REGISTRATION OF PROPERTIES IN STRATA

REPORT ON THE WORKING SESSIONS

INTRODUCTION

A cadastre is usually, and in most countries, a parcel-based, and up-to-date land information system containing records of interests in land (rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. Some countries do however also register apartments and other structures above or under the surface as property objects in line with parcels on the surface. In this workshop the cadastre is seen in relation to land registration as one system of land administration.

However, until now, the legal boundaries of parcels used for the registration of the legal status are usually fixed in 2D space. It is difficult to reflect the vertical dimension of the legal status of real estate objects, which may be important in current cadastres with most 3D relationships registered administratively, as an attribute of defined parcels, using condominium or strata title legislation.

In areas with an intensive use of land, there is a growing interest in using space under and above the surface. To be able to define and manage the juridical situation satisfactory, 3D geo information becomes therefore indispensable in registering today's world.
More and more situations occur in which the vertical dimension is an important factor in registering the legal status of real estate objects. Land Registration Offices and Cadastres throughout the world are being confronted to register those situations within the current registration possibilities. Since it is expected that Land Registration Offices and Cadastres will meet registration complications in the future, the way to register the legal status of real estate objects for which the third dimension is a matter of importance. It will be a challenge to science to find the right geometric descriptions.

This workshop has been organised as part of the activity of Commission 7 (Cadastre and Land Management) of the International Federation of Surveyors (FIG). The aim of the workshop is to consider the 3D issue of cadastral registration in an international context. The possibility to register property in three dimensions efficiently (including under and above the surface) will facilitate the separate use of spaces. It should also stimulate the improvement of the legal security of spatially complex rights. It may be expected that the workshop will form the start of international FIG discussions on 3D Cadastres as the next 2002-2008 FIG work plans will be approved not earlier then in 2002.

FIG Commission 3 (Spatial Information Management), FIG Commission 7 (Cadastre and Land Management) and the Bureau of the UN Economic Commission for Europe Working Party on Land Administration (WPLA) encourage this workshop.

The main purpose of this workshop is to open international discussion on 3D Cadastres and exchange the status, experience and (planned) developments on use of 3D cadastral registrations. It will be a useful workshop aiming to exchange ideas, experiences and knowledge, concerning technical, legal as well as organizational aspects of a 3D Cadastre. The workshop focuses on the following subjects:

- the legal status of 3D objects, limitations, etc.
- conditions for establishment, including relations to neighbouring properties, etc.
- the registration of 3D objects, both the legal status and the geometry
- practical aspects, considerations and solutions for the establishment of a 3D Cadastre.

WORKING SESSIONS

The International workshop on '3D Cadastres' included three working sessions – one each for technical, organizational and legal issues.

The overall objective was to provide some feedback to FIG Commission 3 (Spatial Information Management) and FIG Commission 7 (Cadastre and Land Management).

OUTCOMES OF THE WORKING SESSION ON TECHNICAL ISSUES

(Chaired by Chris Gold, Hong Kong Polytechnic University/presented by Chrit Lemmen, Kadaster, the Netherlands)

During the working session three general themes were identified:

1. the concept of property (values/law);
2. user needs and requirements;
3. system design.

1. The concept of property

We have to base any system design on the concepts of ownership of property, value systems and law.
These vary by locality and culture. For this reason systems can be either very complex or very general.

2. User needs and requirements

The primary concern is to prepare a set of user requirements, where the user is the average property owner, rather than the system developer or the land surveyor.
Examples include:

- Ease of understanding of 'property'
  E.g. in the UK it is possible to be the owner of a 'piece of air'. Is this something real or virtual? What happens with it if it is destroyed? What happens to the right?
- Visualization
  The visualization issue is very important for understanding part of the problem. Virtual objects can be used to show people what the property looks like.
- Legal concept of 'property'

Objects are already 3D (the surface of the earth and above and under it). The registration is 2D. Therefore it is possible to establish a link the real world and the legal cadastral entities.

- Land/space rights registration
  Here we face a problem of overlap. E.g. you have a bridge connected by a construction. If the construction disappears does this mean that the bridge disappears as well? Formally spoken, yes.
- Cost of data
  3D data are not required everywhere. The question is if it will be possible to move gently to 3D data where it is really needed.
- Definition of 'objects' in 3D
  The definition of the object is important. Topology has not really been developed yet.
- Classification of reference of 3D objects back into 2D
  It is always possible to make the reference between 3D and 2D (the surface of the earth).
- Relation between legal parcels and real-world objects
  The question is how this relationship should be measured.
- Does a cadastre depend on measurements of boundaries?
  The measurement of boundaries is general fixed and based on common law. What should be measured in case of three dimensions, e.g. the visible roof or the tunnel? How does the system depend on this?

3. Approaches to system design

- What is a minimum subset of requirements to represent 3D?
  E.g. what is needed to do 80% of the job with 20% efforts?
- What aspects of 3D parcels/objects are specific to 3D and which are in common with 2D?
- Where do you really need a 3D geometric representation?
- Is projection to a 2D map sufficient?
- How best to model the entities you desire?
  Modeling is a very important issue.
  Is it possible to keep the empty space object if the real physical object has been destroyed? In this case it is not possible to 'touch' the object anymore.

Remarks made after this presentation:

- Multi purpose use of 3D data
  The conclusion has been drawn that 2D representation is still ok, even if the objects are 3D. A 3D cadastral database is too costly to introduce as a general concept. In 90% of the cases there is no need for a 3D cadastral database. Is this true?
  However, for city management, city planning, etc. models have to be made in 3D. 3D cadastral data could also be exported to planning systems, etc.
  It is correct to state that 3D data can be used for many purposes. This fits within the concept of the geo spatial data infrastructure. The cadastre can contribute to the geo spatial infrastructure in many ways (large scale mapping, digital terrain models, 3D representation, etc.). However the question is if it is needed from a cadastral perspective to model the whole world in 3D?

- Definitions
  Sometimes it is also a question of understanding. A uniform more precise language should be a precondition. As long as there is no consensus about the definitions/descriptions of a 3D cadastre, it will be difficult to move on.

OUTCOMES OF THE WORKING SESSION ON LEGAL ISSUES
(Chaired and presented by Hendrik Ploeger, Department of Geodesy, Delft University of Technology)

It is good to realize that multi use of land and the need for a 3D cadastre has two aspects:
1. the legal issue, the question of the legal instruments for the multi use;
2. the aspect of the cadastre and the registration of the rights and objects in 3D.

1. Legal instruments

First a short look at the rights on the land and the constructions in, on and above the land.
Rihts like, lease, building rights (like the Dutch 'opstalrecht', and the German 'Baurecht'), condominium, apartment ownership, and the use of servitudes have been discussed.

A question that also has been raised in the presentations on the first day is if it is possible to enforce these rights.
For example for building a tunnel under several properties, it is possible to enforce a building right? Is it possible to expropriate only a part of the land in the public interest?
Such a possibility in law will make the multi use of land more attractive.

A last topic is the relationship between parties, e.g.:
- the owner of the ground and the owner of the tunnel, or
- the owners of several properties in layers.

Is there any vital, crucial difference in the relationship between vertical neighbors and that of the ordinary horizontal neighbors?

2. Cadastre

On the other hand there is the issue of the cadastre.
We want a registration of the multi use, of the property in layers, but this registration is not an aim in itself.
The main target, form a legal point of view, is to make these rights certain, and transferable. By doing this we make the multi use of land practical possible, and attractive to the market.

3. Interaction between legal instruments and 3D cadastre

It is important to notice the interaction between the legal instruments for multi use of land and the 3D cadastre.

4. Two views

In a very simplified look there are two views:
- we have the instruments, we know what rights parties can use to make a property in layers possible, but the question is how to register these rights we create as lawyers;

– how to register these rights, so we can make the use of legal instruments possible.

One thing is important to notice:
A 3D Cadastre itself does not make multi rights possible. In fact if a legal system does not give the market the instruments to create property in layers, there is no need for a 3D cadastre at all.

5. What is '3D property'?

Furthermore the concept of 3D property has been discussed. The question was, is it possible to make a definition of '3D property'?

A conclusion is that the concept of 3D property depends mainly on the national legal system. Each legal system has its own instruments for multi use of land.

A successful 3D cadastre needs an inventory of the legal instruments for creating multi property on national level to start with.

The question is: what do we want to register? The question was raised if there is a need for unification of property law. In any case we have found a common background.

In all cases there is a right that gives the use of a certain volume of the land.

6. Topics for further research

Legal description of the right and the volume
A choice has to be made:
- How detailed should the information be?
- Is a description in the deed enough, or do we want a sketch of the volume
- How detailed must this sketch or drawing be?
- Is it sufficient that the cadastral map in 3D only gives an indication of the position of a building (or a volume in which the building can be build), but not the exact boundaries.
- This is not a technical question, but a legal question

It is opinion if the chairperson that in any legal system there is a need for laws that prescribe which information the involved parties must provide to the cadastre when creating a 3D property.

Registration of 'empty volumes' (air rights)
Should the registration of empty volumes, a volume without a building, be possible? Reference is made to the presentations from Sweden (Julstad/Ericsson) and Norway (Onsrud).

Registration of objects on or under two or more land parcels (tunnel/bridge)
What about the possibility of a registration of objects on or under two or more land parcels?
Is there the need and possibility of an own, unique ID number for such a object.
How to deal with the fact that the legal status of an object, does not have to be the same for all the ground parcels.

For instance the owner of the tunnel, or pipeline has an easement on the first parcel, a building right on the second parcel, and a personal right out of contract on the third parcel, etc.

Relationship between vertical neighbors
An inventory of the rights and duties of the vertical neighbors. Is there need for special laws? How are these questions solved in the different countries?

Remarks made after this presentation:
- From a legal point of view it is important that the basic transfer of property goes as efficient as possible. This does not necessarily mean that the cadastre should be 3D.
- Laws should reflect the public opinion. Otherwise it will not work. Looking at a 3D cadastre, the problem is in fact not the law. If necessary, laws can be changed. The problem is that some boundaries are not always closed volumes. Sometimes you have to deal with fuzzy faces and lines. If faces and lines are not exact it is difficult to model reality. Of course, surveyors are also unhappy with fuzzy boundaries. Moreover there are no commercial systems that support unclear fuzzy objects.
- Although every country has its own specific laws, this should not lead to the development of a system for every country. If a system should be developed, it is important to look at the common aspects. In fact the representation problems are common to all countries. Only the relationship to property is different.
- There is no overall agreement about the necessity to register empty volumes. Some are in favor, others not. This mainly depends also on the legal possibilities.

OUTCOMES OF THE WORKING SESSION ON CONCEPTUAL AND ORGANIZATIONAL ISSUES

(Chaired and presented by Michael Sutherland, University of New Brunswick)

1. What is a 3D Cadastre?

- It is very difficult to discuss organizational aspects, even conceptual, with regard to a 3D cadastre if we do not know or agree on what a 3D Cadastre is.
- Most of the discussion centered on the question 'What do we mean by a 3D cadastre?' E.g. is it a totally new concept?
- Additionally, each society has its own value system (culture) and person to land relationship. Consequently it has its own perspective on what a cadastre is.
- It is felt that a cadastre (a register of rights to legal objects supported by graphic representation of the object of the rights, laws, etc.) has always been 3D (implicitly and sometimes explicitly):
  - people live in (at least) a 4 dimensional reality with rights to 3D objects, the rights of which changes from time to time;
  - the rights to these 3D objects have been registered (Words and Graphs), but
  - the description of the 3D objects has mostly not been explicitly 3D, i.e. the visualization has been 2D, or a series of 2D visualizations to convey a 3D concept. Visualization tools need to catch up. Technology now makes it possible to do 3D visualization.
- There is a need to define what is meant by a 3D cadastre.
- In response to the question 'What benefit(s) to developing a 3D cadastre?'

A cadastre should serve to enhance the quality of social life; 3D perception and visualization translates to improved quality of information, which supports quality decision-making to support improved quality of social, political and economic life.

- Legal and policy aspects of the cadastre need to become more precise in conveying the concept of volumes to which rights are attached.
- There may not be or is not the need to register or maintain 3D cadastral information on every object of property rights, e.g.
  - government should collect 'minimum' data;
  - minimize cost to the public;
  - 3D cadastral information may be needed only for certain situations.
- 3D cadastre needs to be economically justified.
- New demands and technologies require new approaches, also in an organizational sense:
  - (improved) education;
  - centralization of cadastral authorities or new levels of integration (horizontal and vertical) among organizations managing cadastral information. Here communication plays an important role;
  - more qualified personnel;
  - more investment in technology;
  - intensification of the skills set of personnel;
  - organizational reform, e.g. management structure reform, process (work) reform and data management and process reform.
- From a technical point of view
  Maybe there needs to be a perception of a cadastral volume instead of a parcel. The 'perception' is a mental map of the world and should be supported by more precise policy, law, administration, technology (visual representation) related to the cadastre. The perception of all aspects of the cadastral object must be 3D before we can deal with an 'explicit' 3D cadastre. E.g.:
  - a 'space' defined by coordinates that can be of any shape;
  - right can be attached to that space(s);
  - those spaces may overlap;
  - those spaces can be anywhere in 3D (or 4D). Space i.e. above, on or under the surface;
  - these spaces may be registered in a cadastre.
- Problem-solving with regard to the organizational aspects of a 3D cadastre is not 'mature enough' to come up wit adequate solutions. For that reason more discussion is need.

Remarks made after this presentation:

- The 3D cadastre 'problem' is mainly a technical (visualization) problem as well as a GIS topological problem.
- However land and policy also need to be more precise in how to deal with 3D spaces (cadastre has always been implicitly 3D).
- A 3D cadastre refers to a more explicit processing and representation of 3D objects. This is only possible if becomes clear in a legal sense what kind of information should be stored.
- Not every aspect of a cadastre needs to be '3D'. This will also minimize costs.

Overall conclusions/remarks:

- Society will require 3D models more and more. The question is if the cadastre should be the organization to take the leading role in these developments. Another possibility could be to develop it as part of the geo spatial data infrastructure.
- Economic factors have to be considered as well. From an economic point of view it is possible that it is not feasible to create a 3D cadastre now. Nevertheless there is a feeling that the cadastre should go in this direction in the future. Also in the future, the problem will be easy to solve. The organizational complexity will increase.
- On the other hand technological possibilities will become bigger and bigger.
- The need of a 3D cadastre depends on the users. Not only private persons, but also governmental agencies, etc.
- From an academic point of view research in the field of 3D cadastre should be continued.

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