked to the property register, the easiest way is to introduce into the database a gender identity field and add this information at the time of the application submission. This contributes to measure gender equality in land ownership. There are related indicators in the United Nations' Sustainable Development Goals (SDGs) (see SDGs 5.a.1, SDGs 5.a.2 and SDGs 1.4.2.).

6.3.9 Digital archives and data conversion

Usually the responsible agency will already have some digital archives when new systems are being developed. It is easy to start, but it is not easy to make it work and keep and then maintain it in the long-term. Priorities must be established – which documents should be kept in the digital archive and for how long, from which offices to start, how many years back should the old archive be digitised. Then decide whether the digitisation is organised in-house or outsourced? Digitising of incoming documents should be one of the first things to plan in order to have a cut-off date and stop the paper archive growing.

Author insight

Digitising archive documents is an opportunity to do some more data entry. For example, the object identification, the right-holders names, etc. can be added.

In Ukraine, for example, more than 16 million land certificates were scanned using OCR (optical character recognition or optical character reader (OCR) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document or a photo of a document). Scanning, data entry and data validation was completed in five months, working in shifts and involving students for the scanning.

Consider the digital standards, including metadata, the size of the files and the digital file format, in order to ensure easy access to the huge digital archive in the future and to ensure

that the digital records will still be readable in the long term with the changes of technology. Use PDF/A format (**ISO 19005-1:2005**), which identifies a 'profile' for electronic documents that ensures the documents can be reproduced exactly the same way using various software solutions in years to come. If digital signatures are being used, then it is good practice to digitally sign the documents going to the archive to guarantee that it is the same as the original. Blockchain can also bring value here, for example, for storing the hashes of the documents to identify any unauthorised changes to the original documents (hashing is the process of taking an input of any length and turning it into a cryptographic fixed output through a mathematical algorithm). The digital archive system should be interoperable with the property registration and cadastre system and provide access to digital archive via e-services.

6.3.10 Software products for field data collection, systematic registration and customary rights

Systematic registration has its own workflow and business processes. It can be developed as a separate module of the property registration and cadastre IT system or a separate IT system, but it is recommended that both IT systems are interoperable and have the same core data model. There are several software products that can be used by communities for digitising the community rights, supported by different organisations: **OpenTenure**, supported by UN FAO; **Cadasta**, supported by DFID (UK Department for International Development); **MAST** (Mobile Applications to Secure Tenure), supported by USAID; **STDM** (Social Tenure Domain Model), supported by UN HABITAT; and **ODK**, (Open Data Kit), supported by the University of Washington.

6.4 New technology

Technology is always evolving. The IT systems should follow the latest trends in data capture, for example, they should support the use of data captured with drones and VHR satellite imagery (the imagery is captured from different angles and data processing is needed), 3D imagery and LiDAR data. One evolving technology in recent years is blockchain. There are several countries that are using or testing blockchain technology for property registration and cadastre, with different levels of complexity, and trying to resolve different issues, such as cybersecurity and corruption. In all cases, this is complementary to the classical IT systems and not replacing the existing IT systems. For example, in the Russian Federation, blockchain technology is used for registering new land plots in the Far East. Those are new land parcels and they are recorded through blockchain at the time of the first registration.

It is important to consider the main challenges that should be dealt with and what is the most suitable technology, what is affordable and what are the major risks? The sustainability of the IT system should be considered, including the financial resources needed to maintain the system and the local capacity. Public Private Partnership has to be considered as an option, as the private sector is normally much faster at responding to demands and has the necessary flexibility to test and use new technologies. Also, what is the level of cybersecurity?

6.5 Key summary

The implementation of a property registration and cadastre IT system often fails in terms of delivering in the defined time and scope or does not provide the benefits. IT is just a tool –

people are trying to replace one technology with another or trying to automate the manual processes, assuming that it will be easier, quicker or simpler than it really is. Hard as it may be to go through the specific necessary stages of implementation and to ensure that the right people with the key skills are involved. The high-level champion, the business and IT experts, and an independent quality assurance and control team are essential for success. Data digitisation and data quality are issues that have to be dealt with in parallel with the IT system development. System interoperability with other key registers has to be planned from the beginning and international and national standards should be considered, such as LADM.

Even if the system is implemented successfully, there will be further difficulties, such as how to keep the system running after the project is closed. System sustainability is an issue and has to be planned from the beginning covering the network, hardware, licences, capacity development, help desk support, system maintenance and further development. What could the role of the private sector be here? Private Public Partnerships can be useful, but there have been cases where it creates more problems than benefits.

7 Land information services (LIS)

7.1 Context of land information services

Land administration agencies have traditionally been at the heart of initiatives to facilitate comprehensive land information services (LIS) that provide interoperable information about land and the marine environment to support an integrated approach to land management and ensure the sustainability of land and marine environment within a country. This drives evidence-based policies and decision making and provides knowledge and insights and not just data. LIS have a key role in delivering good land governance and sustainable development.

Land governance is about the policies, processes and institutions by which land, property and natural resources are managed. The organisational structures for land governance and administration differ widely between countries and regions and reflect the cultural and judicial setting of the country and jurisdiction. Within this country context, the land governance activities may be described by three components: land policies, land information infrastructures and land administration functions, in support of sustainable development as shown in Figure 5.

The Land Management Paradigm

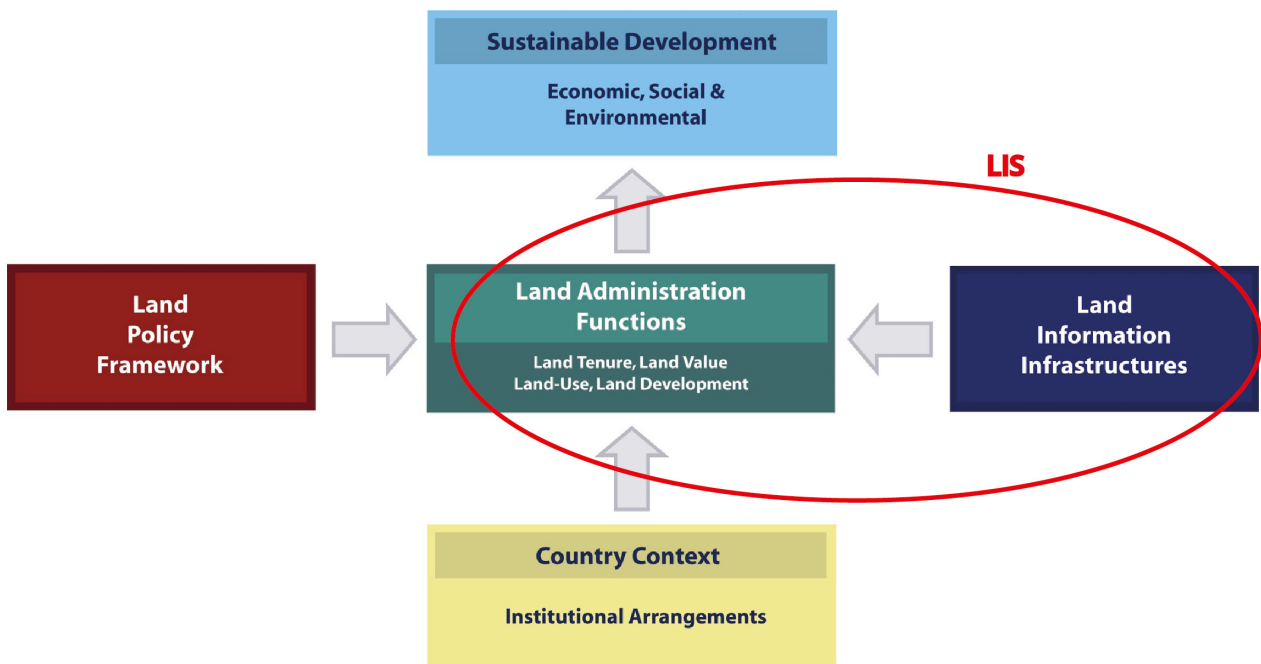


Figure 5: Land Governance and Administration (Enemark, 2004, Williamson et al. 2010)

Sound land governance requires a legal and regulatory framework, operational processes and capacity to implement policies consistently within a jurisdiction or country in sustainable

ways. In this regard, land administration systems and associated LIS provide a country with an infrastructure for implementing land policies and land management strategies in support of sustainable development.

These functions interact to deliver overall policy objectives, and they are fundamentally facilitated by access to the appropriate land related data and services. LIS require access to a comprehensive land information infrastructure on the built and natural environment that are integral parts of a National Spatial Data Infrastructure (NSDI).

This section focuses on experiences in designing and implementing LIS and the underlying land information infrastructure. LIS are complex and particularly difficult to implement due to the wide range of interoperable land information required, and the diverse set of stakeholders involved in creating and managing the land information. Many LIS initiatives have failed by being too ambitious in the early implementation phases, not adopting a sustainable business model and not having sufficient political support to mandate data standards and to build effective partnerships across the public and private sectors.

7.2 LIS origins

- In 1977 the city of Basel in Switzerland had a vision of a digital mapping IT system to manage their cadastral and land registration data and to link it to their mainframe computer managing their valuation data. A Scottish company, Ferranti-Cetec Ltd, won the contract and delivered the world's first LIS.
- In 1979 Prof. Peter Dale published an article in the *Survey Review* on *A Systems View of the Cadastre* linking the ownership, value and use of land to conditions within the physical, economic and social environment. The article was considered the trigger for all further work on land information.
- Dr John McLaughlin of the University of New Brunswick developed the Multi-Purpose Cadastre concept as part of his 1975 PhD thesis at the University of Wisconsin and this led to a seminal FIG Commission III International Symposium on 'The Decision Maker and Land Information Systems' being held in Edmonton, Canada in 1984.
- Peter Dale and John McLaughlin subsequently published *Land Information Management* in 1988.
- John McLaughlin presented 'Towards a National Spatial Data Infrastructure (NSDI)' at a conference in Ottawa in 1991. This triggered the LIS era with early implementations in Australia and Canada providing the foundations for many subsequent National LIS worldwide.
- In 2018 the United Nations – Global Geographic Information Management (UN-GGIM) endorsed an overarching strategic framework called an 'Integrated Geospatial Information Framework' (IGIF). The IGIF is anchored by nine strategic pathways within three main areas of influence: governance; technology; and people (see Figure 9.2 of the Framework). These nine strategic pathways seek to maximise the innovative and integral nature of geospatial information by making it available and accessible to governments, communities, businesses, academia, and civil societies.

- The UN-GGIM working group on land administration developed a framework for effective land administration and builds on the SDGs, voluntary guidelines on tenure and the IGIF. This was endorsed by UN-GGIM in 2020.

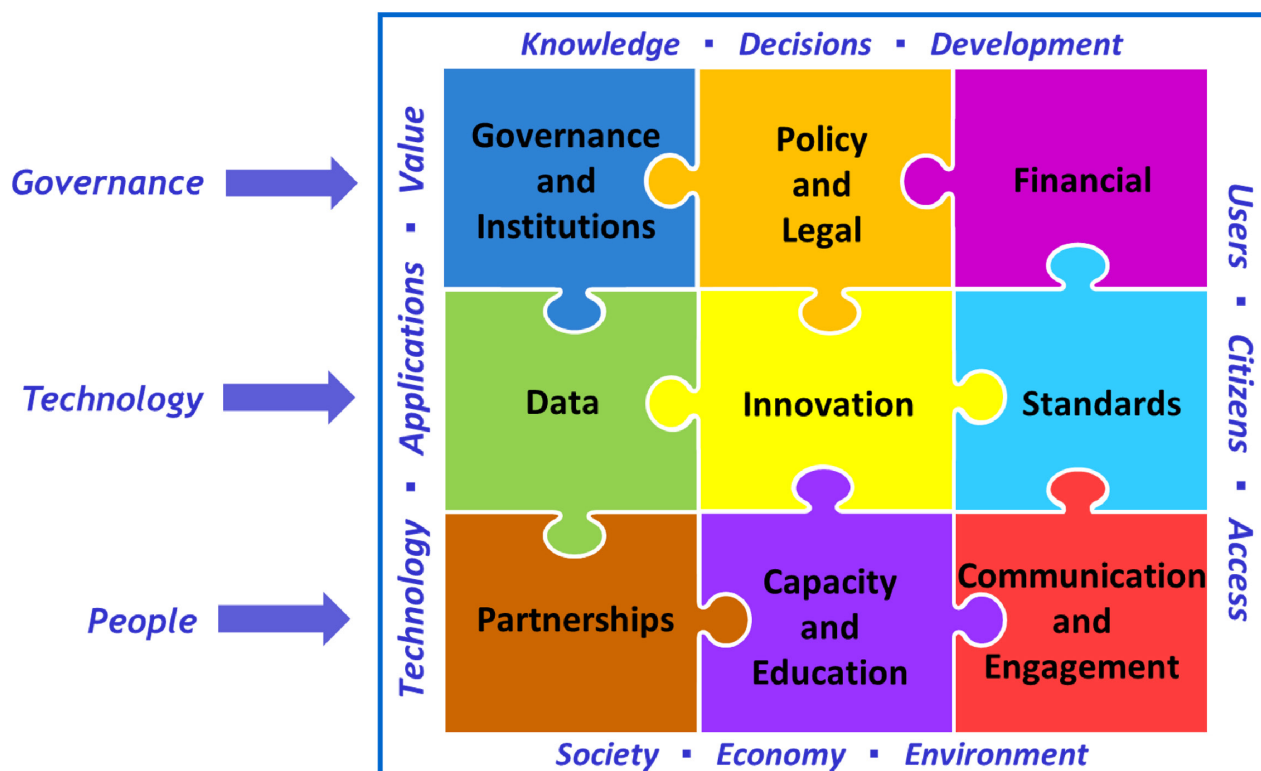


Figure 6: Integrated Geospatial Information Framework (UN-GGIM, 2018)

7.3 LIS drivers

There are two approaches that have been adopted in developing LIS. The most common creates land/geospatial data and hopes that the data will be used by the public and private sectors and information services will emerge. The subsequent development of information services is ad hoc and not always successful. The alternative approach is to drive the development of the data and services within the LIS to support priorities for government land policies and market needs. This more focused approach generates greater political support and funding, raises the profile of the LIS initiative, is not too ambitious and is generally more successful and sustainable. Selling the LIS concept within a country requires politicians and senior decision makers to be convinced of the benefits of the investment.

7.4 Experiences in implementing LIS

7.4.1 LIS governance arrangements

Strong and high-level governance of LIS programmes is key to success. As in project management methodologies, LIS programmes need a programme board, i.e. a National LIS Advisory Committee. The mandate of a National LIS Advisory Committee is to oversee the creation and maintenance of a comprehensive and sustainable LIS. The committee's purpose will be to ensure that the LIS supports the needs of the country through coordinated and

collaborative planning, sustainable business model and funding, sharing of resources and information, and endorsement and promotion from the work plans of key institutions. The committee should include representatives from key public sector agencies, the private sector, the academic sector and civil society. It is recommended that these high-level committees are limited to less than ten stakeholders and representatives should be senior with responsibilities for finance and resources within their organisations.

7.4.2 LIS fuel – unlocking data to improve public policy

A key success factor in implementing an LIS is ensuring that the underlying data are fit-for-purpose, findable, accessible, interoperable (comply with agreed national standards), reusable and maintained. Only then can innovative land information services be built from a diverse set of land/geospatial data. Too often projects fail or are seriously delayed due to inadequate data or insufficient budgets to support data improvement programmes. In many projects, most of the LIS budget relates to investments in data. The financial model underlying the LIS initiatives must integrate the on-going costs of maintaining the data. Without this essential revenue for data maintenance, the currency of the data quickly erodes, and the value of the LIS rapidly diminishes as users' confidence in the LIS is lost.

It is important to expose the data to the users of LIS as soon as possible so that feedback can be harnessed to continually improve the quality of that data. Under the perfection mentality, often embraced by the surveying community, data have to be 'perfect' before they can be exposed for use; this increases the costs and delays the launch of new services. Wherever possible, the fit-for-purpose approach to data should be adopted where a minimum viable product is initially introduced to the market and then improved over time, when there is market demand. An innovative way of improving the quality of data to be considered is through crowdsourcing with citizens. During the World Bank-funded land administration programme in Ukraine, 16.8 million ownership documents (35 million pages) were scanned, indexed, data entered, verified through crowdsourcing and uploaded to a secure database environment in just five months.

High resolution satellite imagery is becoming pervasive and is opening opportunities for new approaches to capturing and maintaining land parcel data. The combination of using AI-based algorithms with satellite imagery is supporting the automatic extraction of parcel boundaries. Although in its infancy, the approach is proving successful and will hopefully accelerate the completion of security of tenure for those presently excluded.

7.4.3 Sharing data

One of the basic premises of LIS is that land/geospatial data custodians will make their data interoperable, through the adoption of agreed standards, and share their data. However, this depends on trust among the LIS stakeholders and the adoption of a culture of sharing. This is not always guaranteed despite the appropriate legal frameworks and decrees.

7.4.4 Key registers underlying LIS

Several countries, including Denmark, the Netherlands, Lithuania and New Zealand, have initiated and driven their LIS initiatives through the creation of what are termed 'key registers'. These interoperable registers include information about individuals, businesses, real properties, buildings and addresses, for example, and underpin a wide range of public services and business applications. The vision is that these data are to be the high-quality, common

foundation for public sector administration, efficiently updated at one place and used by everyone – including the private sector. Open data will benefit public sector efficiency as well as innovation and value creation by society in general. With basic data as a new digital raw material, commercial products can be developed, and public information and services can be improved, providing for greater insight and stronger democracy.

An example of this implementation model in supporting key registers is in Denmark (see the summary paper **Delivering a digital foundation for growth in Denmark**), where revenues for society are expected to be approximately US\$94 million annually and private sector revenues will be up to US\$58 million annually in the real estate, insurance, financial, and telecom sectors, for example.

7.4.5 Building partnerships

Collaborative efforts are essential for the success of any LIS initiative, and particularly so when the voluntary model, as opposed to the mandated model imposed by governments, is adopted. Cooperation and partnerships across different levels of the public sector and with the private sector are an important means at every stage of development for collecting, building, sharing, and maintaining geospatial information.

Sources of land information are increasingly being produced and integrated by the private sector. For example, **Rightmove** in the UK supports users to easily find the areas that match their budget and needs. However, LIS are still perceived by many countries to be solely within the public sector's domain. There is often a reluctance to open public sector data to private sector partners through appropriate legal frameworks and partnership agreements to develop a diverse range of services for citizens and businesses. Countries are encouraged to adopt an open market arrangement to develop LIS.

7.4.6 Think beyond data to services and insights

Too often countries believe that making land information discoverable and accessible is the end of their journey in delivering LIS. Designers of LIS should support the concept of applications/ services that lead customers (citizens and professionals) through a business process and provide them with answers rather than expecting them to perform the analyses themselves using geospatial data. An example is an **application to assess the potential of installing solar panels on buildings** developed jointly by the Swiss Federal Office of Energy (SFOE), Federal Office of Meteorology and Climatology (MeteoSwiss), Federal Office of Topography (swisstopo). The user is unaware that the application makes extensive use of geospatial information, including Digital Elevation Models and 3D buildings data. It is the answer that the user is interested in. This is the real value-add of LIS.

Data driven innovation through data science is accelerating the extraction of knowledge and insights from geospatial data. A good example is the **Geovation** initiative in the UK, where accelerator programmes, community events and hands-on development resources help guide start-ups from initial vision to sustainable growth.

7.4.7 ICT infrastructure

LIS depend on ICT infrastructure to provide an efficient, highly distributed network of information systems that are interoperable to access services – a services-oriented architecture.

This ICT infrastructure is normally part of a common government wide infrastructure to support digital transformation. Representatives of the LIS programme need to be represented on these government ICT infrastructure committees to ensure LIS specifications are being designed into the common infrastructure.

7.4.8 Financing LIS

There is a range of approaches to financing, primarily influenced by fiscal policy, other policy frameworks and regulations imposed by governments, institutional arrangements and relationships, and the maturity of the geospatial information markets and associated suppliers of products and services. Financing options include:

- At one extreme, some countries require full cost recovery associated with operating the LIS. This will require a government department/agency to obtain revenue raised from license fees for access to geospatial products and services by the public and private sectors.
- The costs of implementing and operating the LIS is sometimes shared across public sector geospatial providers and user stakeholders. An example of this is the **shared financial model that operates in Norway**.
- At the other end of the spectrum, some governments are adopting open government policies and improving access to public sector geospatial information. Under this open data policy, governments will centrally fund LIS and support data free for re-use since the resulting products and services support wider economic benefits to justify the approach.

Countries, therefore, have a wide variety of good practices in business models and financing arrangements to choose from across the world. However, the adopted model must be compatible with the government's fiscal and funding capabilities, not limit the wider use of geospatial data in government or by the private sector by high costs, and be truly sustainable.

7.4.9 The value proposition

LIS can play an important role in improving productivity, supporting sustainable development and mitigating and managing the impact of natural disasters in both developed and developing countries. A key challenge for policy makers and programme managers has been in evaluating the net benefits of policy change or investment in these solutions.

There are many methodologies for evaluating the economic impact of policy change and/or investment in the field of geospatial information, but no single best practice solution has yet been identified. Cost-benefit analysis (and its variants) will continue to be essential for project-scale investments because it is widely understood and so offers a mechanism for comparison of heterogeneous investment choices. The Strategic Pathway 3 Finance in the *IGIF Implementation Guide* provides a description of the steps typically conducted to perform a socio-economic analysis to justify investments in LIS.

7.4.10 Determine current state of key stakeholders

Before embarking on the transition to an LIS, it is essential that the stakeholders' organisations are baselined to establish their current land/geospatial data and information services maturity and capabilities. This will allow a clear action plan to be created that will support the transition.

The World Bank Group (WBG) land/geospatial team, working with the Food and Agriculture Organization of the United Nations (FAO) has created a Spatial Data Infrastructure (SDI)

Diagnostic Tool (see Appendix A) package to facilitate a standard measure and approach to assessing a country's SDI readiness and geospatial-maturity, initially at national level.

7.4.11 Capacity development

Effective capacity development is fundamental to the success of LIS. Society must understand, through well-targeted communication campaigns, that these information services are secure, can be trusted and can deliver significant benefits. Formal organisations, such as government agencies, private sector and community-based organisations, need to ensure awareness and up-to-date skills of their members and staff. The largest change will be focused on the public sector where this may involve some institutional and organisational reforms. Governments need to implement capacity development measures across their land institutions.

7.5 Key summary

The development of an LIS must be driven by user needs and the most effective way is to drive the development of the data and services within the LIS to support priorities for government land policies and market demand. This focused approach generates greater political support and funding, raises the profile of the LIS initiative, is not too ambitious and is generally more successful and sustainable.

A key success factor in implementing an LIS is ensuring that the underlying data are fit-for-purpose, findable, accessible, interoperable (comply with agreed national standards), reusable, affordable (open data, where possible) and maintained. Only then can innovative land information services be built from a diverse set of land/geospatial data. Too often projects fail or are seriously delayed due to inadequate data or insufficient budgets to support data improvement and maintenance programmes.

Several countries have initiated and driven their LIS initiatives through the creation of what are termed 'key registers'. These interoperable registers include information about individuals, businesses, real properties, buildings and addresses, for example, and underpin a wide range of public services and business applications. These have been very successful and delivered significant benefits.

Designers of LIS should support the concept of applications/services that lead customers (citizens and professionals) through a business process and provide them with answers and insights rather than expecting them to perform the analyses themselves using geospatial data.

Selling the LIS concept within a country requires politicians and senior decision makers to be convinced of the benefits of the investment. However, land professionals normally use a very technical professional language that is quite different from political speak. Therefore, it is recommended that economists form part of the LIS team to conduct robust socio-economic analyses, create strong value propositions and use the appropriate language to convince decision makers.

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