

7 LADM AND ITS ROLE IN ESTABLISHING CADASTRAL SYSTEMS

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“The Land Administration Domain Model (LADM) makes a significant contribution to understanding the importance of data modelling in the domain of land, land administration and land management. The ‘Cadastre 2014’ vision of the International Federation of Surveyors (FIG) stated back in 1998: “Cadastral mapping will be dead! Long live modelling!”. While one might think that this message was clear enough, few professional colleagues took it seriously. The editorial team of the LADM were the first to undertake action to get to the bottom of this important issue. Now that the LADM has become an official ISO standard, that statement is strongly underpinned”.

This is how Jürg Kaufmann (2013) opened his review of the LADM in GIM International. And this is how one should look at the LADM: it is basically a conceptual model covering basic information-related components of land administration. The term ‘land’ should be interpreted in the broad sense, also including water bodies (rivers, lakes, seas, oceans) and spaces above and below the surface, that is, air space and subsurface spaces. One of the main goals of LADM is to provide an extensible basis for the development and refinement of efficient and effective land administration systems. The LADM is also a language, which can support in development of tools for data exchange in and environment of spatial data infrastructure. It is important to see that all people to land relationships – tenure can be represented in the model.

What is the role of LADM in establishing cadastral systems? Let’s have a look.

Implementation of CADASTRE 2014

First of all the LADM supports the implementation of CADASTRE 2014. The LADM model can show the complete legal situation of land, including public rights and restrictions and this can be based on the principle of legal independence from CADASTRE 2014. The LADM model integrates the essential data such as party names, ownership & use rights, and spatial units. There is no “separation” between maps and register in LADM as stated in CADASTRE 2014. LADM supports the implementation in distributed organisational environment because the model integrates the essential data such as party names, ownership & use rights, and spatial units. There are “packages” of information to support this; those packages are:

- parties (people and organizations);
- basic administrative units, rights, responsibilities, and restrictions (ownership rights);
- spatial units (parcels, and the legal space of buildings and utility networks), including a subpackage for spatial sources (surveying) and spatial representations (geometry and topology).

This means that implementations are possible where different public and private actors sector co-operate as stated in CADASTRE 2014. See Figure 12 for an overview.

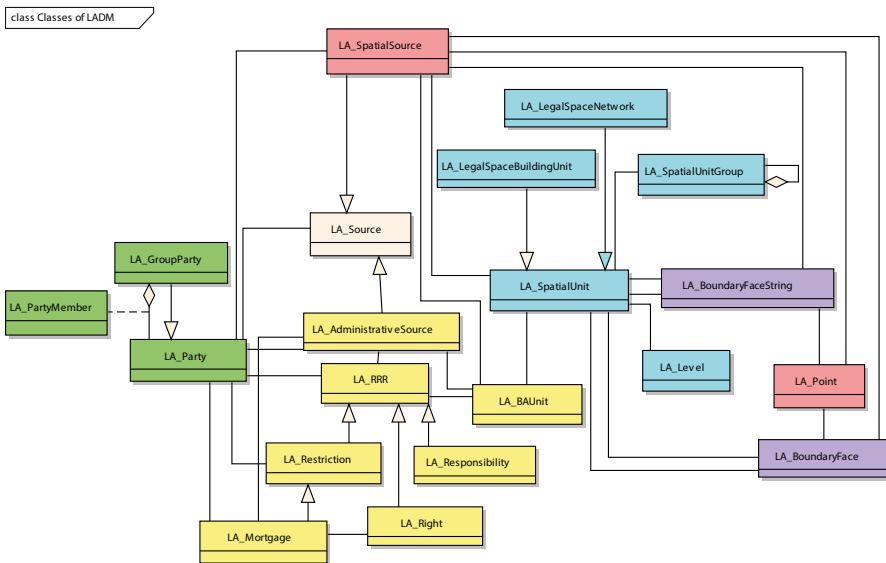


Figure 12: The LADM International Standard.

The LADM is implemented in digital format by default, its use will encourage a move away from a paper based legal and registration process as predicted in CADASTRE 2014. Provision of a solution that is compliant with international standards and best practice will make it easier for a traditionally conservative legal profession to adopt new practices which will enhance services and reduce costs. The LADM can potentially be used to support organizational integration, for example, between often disparate land registry and cadastral agencies.

UN-Habitat's Continuum of Land Rights

Second, and in extension to this, it is relevant to observe that the LADM can be used in support to the implementation of the UN Habitat's Continuum of Land Rights (UN-Habitat, 2008; see Figure 13). According to LADM land administration is the process of determining, recording and disseminating information about the relationship between people and land. The LADM deals with both real rights and personal rights. Rights may be formal ownership, apartment right, usufruct, free hold, lease hold, or state land. It can also be social tenure relationships like occupation, tenancy, non formal and informal rights, customary rights (which can be of many different types with specific names), indigenous rights, and possession. There may be overlapping claims, disagreement and conflict situations. This is an extensible list to be filled in with local tenancies. A restriction is a formal or informal entitlement to refrain from doing something; for example a situation where it is not allowed to have ownership in indigenous areas. There may be a temporal dimension, e.g. in case of nomadic behaviour when pastoralists cross the land depending on the season. Apart from land rights different types of credit rights – micro credit, group loan, mortgage – all can be with a formal or informal basis. The term 'continuum' applies, apart for land rights, for other dimensions relevant

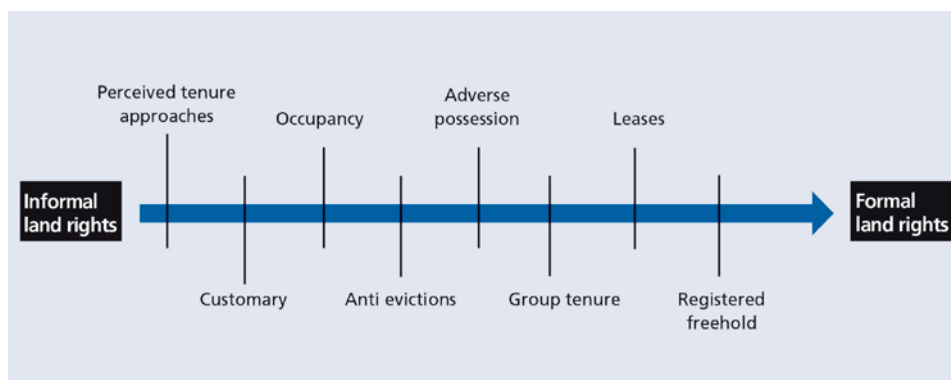


Figure 13: *The continuum of land rights (from UN-HABITAT, 2008, p. 8).*

in fit-for-purpose cadastres. Great variations in methods and results are possible – there is a ‘continuum in continuums’ – with a continuum of parties, of land and credit rights, of spatial units, of data acquisition methods/technologies (with a related continuum of geometric accuracy), of recordation/contents/quality, of information management/organisation an a continuum of purposes.

FAO’s Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (FAO, 2012) outline principles and practices that governments can refer to when making laws and administering land, fisheries and forests rights. This very comprehensive set of guidelines includes ‘delivery of services’ and ‘records of tenure rights’. In those areas some of the guidelines are highlighted here:

- national standards should be developed for the shared use of information, taking into account regional and international standards,
- where possible, States should ensure that the publicly-held tenure rights are recorded together with tenure rights of indigenous peoples and other communities with customary tenure systems and the private sector in a single recording system, or are linked to them by a common framework. Systems should record, maintain and publicize tenure rights and duties, including who holds those rights and duties, and the parcels or holdings of land, fisheries or forests to which the rights and duties relate.

This is in alignment to the continuum approaches.

2D and 3D spatial representations

Third, LADM recognizes that the majority of spatial units is today represented in 2D, while recognizing that in the future, with growing pressure on space, there is more and more need for 3D representations. LADM supports integrated modelling and representation of 2D and 3D spatial units while making sure that there is a good fit between the two. A key role is played by various innovative concepts such as ‘boundary facestrings’ and ‘liminal spatial units’. *Boundary face strings* are used to represent the boundaries of spatial units by means of line strings in 2D. In a 3D land administration system it represents a series of ver-

tical boundary faces where an unbounded volume is assumed, surrounded by boundary faces which intersect the Earth's surface (such as traditionally depicted in the cadastral map). *Liminal spatial units* are spatial units on the threshold between 2D and 3D representations. Further, as in 2D, also in 3D a range of spatial representations is supported, from text and point representations to full 3D topology based representations and also spatial representations based on spatial source documents.

Application software

Fourth, LADM can support to the development of the application software for LA. The data model is the core here. Support in the development of a LAS means provision of an extendable and adaptable fundament for efficient and effective LAS development based on a Model Driven Architecture (MDA), as promoted by the Object Management Group. Implementations so far are in INSPIRE (cadastral parcels as part of a bigger SDI in European Union), FLOSSOLA (software for LA from FAO), STDM (software from UN Habitat). The Social Tenure Domain Model is a spin-off of LADM. The LADM in Unified Modelling Language (UML) is published by ISO. This UML model in EA (Enterprise Architecture) format can be used to set up and create databases. LADM is capable of supporting the progressive improvement of cadastres, including both the geographic and other elements.

Data exchange

Fifth, LADM can facilitate cadastral data exchange with and from a distributed LAS. This can be between cadastres, land registries and municipalities and between countries in a federal state or between countries. In an environment of spatial data infrastructure external links from LADM are possible to databases with; Addresses, Persons, Valuation, Taxation, Land cover, Land use, Documents and with Utility networks. It is interesting to see that LADM can help to reconcile superfluous government databases and reduce the large amount of data redundancy that currently exists.

Quality management

Sixth, LADM can support to data quality management in LA. The use of standards helps to reduce inconsistencies between data maintained in different organisations, mainly because data duplication can be avoided. It should be noted here that a standardised data model, which will be implemented, can be supportive in the detection of existing inconsistencies. Quality labels are important.

Agenda

The LADM user community did set the future agenda during a LADM Workshop in Kuala Lumpur in Malaysia in September 2013:

- the need for exploration of whether, and how, LADM can contribute to the Post-2015 global development agenda;
- LADM can be integrated, and should be integrated, with other geo-information encoding standards;

- LADM code lists could provide the basis for establishing a complete catalogue of global land-people relationships; and
- whilst ISO maintains its own maintenance approach, another form of governance structure – potentially included a reference group – is needed to further progress the refinement and maintenance of the standard (e.g. code lists, new items).

Conclusion

We have to thank the authors, Jürg Kaufmann and Daniel Steudler not only for the development of CADASTRE 2014. We have to thank them too for the way in which this Vision has been brought to the profession and the users of products and services from the profession. This vision and way of thinking has been a key to the development of modern cadastres.

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