The Boundary Concept: Land Management Opportunities for Sustainable Development Provided by the Cadastre 2014 Approach

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Key words: cadastre, Cadastre 2014, boundary concept, land management, boundary rearrangement, conflict resolution

SUMMARY

Cadastral systems served traditionally as a tool for land administration and land management. They normally followed the boundary concept. The modern technologies allow it, to enlarge the content of the cadastral systems by further information documenting besides the property rights all legal arrangements creating impacts on land. The conditions and procedures for such modern cadastral systems were outlined in the FIG publication 'Cadastre 2014 - A Vision for a Future Cadastral System' published at the FIG Congress 1998 in Brighton (UK).

Modern cadastral systems can serve much better as a basis for land management, which in fact is the rearrangement of boundaries defining rights and restrictions concerning land.
The purpose of land management can therefore be defined much broader in the future.

Land management methods based on modern cadastral systems which give a reliable and complete picture on the legal situation of land can be used to resolve problems in the fields of spatial planning, environment protection, land use conflicts, agricultural development, energy and resource management, social problems resulting from illegal land occupation and the parallelism of formal and informal right systems and even ethnic and territorial conflicts. They can become the key tool for a sound sustainable development.

The paper gives an overview on the legal preconditions, which are well developed in Switzerland and it outlines the new opportunities.

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1. CADASTRE 2014 AND THE BOUNDARY CONCEPT

1.1 Boundaries

A boundary is a dividing line between physical or abstract spheres. They separate areas belonging to different territories, societies, jurisdictions, clans and natural and legal persons. They mark areas where something is allowed or forbidden. They describe the edges of spheres were unique conditions exist. The boundary line is the locus where conditions change.

Boundaries are most important in our daily life. Every human being needs a personal sphere to survive. The walls and the door of the bedroom protect my personal sphere. The house wall separates a cold and wet from a warm and comfortable atmosphere. The boundary of my immovable property gives me a space where I can do what I want. (if I'm not too loud, which is a restriction), When crossing a state boundary (border) I will have differing opportunities.
In the education we need boundaries for our children but for the educators as well. We shall respect boundaries in the relations with our neighbors, friends, and enemies.
Social life would be impossible without boundaries.

We surveyors are the professionals fulfilling successfully since centuries the noble task of boundary negotiations, boundary fixing and boundary localization on international, national regional and personal levels.

1.2 The Boundary Concept as base of Cadastre 2014

In the center of the FIG publication 'Cadastre 2014 – A VIsion for a Future Cadastral System', presented the first time at the XX, FIG Congress 1998 in Brighton, six fundamental statements formed the key message. Figures 1 to 6 explain these six statements.

These statements have been adopted by different jurisdictions either fully or in the most cases partially.

The separation of the graphical and the registration part of cadastre systems was overcome in the most of the countries starting with a setup or the reform of the cadastre. The aspect of modeling has become a key issue, as is shown by studies like Cadastral Core Model and by practical implementations of data models in different projects. Even hardliners promoting low-cost cadastral systems have found out, that the application of IT is inevitable to achieve efficiency at reasonable cost. The implementation of a private sector in the field of cadastre survey is a main topic in cadastre and registration projects of the Worldbank many national

donors. The question of at least partial cost recovery of the investments in the cadastre is implemented in many jurisdiction in order to make the cadastral organizations self sustainable.

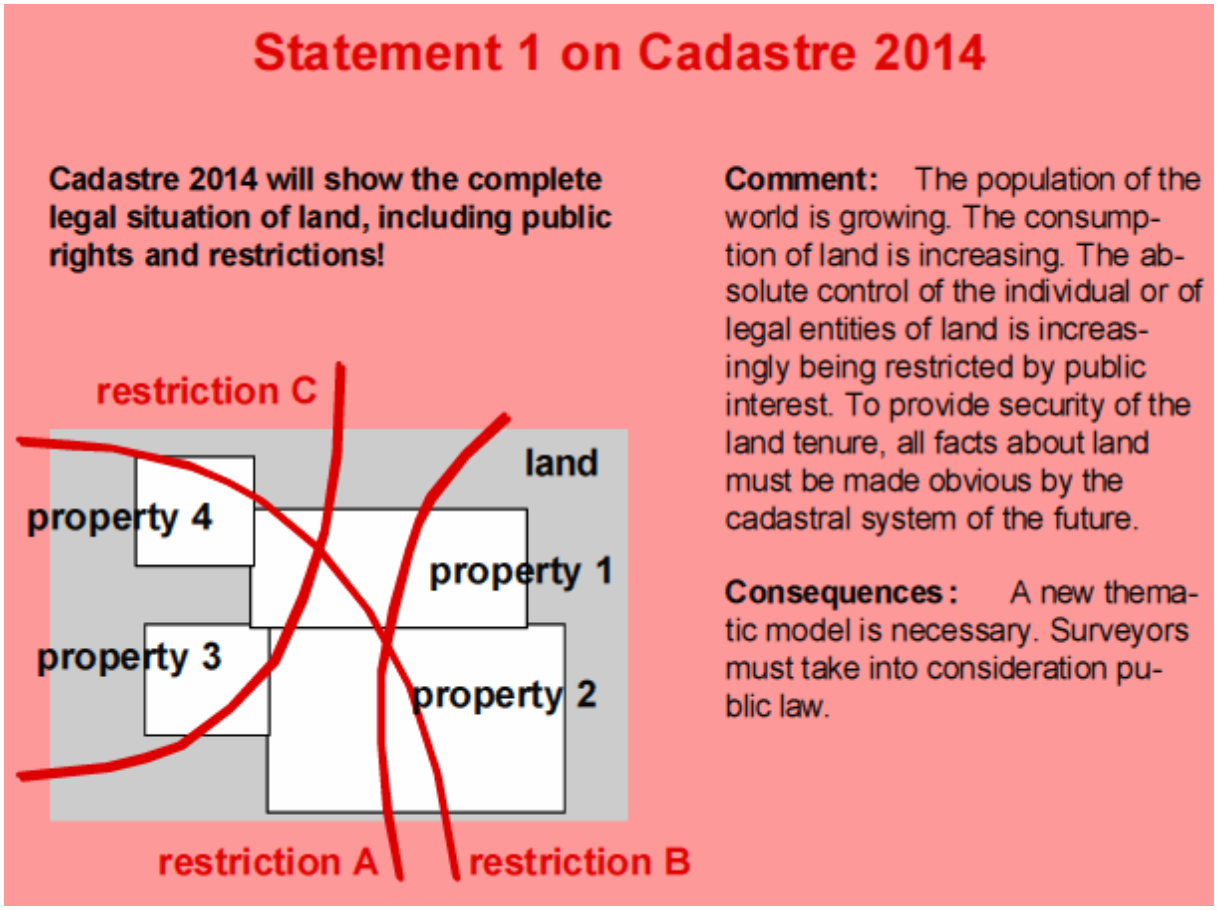

Figure 1 Modern cadastres document boundaries of property rights and restrictions

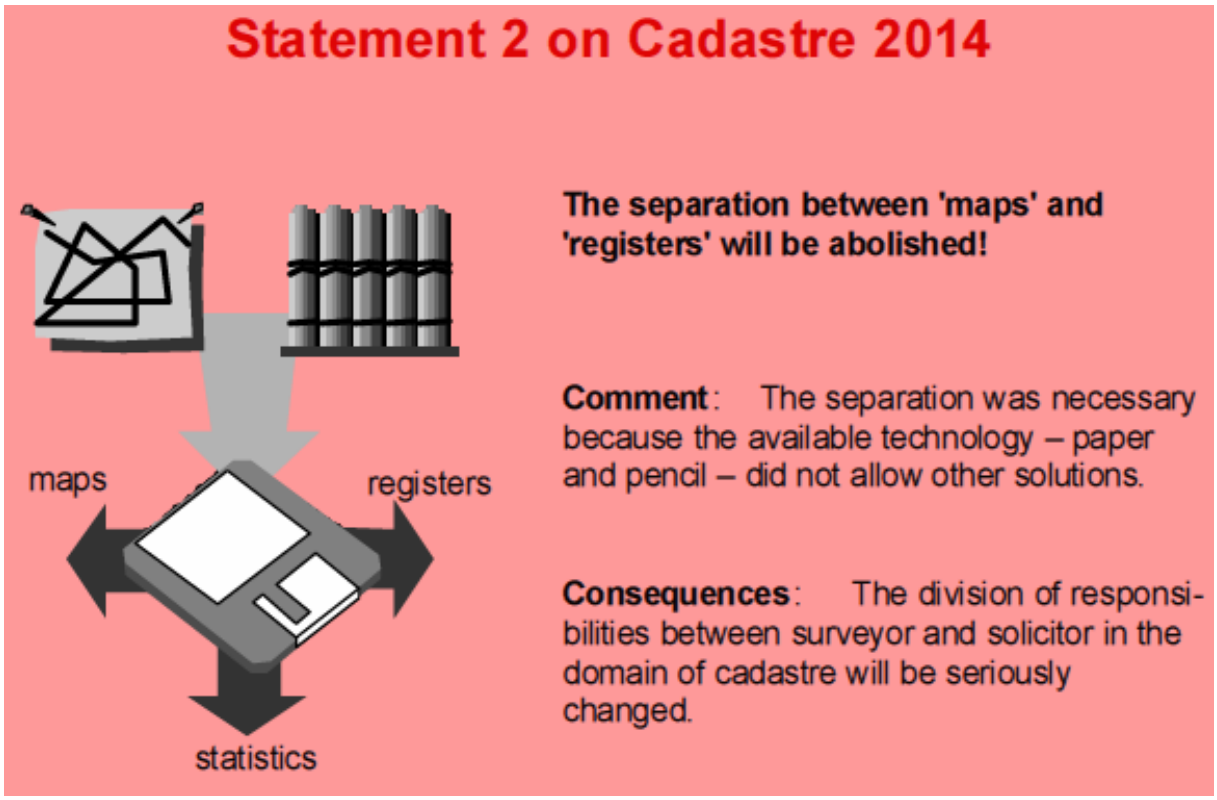

Figure 2 Institutions come together

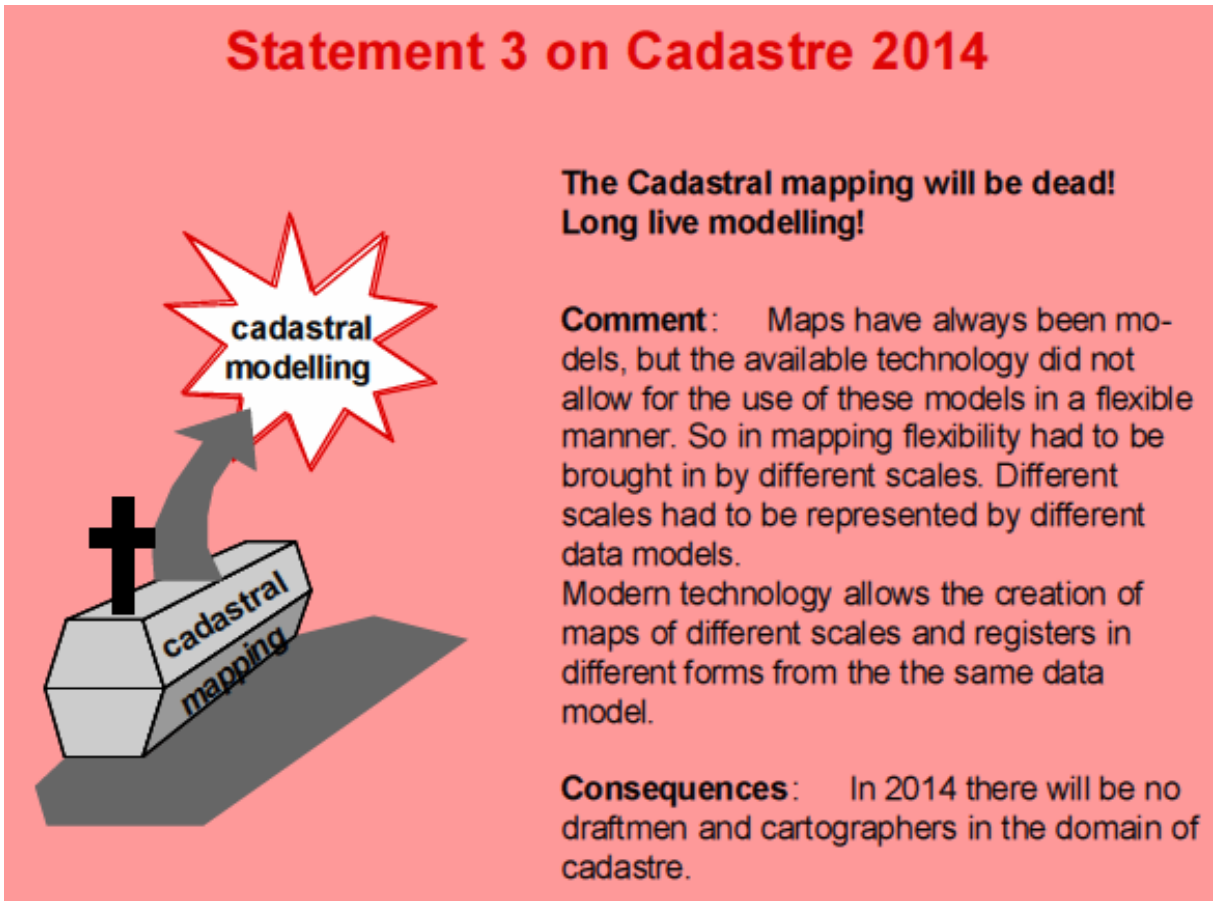

Figure 3 Data modeling instead of mapping

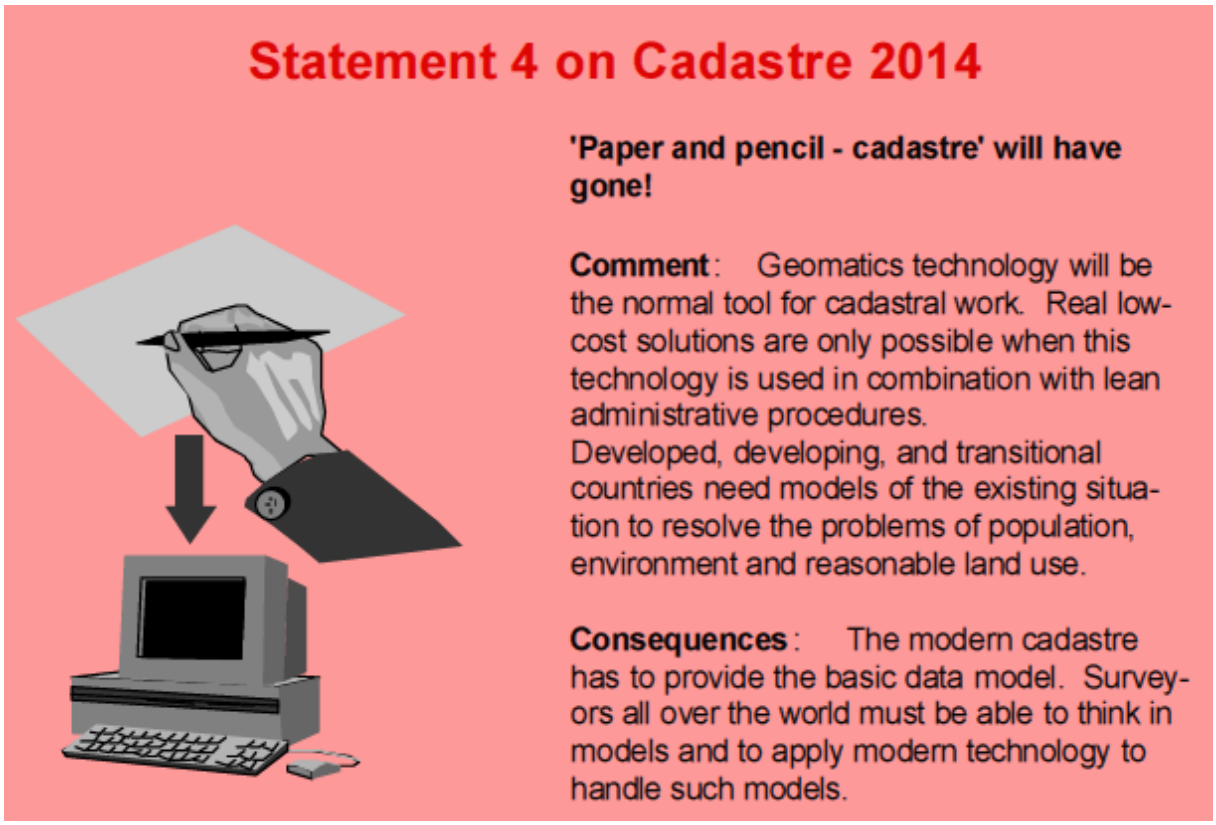

Figure 4 Modern cadastres bas on IT

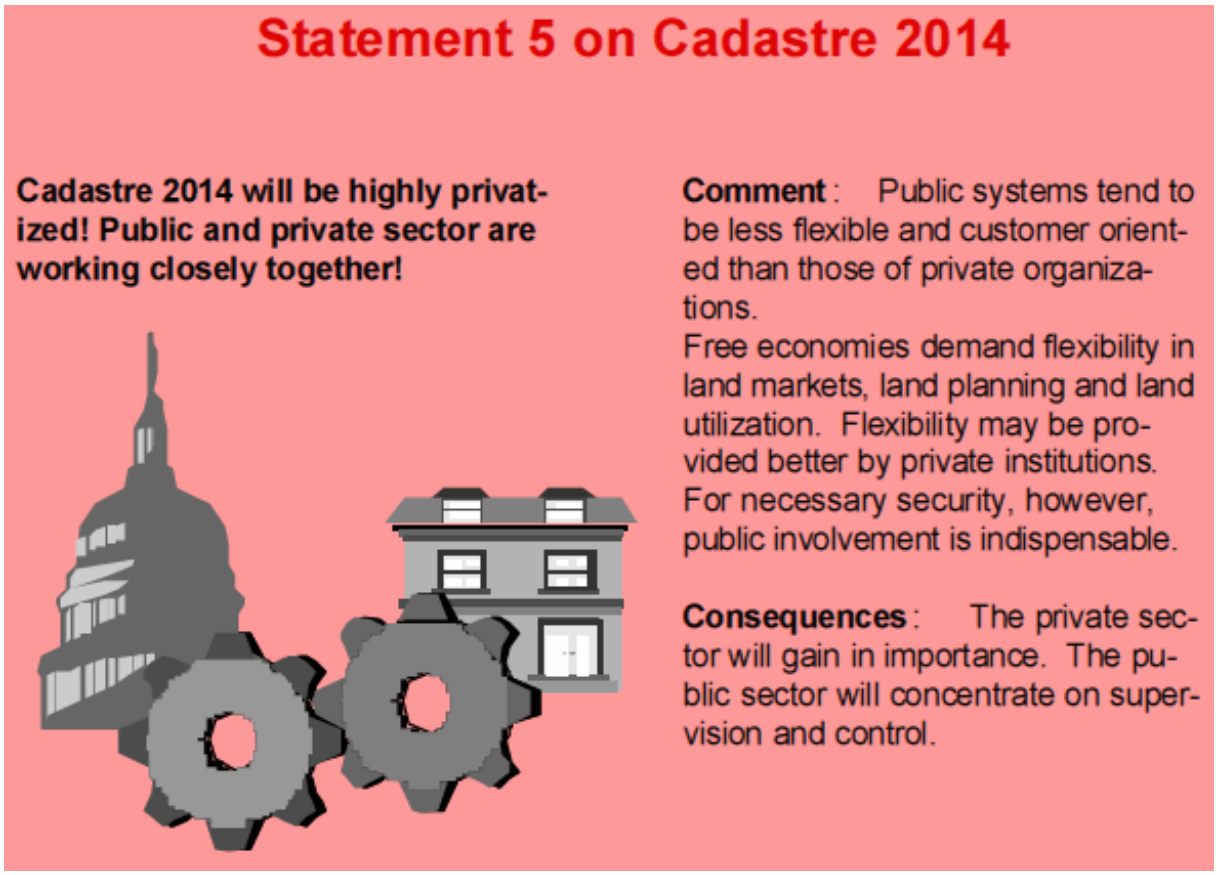

Figure 5 Public Private Partnership in Cadastre

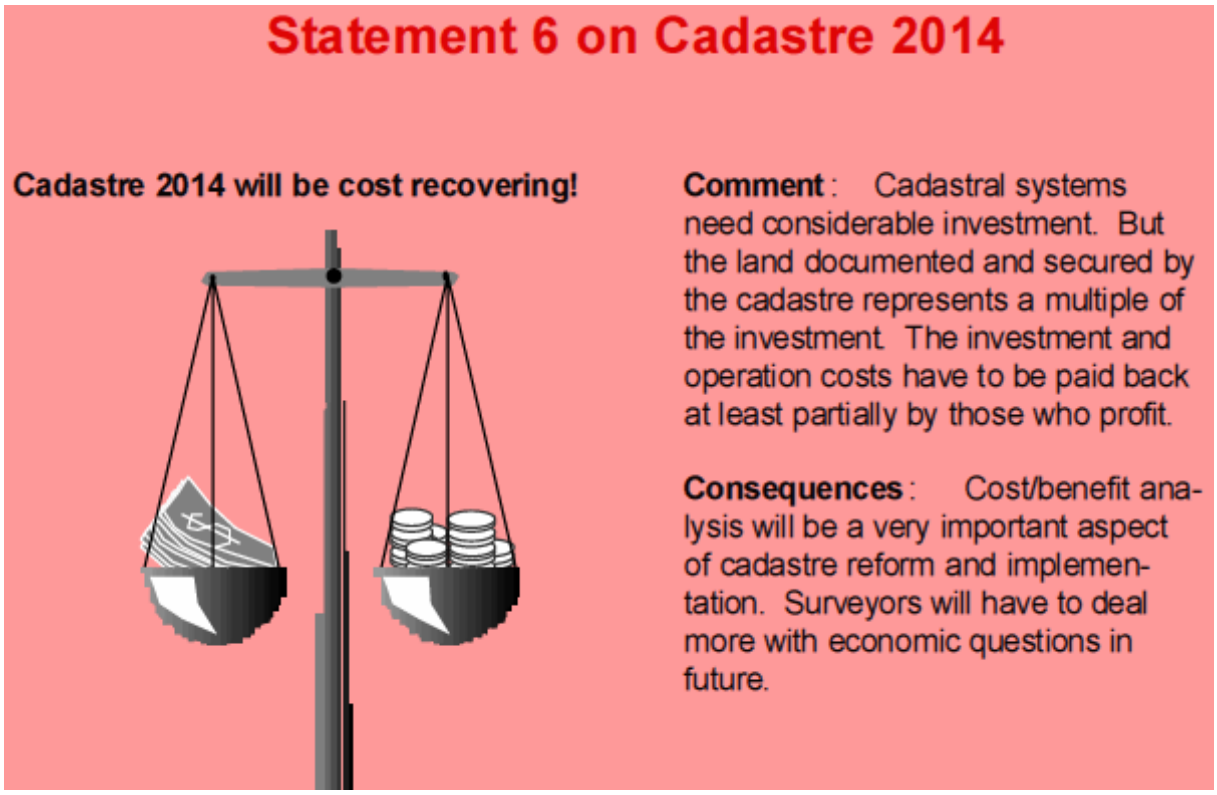

Figure 6 Cost recovery aspect

The key issue of Cadastre 2014 is the statement 1 concerning the documentation of the restrictions of the property rights normally stipulated in the constitutions. Statement 1 is based on the boundary concept.
Statement 1 is not yet implemented in many countries.

Only Switzerland has so far taken an initiative to introduce a C**adastre on Public-right Restrictions** in the framework of the Law on Geoinformation, which will be put to force by mid 2008. This enlarged cadastre will contain the legal land objects defined by the different laws on construction, on traffic infrastructures, on land use planning, on environment and heritage protection, on protection from disasters, etc.

The establishment and the maintenance of the traditional cadastral systems covering the documentation of the land parcels and the registration of the respective property rights seems to be a rather challenging task. An enlargement of the content of the cadastre is therefore postponed to a later period.

A further reason for hesitating to make a step in this direction may be that the **boundary concept** underlying Cadastre 2014 is not understood by many professional. This concept is not discussed in detail in the brochure, but appears, when the definition of legal land objects is explained as shown in figure 7.

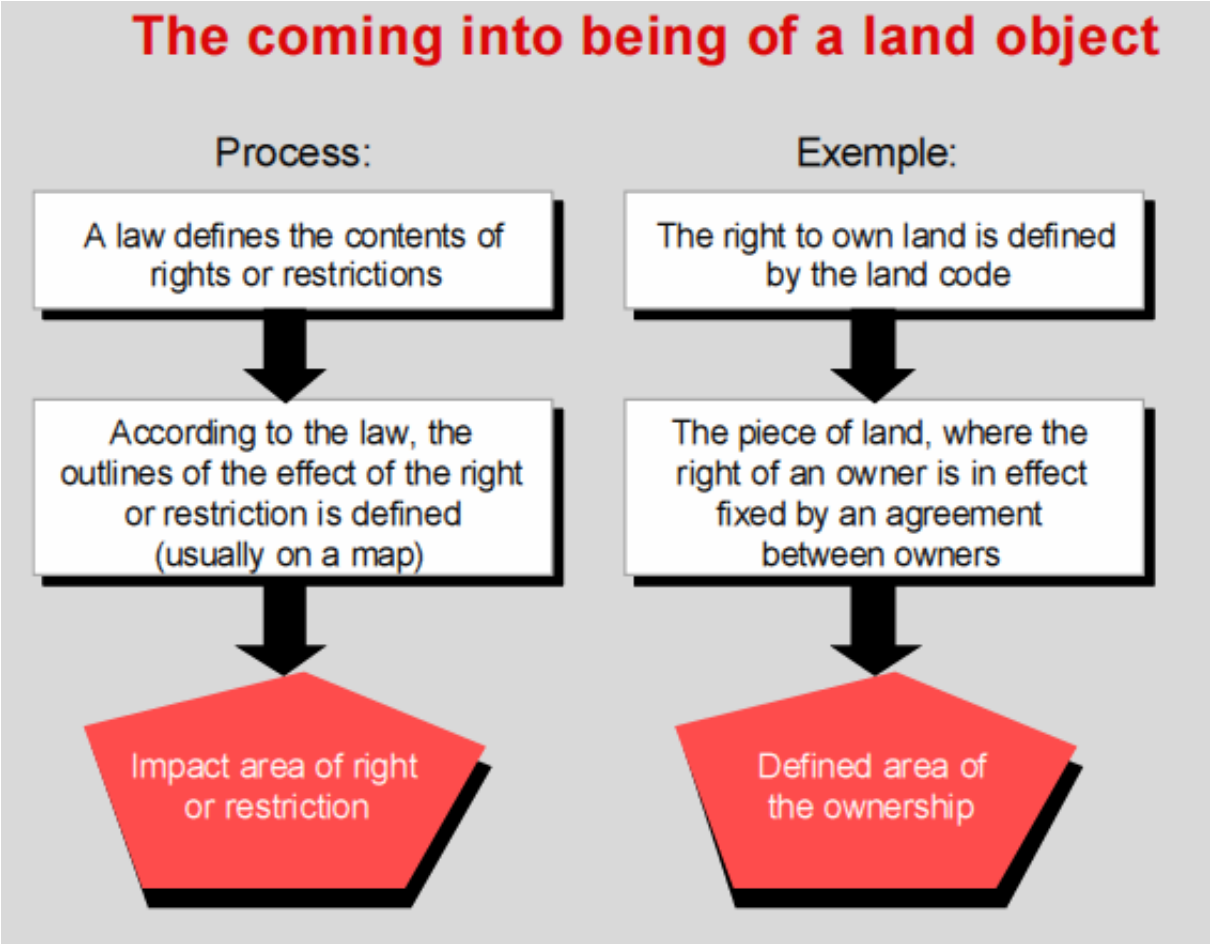

Figure 7 Land Objects are defined by boundaries

The boundary concept is applied normally in the traditional cadastral systems to identify the sphere of properly of the rightful claimants to land. The process of boundary definition and marking together with the neighboring owners or possessors before the survey work is well known by the cadastre professionals. This is the most important step in cadastral surveying both in the establishment and the maintenance of a cadastral system. The owners are the essential key persons and they are given the opportunity to approve their boundaries during the public display of the results of the documentation work. The boundaries are the key issue in the traditional cadastre systems.

My experience shows that the important boundary concept is often not applied properly. Fearing the effort necessary to involve and to deal with the rightful claimants, cloudy procedures are applied to get somehow a definition of the boundaries. Instead quite a lot of money is spent for often ineffective 'public awareness campaigns'. But the best public awareness campaign is the direct work with the rightful claimants.

An important effect of the boundary concept is the fact, that in an IT environment the areas of the parcels are the result of a calculation and have no error margin any more. Many

professionals are not aware and invest too much effort in the area question. We have to explain the people that if the boundary is approved, the resulting area and its changes are to be accepted. The boundary is the key issue of the cadastral professionals.

The same boundary concept is valid for the restrictions of the property rights resulting from the public law arrangements as can be seen from figure 7.

But the definition process is different. It is the society as a whole which defines the boundaries of the spheres of restrictions when it adopts a law with the respective plans. In Cadastre 2014 the specialists will have besides the correct dealing with property boundaries as well the task to take care of the correct handling of the boundaries of the land objects restricting the property.

The boundary concept is fundamental for Cadastre 2014.

2. THE BOUNDARY CONCEPT AS A CHANCE FOR SURVEYORS

The principle of the legal independence (see figure 8) stipulated by Cadastre 2014 allows it to model every physical or virtual configuration of boundaries.

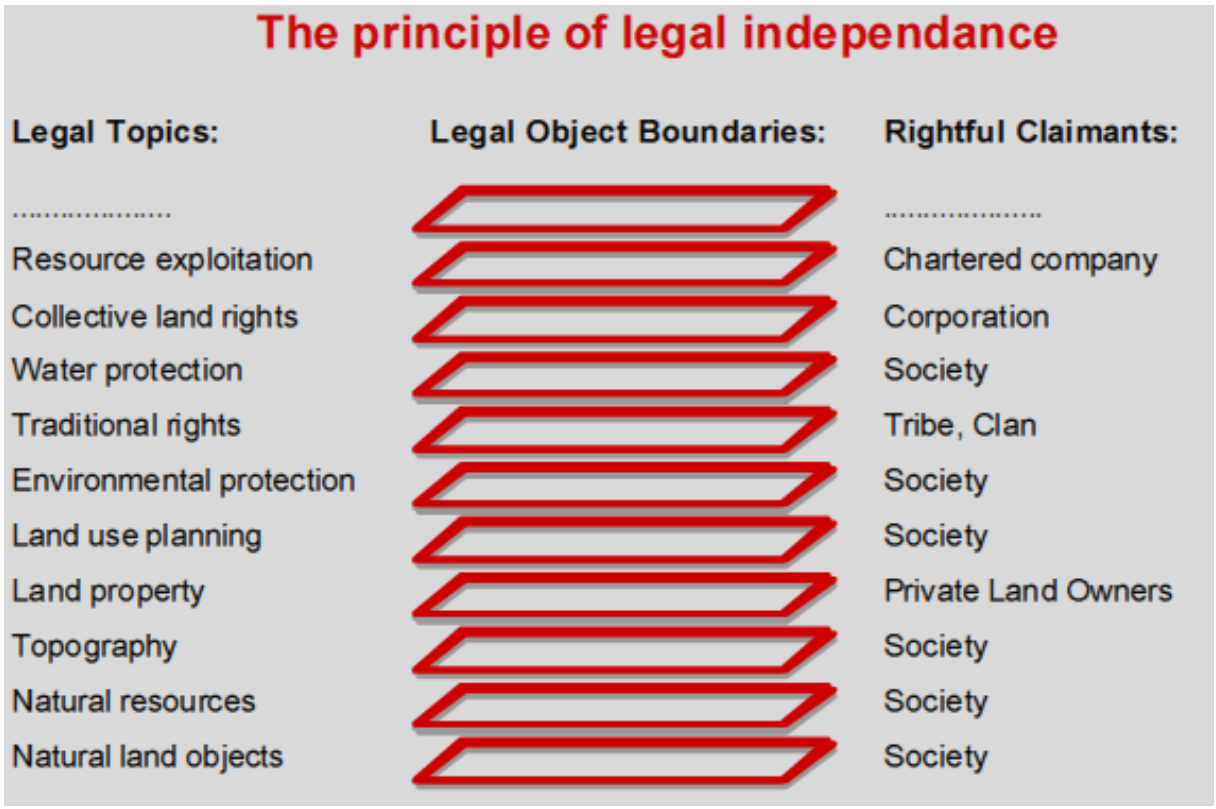

Figure 8 Principle of legal independence

In addition to the above mentioned legal topics and respective boundary configurations state boundaries, district and municipal boundaries are objects based on public laws and treaties. Land valuation as well is normally regulated by law and can be included in the data model. While agricultural land is based on soil quality which can be represented by boundaries separating areas with differing production values, the values of immovable property units are defined in relation to areas around built cpmplexes.

All these boundaries can be documented by cadastral systems obeying the principles of Cadastre 2014. And they can and shall be handled by cadastral specialists.

In Switzerland, the Association of Geomatics and Landmanagement geosuisse is working on a definition of the professional fields of activities according to figure 9

fields of business activities	tasks	space related activities	tools/methods
strategy	visions and goals	space policy	Political activities
management	measures and projects for the implementation of the policy	**land (space) management**	**LANDMANAGEMENT** land use planning land consolidation land reallocation melioration landscape dev. land recycling
administration	active handling of spatial information Data exploitation, visualization, creation of reports	**land (space) administration**	monitoring navigation geoinformation
documentation	cadastre operation data modelling, data acquisition, data maintenance	**land (space) documention**	land registration cartography surveying geodesy **GEOMATICS**

Figure 9 Field of activities of Swiss surveyors

The services of land administration and land management are based on a comprehensive documentation of the legal situation of land. Land management is finally the rearrangement of rights to land and other land objects. It is a fact, that in planning processes most of the time, namely approximately 75% is consumed by the acquisition and preparation of the basic data. Only 25% is left for the real planning work. With a comprehensive documentation of the legal situation, this ratio can be changed to be 25:75.

3. OPPORTUNITIES CREATED BY THE BOUNDARY CONCEPT

The boundary concept is a fundamental tool of land management. Some opportunities are outlined in the following chapter.

3.1 Land Consolidation

Land consolidation is a typical land management task, which will be much more efficient by using the comprehensive documentation on land rights and restrictions. New boundaries, which allow the more efficient land use, are created.

3.2 Land Use Planning

The experience shows that land use planning cannot be implemented without a stringent rearrangement of the land ownership rights. Land use conflicts can be resolved by methods of the reallocation of land rights with new boundaries taking into consideration the guarantees provided by the constitutions and the respective legal framework.

3.3 Environment Protection

Environment protection measures can better be implemented when land management methods are use to compensate disadvantages for the land owners by changing the boundaries to optimize land use and protection.

3.4 Traditional Land Right Management

Often the traditional land right of indigenous tribes are overlapping modern property right arrangements. Protection of important sites and traditional land rights can be enforced by land management methods as compensation and reallocation of rights by rearrangement of the boundaries.

3.5 Territorial Conflict Resolution

Territorial conflicts are about influence on people and/or resources. Clean compensation principles combined with the boundary reallocation methods of land management can help to find solutions.

3.6 Ethnic Conflict Resolution

Land management methods can help to resolve ethnic conflicts by rearranging the boundaries of states and districts according to democratic decisions of ethnic entities.
There are a lot more examples, where the boundary management can be helpful.

4. CONCLUSION

Comprehensive documentations of the really existing legal situation of land based on the boundary concept as proposed by Cadastre 2014 will form a mighty basis for land management in different areas. It will be a task of the surveyors organized in FIG to develop and implement land management activities to help to resolve the social and environmental problems of the human community.

REFERENCES

BIOGRAPHICAL NOTES

Jürg Kaufmann

Date of birth: 22. August 1942
Nationality: Swiss

Education
- Federal Institute of Technology ETHZ, Dep. Mathematics/Physics, 1962,1963
- Federal Institute of Technology ETHZ, Dep. Rural Engineering and Surveying, Diploma 1967
- Diploma of Institut Mössinger, Business-School
- Licence as Swiss Federal Licensed Surveyor, 1981

Languages: German, English, French, Italian

Consulting Experience
- Member of the Project Management Board of 'Reform of the Swiss Official Cadastral Surveying'
- Consultant to national, cantonal and municipal authorities for Cadastre and GIS in Switzerland
- Consultant for Cadastre Projects in Belarus, Ukraine, Kosovo, Serbia, Macedonia, Azerbaijan
- Chief Technical Advisor for Georgia
- Consultant to the Government of the Principality of Liechtenstein for implementation of the National Geodata Infrastructure
- Member of the drafting committee for the Law on Geoinformation

Professional Experience
- since 1988: Independant Consulting Engineer, *KAUFMANN CONSULTING*
- 1981-1988: Keller Vermessungen AG, Switzerland, Chief Executive Officer
- 1979-1981: Federal Institute of Technology Zürich, Senior Assistant Geodesy and Land Information Systems
- 1970-1979: Digital Ltd, Zürich, Informatics Services for Engineering, Director
- 1967-1970: Federal Institute of Technology, Zürich, Assistant Land Management and Cadastre

International activities

- Delegate of the Swiss professional organization of surveyors in FIG, Commission 7, Cadastre and Land Management
- Member of working group 'Statement on the Cadastre'
- Chairman of working group 'Cadastral reform and procedures; Cadastre 2014‘

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