Modernizing Land Administration Systems to Support Sustainable Development Goals - Case Study of Victoria, Australia

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This chapter discusses the concepts of both land administration system (LAS) and sustainable development goals (SDGs) as well as some previous works that have linked these two concepts together. It then recommends the requirements of a LAS that can support SDGs. As a case study, the LAS modernization journey in the State of Victoria, Australia to support SDGs is reviewed next. Finally, the chapter concludes with some recommendations for future enhancements of the Victorian LAS.

21.1 Land Administration Systems

To achieve sustainable development goals (SDGs), countries require access to an effective, efficient and modern land administration system (LAS) based on a cadastre engine that contains spatially accurate land parcels and corresponding rights, restrictions and responsibilities (RRRs).

LAS is a simple tool for managing natural resources, environmental monitoring and protection, disaster management, physical and economic planning [8]. In order to support a land market, LAS is a must for all nation states to support and protect ownership rights. This requires having proper data sets prepared by surveyors to support trading land in the market and having a system to provide access to the ownership information. For many countries,

cadastre is the engine of land administration which provides integrity and security to land market.

Cadastre also provides a base map for various other purposes such as utility services, urban planning, and disaster management which facilitates spatial enablement government and the wider society [18].

Many developed countries use land parcel layer as a main component of Digital Cadastre Database (DCDB) and attach required attributes to this layer for managing cadastral information. This layer requires a survey network as a base for maintaining the integrity and accuracy. In addition, a proper process is also necessary to keep this important data set updated. This adds value to DCDB by adding other layers and connecting the processes to it. However, while the concept of cadastre is simple, implementation of that is very complex and changing an established cadastre takes long as it has lots of connections to various business processes and regulations.

Some initiatives started to highlight the role of cadastre and proposed some changes to make it compatible with the current and future needs of land administration. For example, Cadastre 2014 proposed by FIG provided a vision for future cadastre [17] and the United Nations-FIG Bathurst Declaration on Land Administration for Sustainable Development is another example of required changes in the cadastre [3]. In addition, the Intergovernmental Committee on Surveying and Mapping (ICSM) in Australia has developed Cadastre 2034 Strategy and proposed the future cadastre in Australia [7]. Based on Goal 1 of the Cadastre 2034 Strategy, the cadastral system should sustainably manage land ownership. This keeps the integrity and societal benefits of the cadastral systems.

The following section briefly introduces the SDGs developed by the United Nation (UN).

21.2 Selected LAS Works

Land administration theory requires the implementation of the land management paradigm to drive systems dealing with land rights, restrictions and responsibilities towards supporting sustainable development. The land management paradigm, where land tenure, value, use and development are considered holistically as essential and omnipresent functions performed by organized societies, is the cornerstone of modern land administration theory [19].

The land management paradigm makes a national cadastre the engine of the entire LAS, underpinning the country's capacity to deliver sustainable development (Figure 21.1). The cadaster should assist the functions of land tenure, land value, land use, and land development. In this way, within the LAS, the cadastre or cadastral system becomes the core technical engine delivering the capacity to control and manage land through the four LAS functions.

Cadastrals are regarded as the foundation for sustainable social, economic and environmental development of societies [13].

FIGURE 21.1

The cadastre as an engine of LAS - the “butterfly” diagram [19]

The relationship between 17 SDGs and LAS was also reviewed by Dawidowicz and Zrobek (2017) in Poland to build a LAS to support the SDGs [2]. They identified the key challenges that a LAS should address to support sustainable development. In Poland, the Integrated Real Estate Information System (IREIS), is being implemented based on sustainable development.

In the next section, the SDGs with direct and indirect relationship with LAS are identified and the requirements of a LAS to support SDGs are explored.

21.3 Land Administration Systems Related Requirements to Support Sustainable Development Goals

SDGs require access to LAS. However, the relationship between goals and LAS can be direct or indirect. Direct relationship means that a specific goal cannot be achieved at all without a LAS. Whereas, an indirect relationship means that a specific goal might not be efficiently achieved without a LAS. Table 21.1 shows the goals and targets that have a direct link to LAS.

The rest of SDGs and targets have an indirect link to LAS. As an example, Goal 4, “Ensure inclusive and equitable quality education and promote lifelong

TABLE 21.1

SDGs and targets that have a direct link to LAS

Goal	Target
Goal 1. End poverty in all its forms everywhere	(1.4) By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	(2.3) By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
Goal 5. Achieve gender equality and empower all women and girls	(5.a) Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws (5.b) Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	(11.1) By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums (11.3) By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries (11.6) By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management (11.7) By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities (11.a) Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

learning opportunities for all” does not have a direct link to LAS, however, it can be efficiently achieved using a modern LAS based on a spatially accurate cadastre that demonstrates the distribution of people based on their age as well as educational institutes and their information across a country.

Our study showed that countries should meet the following requirements for supporting SDGs and targets:

- **Requirement 1** - Provide equal access to ownership and control over land and property;
- **Requirement 2** - Provide secure tenure rights to land with legally recognized documentation (title, deed, etc.);
- **Requirement 3** - Develop an accurate cadastral data set (parcel fabric) as a fundamental layer; and
- **Requirement 4** - Utilize information and communications technology for modernizing LAS.

The next section provides an overview of the Victorian LAS modernization journey to meet the above-mentioned requirements for supporting SDGs.

21.4 Case Study of Victoria, Australia

Victoria is Australia's most densely populated state (highlighted in [Figure 21.2](#)) and its second-most populous state overall with population of 6,430,000 [1].

FIGURE 21.2

The location of State of Victoria in Australia

The Victorian Department of Environment, Land, Water and Planning (DELWP), through Land Use Victoria (LUV), is responsible for all land information and administration activities in Victoria including registration of land transactions, property information, surveying, valuation, geographic names, spatial services, government land and the government land monitor.

LUV is also responsible for maintaining the Victorian cadastre (VicMap Property), which is currently a 2D analogue representation of the State's property boundaries, based on property title information, and provides the foundation for Victoria's primary mapping and spatial information systems and services.

To support the SDGs, LUV has been constantly modernizing the LAS using the information and communications technology, as recommended by [9]. Figure 21.3 illustrates the Victorian LAS modernization journey. Before the 1990s, cadastral plans were all lodged in paper. VicMap Property was created in the early 1990s from the digitization of paper-based map records held by Melbourne Water (metropolitan area) and the State government (rural area). VicMap Property comprises more than 3 million land parcels and associated property attributes, such as lot and plan number, and crown description, in the State of Victoria.

Land title information was migrated from paper to the Victorian Online Title System (VOTS) in 2000. VOTS contains a record of all Victorian titles registered under the Torrens System [6]. The system is maintained by LUV and is used to accept, create and register land transaction lodgements, and to update land holdings and registered interests on title as well as create new titles.

FIGURE 21.3
LAS modernization journey in Victoria (modified after [12])

Prior to the launch of the Surveying and Planning through Electronic Applications and Referrals (SPEAR) pilot in 2004, subdivision applications could only be processed via paper. Diagram (a) in Figure 21.4 illustrates

this process. This was generally a lengthy and protracted process that was instigated by the surveyor, on behalf of their client (developer). The process and application milestones are well defined by the Planning and Environment Act 1987 [4] and Subdivision Act 1988 [5], however achieving these milestones, in a paper environment, where there are multiple stakeholders involved in the decision-making process led to delays, errors, and poor transparency between the interested parties.

Although there was a lot of scope to improve efficiencies throughout the life of the application, there was no means of implementing these changes for the benefit of all parties, due to the technology constraints of a pre ‘world wide web’ era.

FIGURE 21.4

Subdivision process before SPEAR (diagram a) vs. after SPEAR (diagram b).

SPEAR revolutionized the way subdivision applications were handled, by introducing online end-to-end processing and tracking of plan applications from their initial submission with local government, right through to registration at LUV. Diagram (b) in Figure 21.4 illustrates the subdivision process after the introduction of SPEAR. A surveyor can use SPEAR to apply for any plan-based dealing under the Subdivision Act 1988, and the planning permit to subdivide under the Planning and Environment Act 1987.

SPEAR introduced invaluable transparency and accountability to the subdivision application process by streamlining the approval process for plans of subdivision, and the associated planning permit to subdivide. The system is now being used by all 79 Victorian local governments, 200 surveying firms, 74 referral authorities, and LUV, which, in total, represents over 4000 users to view the progress of applications.

In addition to SPEAR project, the investigations to the ePlan project commenced in 2008 in Victoria (See Figure 21.3). LUV collaborated with the ICSM ePlan Working Group on developing a national data model to cover all Australian jurisdictions' cadastral and survey requirements [16]. In 2011, SPEAR enabled surveyors interested in ePlan to upload an ePlan LandXML

file along with their PDF application. From 2011 to 2013, ePlan was piloted in Victoria by LUV, the surveying industry and software vendors. In May 2013, SPEAR incorporated ePlan services including visualization, validation, data viewer and data download [11, 10]. The ePlan road map defined by LUV has the following visions [12]:

- **Longterm vision:** Implement ePlan for all Victorian cadastral plans and surveys by 2025.
- **Short-term vision:** Provide the infrastructure and services to enable the submission and registration of ePlan for all 2D Victorian cadastral plans by 2020.

Recent advancements in the demand for high precision, and data driven spatial information have led to the need to modernize and digitize Victoria's cadastre. The Digital Cadastre Modernization project is underway and will deliver a fully digital state-wide cadastre over the next 5 years. This will unlock significant new capability and innovation in Victoria for next-generation spatial services.

All 2D plans under the Subdivision Act 1988 are supported in ePlan. However, strata plans (building subdivision plans) which include overlapped ownership rights are not yet supported.

As indicated in Figure 21.3, the investigations around the 3D digital cadastre to support the building subdivisions in ePlan format commenced in 2014. Following the release of the ICSM's strategy on Cadastre 2034, LUV has started to investigate the technical requirements for supporting 3D building subdivisions in ePlan including the potential use of Building Information Modelling (BIM), 3D data visualization, validation and storage. As part of these studies, several prototypes were developed and are under development to evaluate the implementation. As an example, Figure 21.5 presents LUV 3D ePlan Prototype.

Currently, a 3D digital cadastre road map is under development in Victoria following the ePlan long-term vision and goal 4 of ICSM Cadastre 2034 Strategy. The road map aims to show the major milestones and timeframes towards the implementation of a 3D digital cadastre by 2025. In addition, the institutional, technical and legal aspects of a 3D digital cadastre should link together to clarify the connection and relationships of the interests of the property industry, to build a comprehensive framework for implementation [14].

In conclusion, the current status of Victorian LAS in terms of addressing SDGs-related requirements is shown in Table 21.2.

TABLE 21.2
Current status of the Victorian LAS in terms of addressing SDGs-related requirements

Requirement	Victorian LAS current status
Provide equal access to ownership and control over land and property	The current LAS allows both men and women to have equal access to ownership and control over land and property.
Provide secure tenure rights to land with legally recognized documentation (title, deed, etc.)	Victoria’s LAS is based on Torrens title system which works on three principles: <ul style="list-style-type: none">• The land titles Register accurately and completely reflects the current ownership and interests about a person’s land.• Because the land titles Register contains all the information about the person’s land, it means that ownership and other interests do not have to be proved by long complicated documents, such as title deeds.• Government guarantee provides for compensation to a person who suffers loss of land or a registered interest.
Develop an accurate cadastral data set (parcel fabric) as a fundamental layer	The digital cadastre modernization project is currently underway. This project aims to build a spatially accurate 2D digital cadastre for Victoria by 2024.
Utilize information and communications technology for modernizing LAS	Both ePlan and 3D digital cadastre projects are currently underway aiming at providing services to enable the submission of digital cadastral data to LUV. These projects leverage the information and communication technologies to develop required services for land administration stakeholders in Victoria.

FIGURE 21.5
LUV 3D ePlan prototype (www.spear.land.vic.gov.au/spear/pages/eplan/3d-digital-cadastre/3dprototype/prototype.html) [15]

21.5 Conclusion

This chapter explored the role and requirements of a modern LAS for supporting SDGs. It was discussed that SDGs, depending on their nature, have either a direct or an indirect relationship with LAS. Direct relationship means that a specific goal cannot be achieved at all without a LAS (e.g. Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable). Whereas, an indirect relationship means that a specific goal might not be efficiently achieved without a LAS (e.g. Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all).

The chapter reviewed the LAS modernization journey in Victoria to support SDGs. The study showed that the current Victorian LAS can meet most of the four requirements identified herein. However, to have access to a fully modern LAS in Victoria, the following research and development projects should be considered: a) fully implement 2D ePlan services for all plan-based dealing types by 2020, b) finalize and endorse 3D digital cadastre road map, and c) implement 3D digital cadastre by 2025.

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