

# **Future Cadastres: Implications for future land administration systems - bringing the world together?**

**Jürg Kaufmann**

Cadastré and IT Consultant, Chair Working Group 7.1 FIG

KAUFMANN CONSULTING

Hauffeld 109, CH-8455 Rüdlingen, Switzerland

Tel: +41 1 867 34 89 Fax: +41 1 867 34 89

Email: [jkcons@swissonline.ch](mailto:jkcons@swissonline.ch)

**Presented at the UN-FIG Conference on Land Tenure and Cadastral Infrastructures for Sustainable Development, Melbourne, Australia  
25-27 October 1999**

## **ABSTRACT**

'Study cadastral reform procedures as applied in developed countries, take into consideration automation of the cadastre and the role of the 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 20 years, show the means by which these changes will be achieved and describe the technology to be used in implementing these changes'.

This was the task given to Working Group 7.1 of FIG in 1994 during the Melbourne FIG Congress. The result is the publication 'Cadastré 2014; A Vision for a Future Cadastral System'. Starting from the actual cadastral systems dedicated to support the registration of land property, the ongoing cadastral reforms have been analyzed. Two aspects initialized the reforms. On one hand, the existing cadastral systems in view of the needs of societies, have deficits and on the other hand, the possibilities of information technology promise to fulfill cadastral work much more effective and efficient.

A quickly growing world population leads to increasing utilization of natural resources and impacts on environment. The absolute control over his parcel the land owner used to have, is increasingly restricted by public regulations enacted in the interest of the society. The localization and the implementation of these regulations are not always fulfilled with the necessary care. The documentation is insufficient and not open to the public. This implies the danger of arbitrariness. Cadastre 2014 will be the tool to handle the aspects of land appropriate. It creates a model of the entire legal situation of land. Regulations affecting land define normally boundaries demarcating the area where a right or restriction applies. Cadastre 2014 defines these areas as land objects. Future cadastral systems will be public inventories of data concerning all legal land objects in a country, based on a survey of their boundaries. Similar procedures as in the traditional cadastral systems are applied to provide legal security for the handling of regulations based on public law.

It is self-evident, that such modern cadastral systems can only be managed with the help of information technology. Data in a modern cadastral system are to be arranged in a structure corresponding to the structure of the jurisdiction of a certain country, so that the cadastre can adapt to the development of the legislation.

Reliable data provided by modern cadastral systems will strongly support sustainable development. All countries are to resolve problems of the same kind in the domain of natural resource management and environment protection, the different national legislations are developing in a similar way. Modern cadastral systems, embedded in the respective jurisdiction will therefore become

comparable and this will help to bring the world together.

*Keywords and phrases: land administration, future cadastral systems, Cadastre 2014*

## **1 INTRODUCTION**

The world, its different cultures, and its political and economic systems are in a permanent development process. This process is driven primarily by the activity and the creativity of humankind. New medical and technical possibilities have impacts on life, on the way of living, and on the way of doing business. One effect of this development is the growth of the world's population. More and more people are to be provided with food and water, housing, household and transport equipment, energy, etc. An increasing number of people are demanding leisure activities and facilities. The demand for waste removal, water cleaning, and recycling materials is increasing.

This development leads to an increase in the consumption of natural resources, particularly of land. It has been acknowledged that disorganized consumption of natural resources will lead to a degradation of nature, of the natural world, of the environment, and finally of humankind. Efforts are being made to encourage sustainable development. That means that development should be undertaken in such a way that a minimum of resources are consumed. It is the main goal of Agenda 21 to improve awareness of and introduce measures for a sustainable development of humankind in harmony with the environment.

As land is an important part of nature and the environment is the basis for nutrition, housing, energy production, resource exploitation, leisure activities, waste disposal, economic activities - in short for the maintenance and survival of humankind - cadastral systems are a crucial aspect of sustainable development. Traditional cadastre systems, however, can no longer meet the high standards set by sustainable development. There is a need to adapt the currently successful operating cadastral systems to the new standards and to implement improved cadastral systems where no such infrastructure exists. This is one reason for the many ongoing cadastral reforms and efforts in the world. Unfortunately the changes are often not rigorous enough and a lot of human resources and financial means are invested with questionable results.

## **2 SUSTAINABLE DEVELOPMENT AND CADASTRAL SYSTEMS**

To be able to use land and natural resources in a sustainable manner it is necessary that one can access a reliable bookkeeping system. As the successful operation and development of a business is based on a well developed financial administration system so the sustainable development of humankind must be supported by a complete land administration system. Like the financial administration system, the land management system must obey clearly defined rules that are valid world-wide in principle, and which are only adapted in detail to accommodate national and cultural peculiarities.

Cadastral systems will in future provide this bookkeeping as the framework of sustainable development. The principles of a cadastre are acknowledged world-wide. The details can be adapted to meet the needs and traditions of a particular country.

Land management needs reliable information about the existing land and its resources and about the legal situation of these items. This information will be provided by future cadastral systems. Cadastres will be the land administration systems that will support the world's hoped for sustainable development.

### **3 PRINCIPLES, CONTENTS AND STRUCTURE OF FUTURE CADASTRAL SYSTEMS**

Commission 7 of FIG, aware of the need for change in the cadastral domain and of the efforts in cadastral reform, initiated at the Melbourne 1994 FIG Congress Working Group 7.1 the terms of reference for which are 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.

The result of this work was published by myself and my Working Group Secretary, Daniel Steudler, as a brochure with the title 'Cadastre 2014, A vision for a future cadastral system' [Kaufmann, Steudler, 1998]. It was presented at the FIG Congress in Brighton.

We studied the existing literature and the experience being gained in ongoing cadastral projects and had discussions with Mr. Jo Henssen the former chairman of the Office Internationale du Cadastre et du Registre Foncier, OICRF, an institute of FIG. These studies gave a clear view of the role and principles of cadastre and the importance of the security it provides for the coexistence and economic activities of humankind. Economic development on the basis of a functioning land market is only possible when land matters are settled in a legally correct way and within a secure legal environment. We also found that the traditional principles are proven and true and must be the basis for modern cadastres.

After a wide-spread survey of existing cadastral systems and the reasons and aims of the ongoing cadastre reforms, and a second enquiry into the development of privatization and cost recovery in the different cadastre institutions, we were able to identify the deficiencies of existing cadastres and the trends in development. It became clear that the documentation and registration of private land rights does not provide enough information to assemble a complete picture of the legal situation of land. The legal situation has changed remarkably in the last few decades because societies had to introduce new legislation under public law which had impacts on private land rights. In the interest of a careful utilization of land, physical planning was established, and new laws were aimed at better protecting the environment and the people living in it. The exploitation of limited natural resources was regulated. All these new laws, in a certain sense, favour sustainability.

It can be considered as a fact that further regulations will and must be implemented to resolve the problems caused by the world's growing population and changing

ways of living. This is in the sense of sustainability but the danger exists that all these regulations hinder development and even sustainable development. Furthermore, all these regulations touch the absolute rule of the land owner.

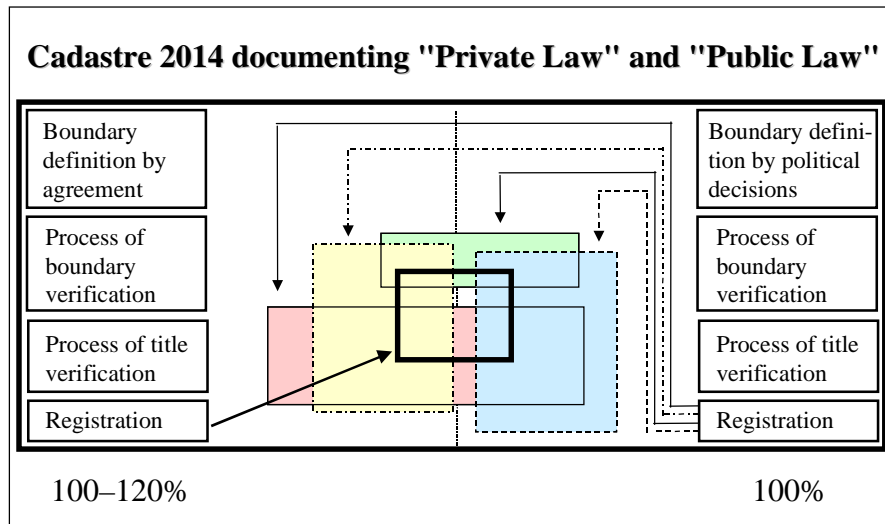
Modern cadastres must take into consideration this development but they must also follow the proven principles of the traditional cadastre. Cadastre 2014, therefore, enlarges the objects to be processed by the cadastre and the content of cadastral systems.

The new objects to be processed are the land objects. Land parcels are a category of land objects.

Traditional Definition	Definition of Cadastre 2014
<p><b>Land Parcel</b></p> <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><b>Land Object</b></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>

The content of modern cadastres take into consideration all land objects in a defined area.

Traditional Definition	Definition of Cadastre 2014
<p><b>Cadastre</b></p> <p>Cadastre is a methodically arranged public inventory of data concerning <b>properties</b> within a certain country or district, based on a survey of their boundaries.</p>	<p><b>Cadastre 2014</b></p> <p>Cadastre 2014 is a methodically arranged public inventory of data concerning all <b>legal land objects</b> in a certain country or district, based on a survey of their boundaries</p>



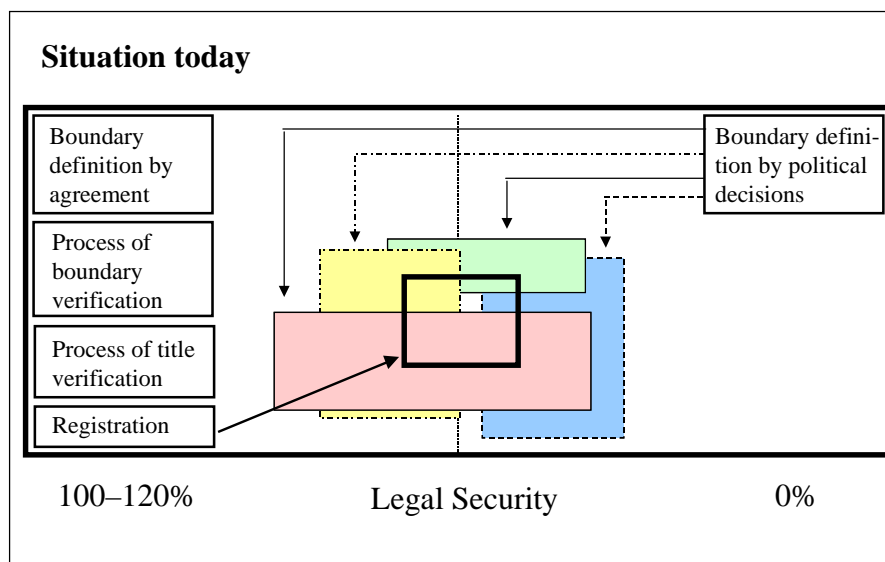
This definition corresponds to the first six statements on Cadastre 2014 which states:

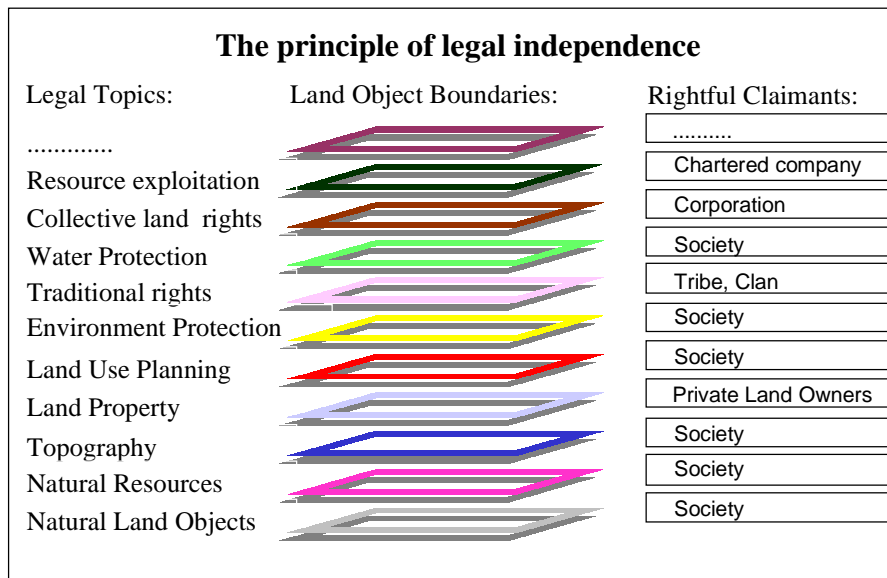
**Cadastre 2014 will show the complete legal situation of land including public rights and restrictions!**

Every piece of legislation concerning land matters defines legal land objects. All these land objects are to be carefully defined, verified, and kept in a public register. Otherwise the legal security important to governments and administrations, economies,–private persons, and land owners will not be provided. Lacking legal security leads to uncertainty, lack of confidence, disorder, and finally chaos. This means that citizens lose confidence in their country’s institutions, the land market as an essential part of the economy ceases to function, business becomes weak, and the whole system can crash. We can see such effects in different regions of the world. We can characterize the actual situation as follows:

Future cadastres shall correct this dangerous situation by applying the principles of cadastral systems on all legal land objects.

All legal land objects must be carefully delimited, verified, and registered. This future complete documentation of the legal situation of land must respect a certain structure. It must respect the principle of legal independence, which is shown in the illustration below.





The different legal land objects are to be arranged according to the laws by which they are defined. This structure allows the immediate adaptation of the cadastre to the development of the legislation. It is not necessary to rearrange the information. New legal topics can be simply added.

The second statement on Cadastre 2014 says:

**The separation between 'maps' and 'registers' will be abolished!**

The establishment of separate organisations for map production and land registration was often necessary because the two operations used to require different skills, and the available technology did not allow for other solutions. With information technology (IT) it is possible to link land objects directly with the information needed for registration. Land objects can be described in future by the geometric and the alphanumeric parameters, with the latter containing the legally relevant records. The still often practised separation of the physical and organisational structure will become unnecessary.

Statement three takes into consideration that modern information technology based cadastres will have a forceful impact on the way of working:

**'Cadastral mapping' will be dead! Long live modelling!**

Information technology works with digital data and provides the ability to model objects of the real and legal world. Maps as analogue representations will lose their function as information storehouses; their only purpose will be to represent information in such a way that it can be communicated easier and in a more comprehensive form. In future we will have increasingly different graphic representations as extracts of the cadastral model tailored to the needs of the

individual customer. To store maps as a picture on a computer is therefore an archaic operation.

The fact that in future information technology will be used to operate cadastral systems is expressed by statement four:

**'The paper and pencil cadastre' will be gone!**

As you can see from the terms of reference of our working group, the work concentrated on developed countries because one thought then that in developing and transitional countries the traditional methods would be carried on. Today, five years later, you cannot find any cadastre project in the world where information technology is not involved. IT makes work easier.

The trend to privatize at least the operational work to be executed in the field of cadastre is reflected in statement five:

**Cadastre 2014 will be highly privatized! Public and private sectors are working closely together!**

The privatization and new public management topic will affect the cadastre as it affects any other domain of human activity. This is a fundamental trend. The public domain will nevertheless have to provide for secure land titles but it will outsource most operational work and concentrate on supervision.

Finally, in statement six the aspect of cost recovery which is also a potent trend is expressed:

**The cost of Cadastre 2014 will be recoverable!**

The awareness that even operations executed by the public sector have their price, and that the public and the private sectors have at least to cover their costs leads to efforts to implement cost covering fees also in cadastre. In several cadastral systems it was proved that cost recovery is possible. Because cadastre is a long-term investment the depreciation period for the initial investment costs can be longer than for normal goods.

#### **4 SUPPORT OF SUSTAINABLE DEVELOPMENT**

Future cadastral systems will support sustainable development in several respects.

As mentioned earlier it is the bookkeeping system for scarce resource land. Bookkeeping is accurate, documents facts, and, therefore, avoids disputes. Sustainable development often is hindered by fruitless discussions. Future cadastral systems document all facts in an indisputable manner.

Decisions in the interest of sustainable development can be taken on the basis of complete and reliable information. This accelerates the execution of the decisions.

Because future cadastral systems provide a reliable and clearly defined model of the existing situation, the effects of planned measures can be tested in the model. Erroneous decisions can be avoided.

The earlier mentioned danger that too much and/or inconsistent regulations make development, and in particular sustainable development, impossible can be banned because over-regulation and inconsistency can be identified with the help of a complete and reliable cadastral information during the early stage of action.

The time consuming acquisition of base data, which today often can consume more than 50% of project time, will not be necessary when the cadastre provides complete and reliable information. Projects in favour of sustainable development can be implemented in shorter periods. Money and human resources can be saved and humankind and the environment can profit earlier from sustainable development.

## **5 BRINGING THE WORLD TOGETHER?**

It is a fact that the topics to be regulated world-wide are becoming increasingly similar. Globalization and internationalization and the resultant contacts advance this process. The efforts for sustainable development and the respective conferences make the necessity of comparable regulations obvious.

Cadastrals are based on world-wide comparable principles and on a common language. This is shown by the activities and in particular the conferences of FIG in which more and more countries take part. That the brochure on 'Cadastre 2014', after one year, is available in 10 languages is evidence that the world is coming closer together.

Modern cadastrals as the future land administration systems will become more embedded than hitherto in the converging legislation. Thanks to their completeness, reliability, and objectivity, they will strengthen the users' confidence and will therefore help to bring the world together.

## **CONCLUSIONS**

Sustainable decisions can only be taken and enforced when based on reliable and complete information about the situation of land. Political discussions can then be focused on the really existing problems and the possible solutions. A waste of mental and intellectual resources will be the result of missing facts. The relevant facts are created by legal assignments. A careful and secure documentation of all legal facts concerning land is the aim of future cadastral systems, such as it was the aim of traditional cadastral systems to provide the facts about private property rights. Modern cadastral systems, providing complete information about land and enabling efficient and effective use of it, represent a strong support for sustainable development. Humankind needs modern cadastrals as a mighty tool to manage the further development of the world.

## **REFERENCES**

Kaufmann J., Steudler D. with Working Group 7.1 FIG Commission 7 (1998) Cadstre 2014, A Vision for A Future cadastral System