

# Cadastré 2014 – Still a Vision?

Daniel STEUDLER, Switzerland

**Key words:** Cadastre, Cadastre 2014, land administration, visions, development

## SUMMARY

In 1998, the FIG-Commission 7 published vision statements for a future cadastral system, named "Cadastré 2014". The six statements were dealing with the integration of public-rights and restrictions, the integration of services, the digital format and data modelling, public-private-partnerships, and the economic sustainability of cadastres.

The developments in the cadastral field over the last 10 years were remarkable. From a technical point of view, the digital age has fully arrived; with new and highly improved data acquisition methods such as GPS, orthophoto imagery or laser scanning and the maturing of data provision possibilities through the Internet, nearly all data are now in digital form. From a conceptual point of view, terms such as land administration, spatial data infrastructures (SDI), E-Government or national geodata infrastructure (NGDI) thrived and had a great impact on the geoinformation community and the cadastre. This triggered many institutional changes, reshuffling of services, integration and incorporation of agencies and departments. In a few countries, the cadastre merged with topographic mapping and in some others with land registration organizations.

This paper will review these developments and in particular the vision statements of "Cadastré 2014" from a today's perspective.

# Cadastré 2014 – Still a Vision?

Daniel STEUDLER, Switzerland

## 1. INTRODUCTION

FIG-Commission 7 established in 1994 for a 4-years period a working group that was commissioned to:

*...study cadastral reform and procedures as applied in developed countries, take in consideration automation of the cadastre and the role of cadastre as part of a larger land information system, evaluate trends in this field and produce a vision of where cadastral systems will be in the next twenty years, show the means with which these changes will be achieved and describe the technology to be used in implementing these changes.*

In 1998, the working group submitted the booklet "Cadastré 2014 – A Vision for a Future Cadastral System" (Kaufmann and Steudler, 1998) to the XXII FIG Congress in Brighton. The booklet identified the cadastral trends at that time, and looked into the developments of the cadastre in the future. The publication is known since as "Cadastré 2014" and basically gives six vision statements for a future cadastral system and several recommendations related to those.

Cadastré 2014 has experienced an unexpected professional attention worldwide since. It has been translated into over 25 languages so far and is still nowadays the focus of conference sessions and discussions. Workshops and seminars have been organized to assess whether local developments were consistent with the vision. Cadastré 2014 still attracts research attention as two recent theses from Nogolica (2006) and Musungu (2005) show.

The intention and the statements of Cadastré 2014 have sometimes also been misinterpreted and misunderstood. It also has been put as the benchmark or as a clearly defined and regulated concept. However, Cadastré 2014 only presents a set of visions, which sole intention was to identify trends in the cadastral domain and to project them into the future.

Within this paper, a review of the Cadastré 2014 statements is done from a today's perspective – half way through the period between the publication in 1998 and 2014. The paper briefly reviews further developments since 1998 and attempts to evaluate the vision statements against them.

## 2. BRIEF SUMMARY OF THE SIX VISION STATEMENTS

The working group first undertook a questionnaire study of the current trends. Based on the results, the following six statements basically summarized the trends and developments that the working group considered as most important.

1) *"The cadastre of the future will show the complete legal situation of land, including public rights and restrictions!"* As land becomes a scarce resource and more and

more public rights and restrictions influence the private landownership, the cadastral system of the future needs to show the complete legal situation in order to provide the required land tenure security.

- 2) *"Separation between maps and registers will be abolished!"* The separation was historically necessary because of the available technology at the time, but this can nowadays be overcome, at least technically if not institutionally as well.
- 3) *"Cadastral mapping will be dead! Long live modelling!"* The production of plans and maps has always been the main objective and raison d'être of surveyors; modern concepts and technology provide different and much more advanced opportunities, which surveyors need to acknowledge by adopting principles from information technology.
- 4) *"Paper and pencil'-cadastre will have gone!"* Digital technology will be a prerequisite for efficient and adequate service.
- 5) *"Cadastre of the future will be highly privatized! Public and private sectors are working closely together!"* Public systems tend to be less flexible and customer oriented than private organizations; the private sector can help to improve the efficiency, flexibility and introduce innovative solutions while the public sector can concentrate on supervision and control.
- 6) *"Cadastre will be cost recovering."* Cost/benefit analysis will become an important aspect of cadastral reform projects and the considerable investments need to be justified.

In order to turn these statements into feasible practices, Cadastre 2014 provided two new definitions:

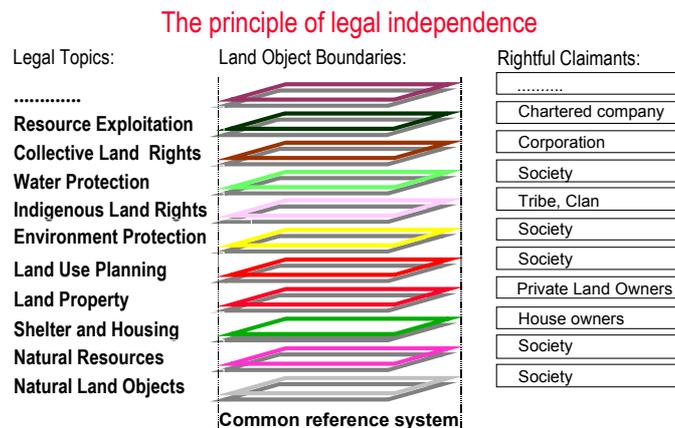
- 'Land objects': the traditional cadastre is very much linked with either the land ownership or tax parcel. Cadastre 2014 states that in addition to the parcel, there are other spatial or land related objects, which were suggested to be named 'land objects'. This conceptual extension is particularly important for accommodating public rights and restrictions, which are in most cases not congruent with land ownership parcels.

Land Parcel	Land Object
<p>A land parcel is a piece of land with defined boundaries, on which a property right of an individual person or a legal entity applies.</p>	<p>A land object is a piece of land in which homogeneous conditions exist within its outlines. The legal land objects are described by the legal content of a right or restriction and the boundaries which demarcate where the right or restriction applies</p>

**Figure 1:** Definition of 'land object' (Kaufmann and Steudler, 1998).

- The principle of 'legal independence' is basically nothing else than the layer concept known from GIS. This is at first sight mainly a technical issue, but it has crucial managerial impacts: data can be acquired and managed independently in different layers and can thus

clearly be assigned to different stakeholders and custodians. However, a common reference system and a common data modelling mechanism has to be used.



**Figure 2:** The principle of 'legal independence' (Kaufmann and Steudler, 1998).

Based on the above listed statements, Cadastre 2014 has two main messages that should be emphasized:

- The cadastral surveying and mapping profession is facing a change of paradigm: the traditional map production paradigm needs to be replaced by an information service paradigm. This includes the requirements for the digital data format and for flexible data modelling and exchange standards and thus providing the conceptual basis for national spatial data infrastructures.
- A cadastre of the future will accommodate not only private property rights, but also public rights and restrictions. This means an extension of the traditional content.

### 3. DEVELOPMENTS SINCE

Since the publication of Cadastre 2014 in 1998, there were three developments that had considerable impact on the research as well as the business agenda within the cadastral domain. First, the concept of Spatial Data Infrastructure (SDI) – although already known in 1998 – has taken up and is well accepted. Second, the same can be said for the phenomenon of the Internet, which in many ways and despite the bursting of the dot com bubble is affecting our daily lives. The possibilities of data and information exchange and the services available over the Internet are growing every day. And third, the concept of land administration and its link with sustainable development has been developed and provides a somewhat broader conceptual framework.

The term '**Spatial Data Infrastructures**' (SDI) came about over the last decade, with many governments and the private sector spending tens of billions of Euros in the acquisition of spatial data and the development of geographic information, largely to serve specific communities (forestry, agriculture, urban and rural planning, land records management, security services, health care, emergence services, etc.) (Groot and McLaughlin, 2000). The infra-

structure facilitates and coordinates the exchange and the sharing of spatial data at a local, national and international level, between stakeholders within and outside of the geo-information community.

Many countries are developing SDI to manage and use their spatial data assets more efficiently. Over the past few years, many countries have spent considerable resources on establishing National SDI (NSDI) or National Geodata Infrastructures (NGDI).

The core components of SDI are policy, access networks, (technical) standards, people (including partnerships), and data. Rajabifard et al. (2002) suggested that different categories could be formed based on the different nature of their interactions within the SDI framework. An integrated SDI cannot be composed of spatial data, value-added services and end-users alone, but instead involves other important issues regarding interoperability, policies and networks, reflecting the dynamic nature of the whole SDI concept.

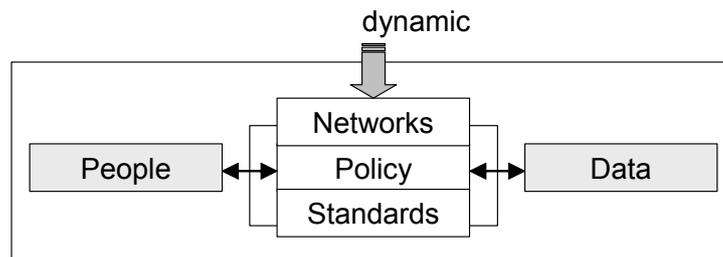


Figure 3: SDI elements and their relations (Rajabifard et al., 2002).

The establishment and the enormous success of the **Internet** also had a big impact on how cadastral systems developed over the last few years and how service can be delivered to customers. The Internet together with the recent success of broadband access has the potential that many information services are – or soon will be – provided directly to offices and homes. The accessibility of the information entails developments such as e-Government services, civic participation, etc., which will again affect the way how the cadastres will have to provide their services.

The term '**Land Administration**' is based on the definition in the guidelines developed for the UN-Economic Commission for Europe, which defines the term as "the process of determining, recording and disseminating information about ownership, value and use of land when implementing land management policies" (UN-ECE, 1996).

Dale and McLaughlin (1999) write that "the basic building block in land administration systems is the cadastral parcel and that land administration functions can be divided into four functions: juridical, regulatory, fiscal, and information management". Land ownership information and the therefore the cadastre are crucial elements within the land administration framework.

#### 4. EVALUATION OF VISION STATEMENTS FROM TODAY'S PERSPECTIVE

In this section, the six vision statements of Cadastre 2014 are reviewed from a today's perspective with the above mentioned developments in mind.

#### **4.1 Statement 1: "The cadastre of the future will show the complete legal situation of land, including public rights and restrictions!"**

This first statement probably had the most impact on the cadastral system and the professional development. If the cadastre is to be extended to include also public rights and restrictions, it would have major political and legal implications. Several publications, however, reiterated the trend of increasing pressure on the resource "land" and the changing humankind to land relationship, requiring the cadastral system to be flexible and to adapt to the changing needs (Ting and Williamson, 1999).

A recent insider's view by Dale (2006) focused on land administration and the process of determining, recording and disseminating information about the ownership, value and use of land. He identifies the missing recording of the land-use rights in the land books or the cadastre as the weak link in that process. The primary objective of the cadastre and the land book system has been to record the ownership, the physical size and shape of parcels and their value. But with the European agricultural subsidy system depending on the land-use, there is a growing need to have reliable information about land-use rights and obligations attached to a specific land parcel. He writes that we need to know what we are allowed to do with the land that we own as much as we need proof of our ownership.

Dale (2006) continues that there has been increasing concern that all development has to be sustainable. To achieve sustainable development we need to know the rights, restrictions and obligations associated with every piece of land. These should be clearly defined and the information easy to access.

In Switzerland, the geoinformation community recognized the need to record public rights and restrictions and to make them transparent. The professional association of surveyors has initiated a project to browse through the existing legislation and to determine all rights and restrictions that have a spatial component and that have an impact on the ownership of a parcel (Dütschler, 2002 and 2006). The aim is to establish a new service to the land market.

The Swiss government at the moment is discussing and preparing a new Law on Geoinformation; this new law is the consequence of a new constitutional article which for the first time states that national surveying is a matter of the Confederation, who also can define regulations about cadastral surveying and public information concerning the land and its resources. The ensuing Law on Geoinformation now will unify all the existing legislation and will also include basic regulations concerning the documentation of public-right restrictions affecting the land property ownership (see Miserez, 2006).

#### **4.2 Statement 2: "Separation between maps and registers will be abolished!"**

The tendency to amalgamate the cadastral and the land registry organization has increased over the last ten years. Of course, a complete integration of the two organizations is not necessary to achieve the cooperation between them. Sharing and integrating data is possible with the modern IT and network instruments that are available nowadays.

However, there are a few countries, where the cadastre and land registration have been integrated recently. In the Netherlands, the Kadaster provides an integrated service to their customers for more than ten years now. In Norway, the previously decentralized land registration services and archives are being transferred to the centrally organized Statens kartverk over a period of 4 years (Mjøs, 2006). In parallel to reducing the number of courts, a new IT infrastructure is put in place at a central level. Although the cadastre and land register will be kept as separate databases, the user will enjoy an integrated one-stop access.

In Denmark as well (Fauerholm Christensen and Clausen, 2005), the cooperation and sharing of the data is very much enforced for the purpose of providing efficient service to users and citizens.

### **4.3 Statement 3: "Cadastral mapping will be dead! Long live modelling!"**

Data modelling has long been neglected in the discussions about the cadastre and land administration. However, over the last 4-5 years, this topic has more and more been put on the agenda of international discussions.

A significant step has been taken by the 'core cadastral data model initiative' as described by Lemmen et. al (2003). This initiative suggests to establish a standardized core cadastral domain model, covering land registration and cadastre in a broad sense serving at least two goals: (i) to avoid reinventing and re-implementing the same functionality over and over again, but provide an extensible basis for efficient and effective cadastral system development based on a model driven architecture, and (ii) to enable different stakeholders to communicate based on the shared ontology implied by the model, which is to be kept as transparent and simple as possible in order to be useful in practise.

Following this initiative, two events have been organized to foster the issue: in March 2003 the "Workshop on Cadastral Data Modelling" in Enschede, The Netherlands, and in December 2004 the "Conference on Standardization in the Cadastral Domain" in Bamberg, Germany. Data modelling in general has reached a much higher recognition and it now is at the core also of the European INSPIRE project

Also the two definitions, given by Cadastre 2014 have become the issue of international attention. Fourie et al. (2001) observe that in the light of sustainable development and land management, a whole range of land objects, not only ownership parcels are part in a land information system, and that it is high time to start discussions on this issue. The other definition, the principle of legal independence, basically states that data and information from different sources can be integrated and shared independent from the different stakeholders by using a layered approach.

#### **4.4 Statement 4: "'Paper and pencil'-cadastre will have gone!"**

The digital age has come a long way and is now in full swing. Statement 4 and a digital cadastre are therefore not much in question anymore, although of course it always depends under what circumstances a cadastre has to be operated.

#### **4.5 Statement 5: "Cadastre of the future will be highly privatised! Public and private sectors are working closely together!"**

This statement has often been misunderstood; it was thought that it calls for a complete privatization of the cadastre. The aim of it, however, was to show that the involvement of the private sector in carrying out certain tasks – under the supervision and responsibility of the public sector – can lead to considerable savings and accelerations. In Switzerland for example, the involvement of the private sector always was a source of innovation. The private sector with its exposure to the free market can find less costly and more efficient methods for carrying out certain tasks.

Over the last few years, the issue of cooperation between the public and private sectors – also referred to as Public-Private-Partnerships (PPP) – has come on the agenda of the international community. The UN-ECE Working Party on Land Administration (WPLA) for example has run in 2000 a workshop in Albania dedicated to PPP and another one in Vienna in 2002 on "Customers Co-operation Services".

#### **4.6 Statement 6: "Cadastre will be cost recovering"**

Also statement 6 was subject to misunderstandings and the term 'cost recovering' received a lot of scepticism. It however also provoked some discussions and many macro-economic figures have come forward to illustrate the importance of a well-functioning cadastre and land registration system.

Wiberg (2001) for example gave some impressive economic figures about the Swedish land. He estimated the total market value of real estate to 550 billion USD, the total value of mortgages to 204 billion USD and compared this to the annual GNP of 205 billion USD and the total value of shares at the Stockholm stock exchange of 350 billion.

Similar figures came forward for Switzerland. Walther (2004) indicates the total value of real estate in Switzerland at more than 1700 billion USD, and the total amount of mortgages at some 500 billion USD. These figures speak for themselves when compared with the total value of the Swiss stock market exchange of 420 billion USD.

When comparing these figures, the expenses for the operation of a cadastral system – providing the security and transparency for the land market – seem to be negligible and cost recovery more than achieved within the macro-economic context.

## 4.7 Summary

While all six statements still are very much valid also in 2006, some authors made very valuable contributions in order to bring the cadastral as well as the Cadastre 2014 issues into a broader context.

Mainly van der Molen (2003) in his thorough investigation about future cadastres points out that we need to understand cadastral systems not as independent systems or an end in itself, but as part of land administration. And also land administration has to be seen in a broader context, i.e. to achieve sustainable development. Society and politics are nowadays very much concerned with sustainable development in economic, social and environmental terms. The Bathurst Declaration (Williamson and Grant, 2002) established that sustainable development needs a sound land administration system and furthermore that a reliable cadastre can provide very valuable contributions.

When evaluating the Cadastre 2014 statements, van der Molen (2003) also remarks that we need to be aware of the fact that there are significant differences between the 30 to 50 countries that either possess or that will soon possess a land administration system with appropriate performance, and the other 140 to 160 countries that will not have an appropriate system. He argues, that many of those 140 to 160 countries first need to do a great deal of work before they can start thinking about the challenges laid out in Cadastre 2014, although they can adopt the statements as guiding principles.

## 5. CONCLUSIONS

In conclusion, it still can be assumed that Cadastre 2014 can serve as guidelines in what direction cadastres will develop in the future. However, as mainly van der Molen (2003) indicated, the six statements have to be considered with the correct background. The statements are cadastre centred and they need to be understood in a broader land administration context. And it also has to be noted, that many countries have not reached the appropriate level of development for taking these statements on board, although the statements can serve as guidelines.

From a professional point of view, however, it is very crucial that the surveying profession thinks through the meaning of statements. Surveying is the profession that provides the geographic location and description of land objects, be it parcels or land-use right areas. Surveying profession needs to embrace the change of paradigm: surveyors "provide" geodata and corresponding services, which is a different ball game than to just produce maps and plans. Surveyors are part of the information society and they therefore need to understand the rules of the game and play it accordingly; this of course on the sound basis of their traditional craft. This is echoed by Dale (2006): mapping land-use rights is an obligation that cadastral surveyors should take onboard)

And as also Williamson (2005) points out, the cadastral surveyors need to adapt to the evolving context of the cadastre. The cadastre itself has to be understood to be a part of the

broader concept of land administration and the ensuing issues such as land market, e-Governance and e-citizenship. Cadastral surveyors based on the traditional skills and embracing those new opportunities are well prepared for future challenges.

## REFERENCES

- Dale, P. (2006). Recording Land-use Rights. Insider's View in *GIM International*, June, p. 65.
- Dale, P. and J.D. McLaughlin (1999). *Land Administration Systems*. Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, ISBN 0-19-823390-6, 169 p.
- Dütschler, P. (2002). Cadastre 2014 in Practice – Activities of the Swiss Private Sector. *FIG XXII International Congress*, Washington, D.C., USA, TS7.11, April 19-26, 12 p.
- Dütschler, P. (2006). Integration of Public-right Restrictions into Cadastre – Case Study from the Practice. *FIG XXIII International Congress*, Munich, Germany, TS49, Oct. 8-13.
- Fauerholm Christensen, S. and Ch. Clausen (2005). E-Government Initiatives in the Danish Land Administration System. Country report during annual meeting of FIG Commission 7, Madison, WI, USA, 22 June.
- Fourie, C., P. van der Molen and R. Groot (2002). Land Management, Land Administration and Geospatial Data: Exploring the Conceptual Linkages in the Developing World. *Geomatica*, Vol. 56, No. 4, pp. 351-361.
- Groot, R. and J.D. McLaughlin (Editors) (2002). *Geospatial Data Infrastructure: Concepts, Cases and Good Practice*. Oxford University Press, Oxford, UK.
- Kaufmann, J. and D. Steudler (1998). *Cadastre 2014 – A Vision for a Future Cadastral System*. Switzerland, Working Group 1, Commission 7, International Federation of Surveyors.
- Lemmen, Ch., P. van der Molen, P. van Oosterom, H. Ploeger, W Quak, J. Stoter and J. Zevenbergen (2003). A Modular Standard for the Cadastral Domain. *3<sup>rd</sup> ISDE: Digital Earth – Information Resources for Global Sustainability*, Brno, Slovak Republic, 21-25 September, pp. 399-419.
- Miserez, J.-P. (2006). Registration of Public Land Rights and Restrictions in a Land Administration System. *FIG XXIII International Congress*, Munich, Germany, TS49, Oct. 8-13.
- Mjøs, L.B. (2006): New organisations in Norway. Country report during annual meeting of FIG Commission 7, Bled, Slovenia, 13 May.
- van der Molen, P. (2003). The Future Cadastres – Cadastres after 2014. *FIG Working Week*, Paris, France, April 13-17.
- Musungu, K. (2005). *Benchmarking the South African Cadastre Against Cadastre 2014*. Bachelor Thesis, University of Cape Town, School of Architecture, Planning and Geomatics, Geomatics Division, October, 99 p.
- Nogolica, Z. (2006). *Management of Data Harmonization in Real Property Registration and Cadastre Project in Croatia – Implementation Model for the New Land Administration System*. Master thesis, IEDC- Bled School of Management, Postgraduate Studies, April, 74 p.

Rajabifard, A., M.-E. Feeney, I.P. Williamson (2002). *Future Directions for SDI Development*. *International Journal of Applied Earth Observations and Geoinformation*, 4(1), pp. 11-22.

Ting, L. and I.P. Williamson (1999). *Cadastral Trends: A Synthesis*. *The Australian Surveyor*, Vol. 44, No. 1, June, pp. 46-54.

UN-ECE (1996). *Land Administration Guidelines. Meeting of Officials on Land Administration*, UN Economic Commission for Europe, ECE/HBP/96 Sales No.E.96.II.E.7, ISBN 92-1-116644-6, 111 p.

Wiberg, H.-E. (2001). *The importance of the Swedish Land Information System for business activities*. *Proceedings of the International Symposium on "Reforming and Benchmarking the Cadastre: Measuring the Success"*, Gävle, Sweden, June 13.

Williamson, I.P. and D.M. Grant (2002). *United Nations-FIG Bathurst Declaration on Land Administration for Sustainable Development: Development and Impact*. XXII FIG International Congress, Washington DC, U.S.A., 19-26 April.

Williamson (2005). *Building Upon Traditional Skills – The Need to Grasp Chance from Change*. *GIM International*, October, pp. 58-61.

## BIOGRAPHICAL NOTES

**Daniel Steudler** graduated from the Swiss Federal Institute of Technology (ETH) in Zurich in 1983, earned the Swiss license for licensed land surveyor in 1985, and did a M.Sc.Eng. degree at the University of New Brunswick, Canada from 1989-91. Since 1991, he is working with the Swiss Federal Directorate of Cadastral Surveying with the responsibilities of supervising and consulting Swiss Cantons in organizational, financial, technical, and operational matters in cadastral surveying. Since 1994, he is involved in the activities of FIG-Commission 7 as a working group secretary until 2002 being involved in the publications of "Cadastre 2014" and "Benchmarking Cadastral Systems". He became the official Swiss delegate to Commission 7 in 2003. Between April 2000 and February 2004, Daniel completed a PhD at the University of Melbourne, Australia. The main research topic was to develop a framework and methodology for evaluating cadastral systems in the larger context of land administration. Since May 2004, Daniel is working with the Swiss Federal Directorate for Cadastral Surveying and is responsible for a national address data project and the development of international cooperation.

## CONTACT DETAILS

Dr. Daniel Steudler  
Swiss Federal Directorate for Cadastral Surveying  
Seftigenstrasse 264  
CH-3084 Wabern  
SWITZERLAND  
Tel. +41-31-963 2482  
Fax +41-31-963 2297  
Email: Daniel.Steudler@swisstopo.ch  
Web site: [www.cadastre.ch](http://www.cadastre.ch) or [www.swisstopo.ch](http://www.swisstopo.ch)