A Worldwide Comparison of Cadastral Systems

Cadastral Template

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While many country reports and descriptions have been compiled in the area of land administration over the last ten years, there has not much attention been given to the basic cadastral issues and the role of cadastres in national spatial data infrastructures. PCGIAP-Working Group 3 "Cadastre" together with FIG-Commission 7 "Cadastre and Land Management" has developed a joint cadastral template that has so far been filled out by 32 countries. This project is one of the first to collect descriptions of national cadastral systems on such a broad basis and to have them publicly accessible on the Internet.

The PCGIAP-Working Group 3 "Cadastre" has two aims for the period 2002-2004. One is to facilitate a workshop for the development of an appropriate generic "cadastral template" for country profile analyses describing the status of national cadastres and land administration systems. The second aim is to facilitate discussion on marine cadastres. This article, however, will focus on the cadastral template.

The workshop for the cadastral template has been held in July 2003 prior to the 16th UNRCC-AP and the 9th PCGIAP meeting in Okinawa, Japan and has been organized with the support of the Centre for Spatial Data Infrastructures and Land Administration from the Department of Geomatics of the University of Melbourne in Australia. The design of the cadastral template itself has been established in close collaboration with Commission 7 "Cadastre and Land Management" of the International Federation of Surveyors (FIG), which has extensive experience in comparative cadastral studies.

The "Permanent Committee on GIS Infrastructure for Asia & the Pacific" (PCGIAP) was established following Resolution 16 of the 13th "United Nations Regional Cartographic Conference for Asia and the Pacific" (UNRCC-AP) in Beijing in 1994. The aims of the PCGIAP are to "maximize the economic, social and environmental benefits of geographic information in accordance with Agenda 21 by providing a forum for nations from Asia and the Pacific". The objectives of PCGIAP are pursued by four Working Groups, which have the titles "Regional Geodesy", "Fundamental Data", "Cadastre", and "Institutional Strengthening" (PCGIAP, 2000).

Background

With the increased interest in land administration and cadastral systems as part of national infrastructures, there have been a number of other activities in the recent past to collect data and information about them. A common objective of these activities was to a lesser extent comparing and evaluating the systems, but rather to collect information to identify best practice.

Many of these initiatives have been carried out by FIG-Commission 7 since 1996 and the UN Economic Commission for Europe (UN-ECE) since 1997. Most of the questionnaires and results are available on the Internet at either http://www.unece.org/env/hs/wpla/ or http://www.swisstopo.ch/fig-wg71/. They cover a large range of different land administration issues, even though they all have their own specific objectives. The objective
of the cadastral template project is to discover the basic social, conceptual, institutional context of cadastral systems as a whole.

Criteria for Questionnaire Design

The development of the cadastral template started with an outline and early draft in 2002 that was presented to PCGIAP and FIG-Commission 7. Both organizations contributed to the project through the feedback and input from several pilot countries. The research team from the University of Melbourne revised the template questionnaire accordingly in early 2003. The basic principles for the design of the questionnaire were:

a) that it had to suit and serve the purposes of the mostly Asian PCGIAP member countries as well as of the FIG-Commission 7 member countries, which are mainly European with a few African, South American and Asian representatives;

b) that it had to be easy to fill out, without too many explanations;

c) that it had to have a simple structure, although the results should still reflect the main issues of cadastral systems;

d) that it had to be as short as possible because it will mainly be filled out by senior executives;

e) that it had to be simplistic with easy to understand questions in order to have a satisfactory response rate;

f) that respondents would not be asked for precise figures or statistics; estimates will be "good enough".

In order to design and develop a questionnaire, it always is crucial to be aware of the final desired results in the first place. Based on the feedback from the pilot countries, the research team defined four basic key issues that the template should endeavour to cover. These key issues were:

a) to get an indication of the order of magnitude of the basic tasks in a cadastral system: how many parcels there are to survey and to register;

b) to get an indication of the magnitude and problems involved in the informal occupation of land;

c) to understand the role of the cadastre in SDI, and to get an appreciation of the completeness, comprehensiveness, use and usefulness of spatial cadastral data;

d) to get an understanding of the capacity building which is in place or which should be established to support the system.

Structure and Content of Template

The template has been structured in two main parts. The first part is mainly a textual description in the form of a country report, while the second part is a short questionnaire looking for the most basic key indicators.

The textual descriptive format of part one was intentional in order to make it easier to fill out. For better comparison of the results, part one is structured into five main topics, each with two to five sub-topics:

Topic A "Country Context" gives descriptions of the country or jurisdiction from geographical, historical, political and administrative perspectives. There are four sub-topics, which are the description of the Geographical Context, Historical Context, Current Political and Administrative Structures and a brief Historical Outline of Cadastre.
Topic B "Institutional Framework" looks at the institutional and organizational issues of the cadastral system. The objective is to get descriptions of the institutions responsible for land administration, public-private partnerships, professional organizations, and licensing and capacity building arrangements. The five sub-topics are the descriptions of the Government Organizations, Private Sector Involvement, Professional Organization or Association, Licensing System and Education System.

Topic C "Cadastral System" attempts to get an understanding of the basic principles of the cadastral system, i.e. the purpose, the different types, informal occupation of land, the actual cadastral concept with the main units and their registration. The four sub-topics are the Purpose of Cadastral System, Types of Cadastral System, Cadastral Concept and Content of Cadastral System. The issue of the cadastral concept seems to be an interesting issue in itself for the understanding of the different cadastral systems. During the development of the template, there was lengthy debate as to the meaning of the terms "parcel" and "property" and how they are dealt with in the different jurisdictions.

Topic D "Cadastral Mapping" intends to get an understanding of the spatial data component of the cadastral systems, which was traditionally referred to as the cadastral map. Spatial data are increasingly being managed in digital formats, making them more suitable for a number of other applications. The main value of this use and flexibility is that cadastral data have increasingly become part of national SDIs. It is therefore interesting to monitor this development in the different countries and jurisdictions. The sub-topics are Cadastral Map, Example of a Cadastral Map, and the Role of Cadastral Layer in SDI.

Topic E "Reform Issues" investigates Problems and Issues, with which the cadastral system is confronted.

The second part of the template identifies the basic principles of the cadastre and some key indicators. The statistics are kept simple and focus mainly on the size and efficiency of the system, i.e. the number of population, parcels and professionals.

**Difficulty with the Term "Land Parcel"**

As mentioned above, the definition of the term "land parcel" posed some difficulties during the development of the questionnaire. It became obvious that "land parcels" have different meanings in different countries and are often used in conjunction with the term "property".

In *Australia* "land parcels" are the spatial units that are surveyed in the field while the corresponding "land ownership titles" are the entities recorded in the land registry. The relationship between these two main units is usually a 1:1-relationship, i.e. each land parcel is related to exactly one land ownership title in the land registry. The term "property" is in use at local councils and utility companies, which maintain "property" records for their own planning and tax purposes. Properties may consist of many parcels, in most cases, however, they consists of one parcel only.

In the 1960s, *Malaysia* introduced the concept of "Qualified Titles", which are ownership titles to land issued prior to a final accurate cadastral survey. This concept was introduced for administrative expediency in the face of the slow pace of registration of final titles because of a lack of qualified land surveyors. This approach was very successful to support an active land market, but it had also the effect that in many areas there are large surveyed areas – called "land parcels" – consisting of many smaller land ownership units.

In *Denmark* the term "property" is a legal term defined in the cadastral act and may include one or many "land parcels". The properties are used as a basis for securing legal rights such as ownership and mortgage, which comprise the whole property. A "land parcel" is part of a
property and may only be sold or mortgaged separately when it is divided from the property through a subdivision process. Usually, however, a property consists of one parcel only. The use and definition of the terms "property" and "parcel" are similar in other Scandinavian countries such as Sweden and Finland.

In Switzerland the cadastral system is based on the folio principle, i.e. each "land parcel" on the ground is related to exactly one ownership title registered in the land registry. Every land parcel has a unique parcel identifier number, to which all parcel-relevant information is linked. The term "property" as such is not commonly used, but it would be considered to be the same as the term "land parcel".

These different uses of the terms "property" and "land parcel" posed some difficulty for the design of the questionnaire. However, one of the aims of the template is to also understand the role of the cadastre in SDI, which by nature deals with spatial information. It is therefore the number of "smallest spatial units" that are of interest for this project, because they reflect the potential size of the cadastral system. The smallest spatial units may in some jurisdictions be referred to as "land parcels", while in others they may be called "land ownership units", not to be confused with the term "property". The questionnaire therefore asked specifically for the "smallest spatial unit".

It has to be pointed out that the UN-ECE recognised this issue as well and appointed in 2002 a task force to prepare guidelines on real estate units and identifiers. These guidelines explore some of the differences in the use and terminology of the basic spatial units that are recorded in land book and cadastral systems. Draft version 2 of the guidelines is very comprehensive and illustrates the many different uses of the basic spatial units and their identifiers.

Progress So Far and Expected Results

All the results of the cadastral template project have been published on a dedicated website, which is accessible through www.cadastraltemplate.org. The website will be maintained and updated on a continuous basis until 2006 and is thus available for permanent consultation.

So far, there are data and information from 32 countries, which provided the description and statistics of their cadastral systems. All the data have been integrated into the website, on the one hand in a country by country and on the other in a data field by data field format for easier comparisons. For easier visualisation, statistical data are also presented in graphical charts.

There will be further efforts to get more country replies. With the continuing support of PCGIAP and FIG-Commission 7, it is expected to obtain replies from more than 50 countries worldwide. The results will provide a broad basis for comparing systems and for identifying good practice among the participating countries. It is planned to analyse the data and to publish the results, which will provide a good basis for further investigating the role of cadastres in national SDIs.

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Further Reading


Biography of the Authors

Dr. Daniel Steudler (Dipl.-Ing. ETHZ, M.Sc.Eng. UNB, PhD UniMelb) is with the Swiss Federal Directorate for Cadastral Surveying since 1991. He is involved with FIG-Commission 7 since 1994 and became the official Swiss delegate in 2003.

Prof. Ian Williamson's teaching is concerned with cadastral, land and geographic information systems, land administration and spatial data infrastructures, in both developed and developing countries. He has published extensively on these topics. He has undertaken research and consultancies worldwide including for AusAID, the United Nations and the World Bank.

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Figures with Captions

**Figure 1:** Homepage of the cadastral template project (www.cadastraltemplate.org).

**Figure 2:** Web page example of country data.

Figure 3: Web page example of country data.

Figure 4: Web page example of field data with statistics.