Re-Imagining Comparative Land Administration Data for the Next Decade

Charl-Thom BAYER, Denmark, Francesca MARZATICO, New Zealand, Wambayi WABWIRE, Kenya and Laura MEGGIOLARO, Italy

SUMMARY

Access to land data is crucial for good land governance. It enhances the development of a transparent land administration system, increasing government accountability and service delivery as well as giving communities and individuals the possibility to take in informed decisions on the management of their land.

The changing landscape for the land data ecosystem and land data users highlights the current and future potential of the Cadastral Template (CT) as a key land data resource. CT represents a unique and relevant data set, capturing important descriptive information on land administration systems as well as core qualitative and quantitative data. Land information and land data play a pivotal role in supporting delivery of administration functions for sustainable development. It is critical that core cadastral data is freely and easily available in a manner that enables the data to be re-used and made interoperable. CT is important because it provides an assessment of cadastral data and cadastral systems. This is important for transparency and accountability, to pursue data accuracy, identify data integration opportunities and improve decision making.

However, as cadastral data is often integrated with other data (land use and developments, taxation, resource rights and environmental and demographic data), we propose a partnership between like-minded organisations to pursue a common goal of providing improved data ecosystems for a more comprehensive understanding of land governance challenges. The purpose of this paper is therefore to explore the opportunities for partnership with FIG on the CT. The researchers propose to provide a brief overview of the CT and its key characteristics as well as explore opportunities to increase the value, use and uptake of CT data by developing strategic data partnerships that are mutually reinforcing, complementary and help to fully explore the untapped potential of CT data for broader use in analysis by the land and development sectors.

This paper is the result of a partnership between the Land Portal Foundation, the University of Otago School of Surveying and Cadasta Foundation to explore potential partnerships to improve the existing information ecosystem and make it richer and more interoperable for efficient land administration and better land governance.

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1. INTRODUCTION

Great focus is posed by the land sector on land administration and land data. The former plays a crucial role in supporting sustainable development, while the latter by contributing to development and innovation in the land sector has been the subject of more recent research initiatives. Less attention has been paid to the contribution that core cadastral data can offer to the broader land community. As a result, since 2003 and by mandate of Resolution 4 of the 16th UNRCC-AP in Okinawa, Japan, Commission 7 with the support of Melbourne University has sought to develop and maintain a repository of information about cadastral systems globally: Cadastral Template (CT) (Steudler et al., 2003). The CT was designed as an easy-to-use tool to collect core cadastral information and land administration functions to complement and support further data collection initiatives. It aimed at providing an information base for country profiles on the cadastre to serve as a diagnostic tool to support Spatial Data Infrastructures (SDI) and to develop indicators. Since 2003, the state of land data has significantly evolved with new land data indexes and initiatives tracking the state of land data being developed (Bayer & Meggiolaro, 2023). In reviewing the state of land ownership data from 2018 to 2023, Bayer & Meggiolaro (2023) identified the importance of developing stronger links between the broader land data community and the land administration sector. At the same time the significance and relevance of the CT was re-enforced at the UN-GGIM expert meeting in New York (2018), approving a resolution to use the CT to track progress on achieving the SDG's.

The Land Portal Foundation is working to emphasise the importance of improved collaboration between the land administration sector and the global land and data communities. Cadasta Foundation supports communities and governments to record land rights and provide tools and frameworks to collect and analyse land data in a way that it can be used and influence policy and development practitioners. The University of Otago Surveying School is recognised internationally for the quality of its graduates and its staff research at the forefront of international measurement and spatial science research. The Land Portal Foundation, Cadasta Foundation and the University of Otago have partnered to undertake a review of existing land data initiatives in order to identify lessons learned to be used to support the creation of a system of open access data on land tenure and land administration around the world in order to enhance land governance.

Data on the cadastre is increasingly moving out of the sphere of the specialised land administrators into the domain of general sustainable development practitioners and advocates. At the same time the increasing interest in data and on the opening up of data is interconnected with a shift to focus on the services and products that can be delivered (United Nations, 2022). This approach allows undervalued and underutilized (Quarati et al., 2021) data assets to be used more productively while increasing access to information.

This changing landscape for the land data ecosystem and land data users highlights the current and future potential of the CT as a key land data resource. CT represents a unique and relevant data set, capturing important descriptive information on land administration systems as well as core qualitative and quantitative data. Land information and land data play a key role in enhancing transparent and accountable administration of land and land-related resources supporting the delivery of key land administration functions crucial for sustainable development. In this context freely and easily available cadastral data become crucial to enabling interoperability and re-use of such data.

The purpose of this paper is to explore the opportunities for partnership with FIG on the Cadastral Template. The researchers propose to provide a brief overview of the CT and its key characteristics as well as explore the preliminary opportunities for developing, revising and increasing the use and uptake of this crucial land data set for broader use in analysis by the broader land and development sector.

2. DESCRIPTION OF CADASTRAL TEMPLATE[1]

The CT database contains cadastral information and is designed as an easy-to-use tool to provide access to information on the cadastre and to support the data collection initiatives and the development of land governance related indicators, making their measurement easier. The CT project collects and presents in its website (https://cadastraltemplate.org/) data on four key issues (Steudler et al., 2003). Main purpose of such data collection is to get an indication of:

- how many parcels are to be surveyed and registered;
- the magnitude of informal land occupation;
- the completeness, comprehensiveness, use and usefulness of spatial cadastral data in the SDI's; and
- the scale of capacity building initiatives.

The CT is based on a MySQL database. The information on the country cadastre is provided by national associations (member countries designated contact persons). Users can consult the database and visualise the information on a global geographic map. The front end allows for country comparisons and provides the user with an overview of participating countries. The interface has been designed with user-friendliness and simplicity in mind using open-source technologies. CT has been developed using an open license although its copyrights with regards to the outputs are reserved and the cadastral data for each country is only available for viewing and not for downloading.

The CT has two major components: a narrative description (Country Report) of the cadastral context of the country, and information on the core cadastral principles and statistics.

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[1] For a complete description and overview of the development of the Cadastral Template see the paper "*The Cadastral Template 2.0, From Design to Implementation*" by Rajabifard et al., (2014)

The country report includes: i) a short description of: the country context with a quick overview of the population, geography, history and political and organisation aspects of land administration, including a description of the political and administrative organisations and of the main features of land administration in the country; ii) an explanation of the institutional and organisational framework for land administration as well as the role of the profession, licensing, the private sector and the level of education provided for land administration officials in the country; iii) a detailed description of the cadastral system and of the legal basis for land markets, transfers, valuations, taxes and planning functions of the state; iv) an overview of the cadastral mapping, including samples of the cadastral maps and the geodata layers; and v) information on any potential land reform issues that might exist in the country and the major challenges that are facing the cadastre.

3. CADASTRAL TEMPLATE CHALLENGES

The International Federation of Surveyor (FIG) is working to support and promote the interest and profession of surveying and relies on its members for the continued functioning and operation of FIG. Information in the CT is provided by the key national personnel from FIG member associations and do so on a voluntary basis. While the CT is a valuable source of cadastral data, it is not without some challenges.

a) *Timeliness of Data*
   The data is not consistently updated. A review of the website reveals that some data was last updated more than twenty years ago while some data was updated as recently as 2018. It is also reasonable to state that some of the elements in the template are unlikely to change every year, it would still be of use to potential users if there was a consistent process for updating the data and the latest version. Otherwise, a user would not be able to distinguish whether nothing has changed, or whether the data has not been updated.

b) *Coverage of Data*
   The CT contains data on fifty-nine countries, which represents a significant data resource. Nevertheless, data from more countries need to be included to make it a globally relevant resource, especially for greater inclusion of the global south.

c) *Descriptive Data*
   The CT contains mostly descriptive data on the country context, but not so much data on the core cadastral components. It should be noted that the data in the CT is mostly descriptive, it contains only a few quantitative data elements. This limitation is driven by the stated need to ensure ease of data collection on basic cadastral elements, rather than on covering all statistical elements possible for land data.

d) *Open and Interoperability of Data*
   The current data set is not available for download in open formats from the website that enable the re-use of the data. While the platform is built using open software and applications, the output is not openly available and does not encourage re-use of the data for other applications and analysis.

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e) Data collection
The current version of the CT provides for data collection through completing a form that is downloaded from the website and submitted through an email submission. Consideration should be given to revise the data collection strategy, possibly into a digital format that could be easily accessed through link, filled and submitted digitally.

f) Resources to maintain the country specific information
The submission of data to the CT is dependent on the FIG member country affiliate. While this is a procedure designed to enhance quality and validate the data, it limits the number of contributors. However, opportunities to scale up the submission of the data should not be at the expense of the possible submission of inaccurate information.

g) Visualization of Data
The platform makes provision for basic visualisation of the data across all 13 data categories that are defined. Results of data queries are displayed on a basic global country map or in the form of bar graphs. It is not possible to visualize more than one variable at a time but any number of countries can be compared in the visualization.

4. RELEVANCE

The CT remains a unique and relevant data set that captures important descriptive information on the land administration systems as well as core qualitative and quantitative data on land administration that is not easily found elsewhere in a similar collection. Land data and information plays a key role in supporting improved land administration functions for sustainable development. This Cadastral Template is also increasingly important for the data community working to improve the availability of land data and information. The CT can help to introduce a broader range of land development actors to core cadastral information, definitions and concepts.

CT is a crucial tool for surveyors, land governance practitioners and academia. By providing open and accessible cadastral data it supports transparency and accountability of land administration authorities thereby enhancing land governance. CT data plays a pivotal role in supporting ongoing initiatives on open data. CT has an educational purpose since the comparison of cadastral data of different countries helps surveying and planning students in contrasting their cadastral system with third countries, sparking their curiosity and understanding of other systems around the world.

Furthermore, the availability of cadastral data and the user-friendliness of the CT support access to important information to vulnerable people or to those otherwise marginalised. Thanks to the availability of such data communities and individuals can make informed decisions about their lands.

CT, through completing land administration data, also supports the development and use of indicators allowing for comparison among different countries and for establishment of

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minimum standards for good land governance in relation to cadastral and land administration data.

5. POTENTIAL SYNERGIES AND OPPORTUNITIES FOR THE FUTURE

Partnership between FIG and other land and data actors can help to increase the visibility of the CT and its core cadastral data to increase impacts and use of the data. Such a partnership between FIG and other actors in the land and data sector can collectively harness and multiply the value of the cadastral data set. This will enable the CT data to be integrated and made interoperable with data from other global initiatives. At the same time such partnerships could also be harnessed to bolster and increase data collection globally using existing initiatives that are tracking the state of land data globally. This would also provide an opportunity to revisit the CT and consider the changes that have taken place in the data landscape over the last decade and take into account what implication this has for the collections, presentation, sharing and reuse of the data.

a) *Integrate and Align with other Global Initiatives*
   Significant development has taken place in the land data landscape since the launch of Cadastral Template 2.0 in 2014. The number of land data stakeholders has grown and this has been partly driven by global data initiatives to improve reporting (Land Portal Foundation, 2023) on indicators such as the Sustainable Development Goals (SDG's). Initiatives to collect land data include the Property Rights Index (Prindex) tracking perceptions of tenure security (Prindex, 2020), the International Land Coalition which is tracking community generated land data in LANDEX (ILC, 2021) and the Land Matrix (LMI, 2023) which is tracking data on large scale land acquisitions. The Land Portal Foundation has partnered with the Open Data Charter and the Global Data Barometer to track the state of land information globally. This effort has been characterised by its adherence to the conceptual framework for modern land administration systems (Williamson et al., 2010) and defines the categories of land data according to the core functions of the land administration system. Integrating land administration theory in the development of resources for measuring, describing and assessing land data ecosystems from the national to the global scale deepens our understanding and ability to tackle land governance challenges. Some of the resources developed include the global index on the state of land data (GDB, 2022), the Land Portal State of Land Information (SOLI) research (Land Portal, 2023) and the Open Up Guide for Land Governance (OUG) (Bayer & Booth, 2021) to support the availability and use of land data for improved service delivery, citizen engagement, and decision-making. Reviewing the CT template in relation to these developments and resources over the last ten years can enable new synergies to develop that will further develop our understanding of land data and governance for sustainable development.

b) *Open and Interoperable*

Making data more open and interoperable can help to overcome the current lack of access to land data. Global land data indices all show that very little land data is currently open, perhaps with the exception of a small number of developed countries. Globally governments publish very little cadastral and land registry data to support the land administration functions of land tenure, use, development and value. Increasing access to land data (in accordance with national laws and international best practices) can help governments deliver critical services in the land sector and support environmental and social advocacy. Bridging the divide between the land and open data communities provides an opportunity for making land data more available for use and reuse. At their 2022 congress the International Federation of Surveyors (FIG) devoted a theme to open land data (FIG, 2022). Ensuring that the CT is open and available for re-use can help reinforce the important role for cadastral data and land administration data in the development sector.

c) *Standards and Frameworks for Reuse*
Opening up land data and making core cadastral data part of broader land governance and data initiatives requires that organisations and countries are aware of and apply common standards, deriving both from the land sector as well as the data sector. Initiatives on land data will benefit from the broader use of and diffusion of standards, including semantic standards as well as codes of conduct. Standards and codes of conduct can help to ensure that personal and restricted data is protected. It can support the use of consistent and common data formats that enable the data to be used as widely as possible while adhering to legal and ethical standards. These are questions and issues that deserve renewed interest and exploration taking into account the development that have taken place in the last decade.

d) *Create Country Portfolios*
While the Land Portal is not alone in offering country profiles with a focus on the land governance context (Land Portal, 2023), its country profiles are among the most comprehensive with an overview of more than 84 countries,with more being developed. These profiles could be further improved with the addition of core cadastral information and data. Partnership with FIG as an international authority on land administration would strengthen and validate these country portfolios to ensure that cadastral concepts and data are appropriately included as well as diffuse these concepts to a broader group of stakeholders. With the addition of data from the CT and partnership with FIG such country profiles could become the primary source of reference on matters of land and administration and governance. Country profiles, such as those produced by the LAnd Portal, describe key features of the tenure system, de-jure and customary regulatory frameworks and institutions as well as adherence to global frameworks such as VGGTs and DGS. This information is derived from a number of national and international sources and datasets. Combining core cadastral data from the CT with such profiles and other socio-economic and population data has the potential to offer a comprehensive data resource to be used in understanding and documenting land governance challenges. Together with the data from land tracking initiatives, it would provide quantitative and

qualitative resources on the state of land data that is of use to the broader development community as well as the needs of land administration professionals.

e) *Use and Uptake of Cadastral Data*
Cadasta provides digital tools to assist communities and governments to document land rights and manage land administration data. Cadasta supports governments to collect, analyse and share land data as well as supporting the inclusion of community data into the national data set (Cadasta, 2023). Universities are using cadastral data for educational and research purposes and help students in comparing and understanding different land administration systems as well as promoting the development of land administration as a professional discipline. Research on the availability of public sources of land information (Land Portal, 2023) helps to uncover country level data and information gaps. This information can be used as a diagnostic tool for developing interventions in the land information ecosystem. Governments may use such diagnostic information to improve their publishing of open land data and overcome open data obstacles and identify and mitigate data management risks. Combining the CT cadastral data with practical resources such as the OUG can enable better use of land data and information decision making and support innovation (Land Portal, 2022).

f) *Integrate with Land Administration/Governance Indices*
Cadasta Foundation in collaboration with FAO have built and piloted a Land Administration Index (Kazungu & Wabwire, 2022) that can be used to inform the polity on the status of land administration in a specific country. The index is intended for use by non-land administration specialists and political decision makers to set land governance targets, measure progress and enable global comparisons for the identification of best practices. This initiative offers an opportunity of interlinking the data to the Cadastral Template.

g) *Integrate with the State of Land Information Indices*
The Land Portal foundation is developing a new indicator to make land-related findings more actionable and to complement existing land governance monitoring systems. The proposed SOLI Index aims to; *comprehensively assess the state of land data across four categories: land tenure, land use, land development, and land value* and to *reveal the foundational data governance frameworks and practices that support open land data globally and within countries.* The indicator is actionable and will enable: i) land data custodians to identify specific areas for short-term and long-term improvements in land information systems, specifically openness; ii) policy makers to identify gaps in governance frameworks, policies, and laws that support access to information and iii) advocates to promote improved use of land information as a pillar for sustainable land governance.

The CT as a source of core knowledge and data on cadastral systems and land administration should be an integral part of these and similar initiatives to improve the relevance and quality of decision making in the land and data governance sector.

6. RE-IMAGINING CADASTRAL DATA

The challenge is therefore to identify the opportunities on how best to revise, integrate and display cadastral data in order to improve access to land information and stimulate new dialogues around land governance worldwide. This requires core cadastral data that is accessible, interoperable and reusable so that it can be freely shared and used by other land governance stakeholders.

This work identified 7 opportunities for the CT to consider in identifying synergies for improved uptake of core qualitative and quantitative data on land administration that is not easily found elsewhere in a similar collection.

a) Integrate and Align with other Global Initiatives
b) Open and Interoperable
c) Standards and Frameworks for Reuse
d) Integrate with Existing Country Portfolios
e) Use and Uptake of Cadastral Data
f) Integrate with Land Administration/Governance Indices
g) Integrate with the State of Land Information Indices

Reviewing the development of open land ownership data over the last five years, Bayer & Meggiolaro (2023) identified several key areas of work that will be central to the future of open land data. The 7 opportunities identified here will contribute to addressing at least three of these challenges and are an interesting waypoint for reflection on the possible role of cadastral data going forward.

The first key area of work is to develop **data management capacity**. Making the CT more open and interoperable to more easily allow for its integration and alignment with other global initiatives is a critical feature. Work on developing and adopting standards and frameworks for reuse, both in the data and land sector, will support the effective management of land data, including core cadastral data. Supporting the development of policy and data sharing frameworks can help to address concerns about data equity, trust and privacy while providing transparent tools for the integration of data from local sources and catering for diverse data needs.

The second key area of work is to develop **inclusive data ecosystems that deliver value** for all data stakeholders. The use and uptake of cadastral data will be core to building value for governments and their ability to improve decision making and deliver land related services to the community as well as private sector data stakeholders. Cadastral data should be core to the development of innovations and services, especially in developing countries, that underpin long term data investments and returns for society.

Finally cadastral data can contribute to **improving the baselines and indices for land and data governance**. Measuring and understanding the indicators for land and data governance can be improved with the inclusion of core cadastral data and concepts. Integrating cadastral

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data into country portfolios and as part of governance and data indices, can play a key role in measuring land governance progress.

As advocates for improved land and data governance we therefore have an opportunity to reflect on the role that cadastral data can play in enabling the complex analysis required for improved decision making. We can reflect on a future information ecosystem in which trust between citizens and government can be restored, and where the interests of all stakeholders is protected while promoting transparency in land and data governance.

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