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Editorial

Cadastral Systems

The guest editors of this special issue on 'Cadastral Systems' of *Computers Environment and Urban Systems* (CEUS) have been working on the re-engineering of cadastral systems in the Netherlands for several years. Driven by this involvement, and also because of personal interest, the guest editors became aware of a 'lack' in scientific publications on cadastral developments in the international peer-reviewed journals, especially in recent years. This is in remarkable contrast with the substantial efforts related to development and implementation of cadastral systems, which can be observed worldwide. For this reason a call for papers for a special issue of CEUS on this subject was made in the fall of 1999. The theme of this special issue includes the management and maintenance of both spatial data and land registration, as well as their integration, often referred to as land administration (covering the geometric and descriptive aspects). This resulted in 25 submissions of papers and a major review undertaking, where every paper was reviewed by three experts on the subject of cadastral systems.

In several countries cadastral systems have a long history and a broad range of use in taxation, land registration, land development, urban planning and design of infrastructure. In these countries we can see a complete re-engineering of existing systems, due to a more business-oriented approach, based on the requirements of the users of cadastral information. Recent technical developments in surveying instruments, databases, Internet and GIS technologies are related to and encapsulated in those re-engineered systems. In many countries without a traditional cadastre, developments have begun to establish a cadastral system. Often, these activities are strongly supported by international organisations such as the World Bank, the United Nations (Habitat), the European Union, and also by national governments. In these countries initial data collection, spatial and legal considerations, and the system implementations are in the focus of interest. Topics listed in the call for papers for the special issue on Cadastral Systems include.

1. cadastral data and process models;
2. (inter)national legal framework;
3. business context;
4. initial data collection;
5. the organisation of information maintenance;

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6. technological aspects: surveying, database, Internet and GIS — (cadastral) system development; tools and methods;
7. organisation;
8. recent developments and future trends; and
9. supply and delivery of information.

During the review process it became clear that a common uniform terminology in the field of cadastral systems is not really available. This complicates international communication in general and the review process in particular. For a while the guest editors considered to advise contributors to use the terminology as defined in the 'Glossary of Terms' of the Bathurst Declaration on Land Administration for Sustainable Development. This glossary is appendix IV in publication no. 21 of the International Federation of Surveyors (FIG, http://www.FIG.net). However in a discussion between some colleagues (Andrew Frank, Paul van der Molen and Jaap Zevenbergen) and the guest editors, it became clear that this did not present a complete solution. The discussion started with the remark that the FIG description of a 'deed' as 'a legal document evidencing legal rights and obligations' lacks the most important property of a deed; namely conveying a right instead of evidencing a right. In some countries a deed also provides evidence of a right; for example a title deed in South Africa. A fundamental problem with the terminology is that the concepts in the legal systems are different all over the world and cannot always be perfectly translated into English. The legal systems may be grouped into: common law (Commonwealth, US), Continental European law, Islamic law, and other law traditions. Further, there is a difference between the terminology used in the UK and the US, although both are based on common law principles. It should be clear that it is difficult to translate non-common law terminology into English without confusion. Therefore, communicating in natural English about the concepts of a cadastral system, would introduce additional complexity.

1. The importance of cadastral systems

The guest editors invited prof. Paul van der Molen, vice chairman of Commission 7 Cadastre and Land Management of the International Federation of Surveyors (FIG), to explain the importance of cadastral systems. He responded:

> Access to land is widely recognised as being of vital importance to achieve objectives of combating poverty, sustainable agriculture and housing, environmental protection and the management of natural resources [1]. But what is so beneficial about having 'access to land' if the rightful claimant is not free from imposition or interference from outside sources, and if he or she may not reap the benefits of labour and capital investments in that land, either in use or upon transfer to another holder? So, 'access to land' is to be understood as having security of land tenure, which may be defined as having the certainty that those

who possess rights to land can be certain that their rights will be valid as long as they are not revoked in a legal and comprehensive way [2].

Land administration, defined as the process of determining, recording and disseminating information on the ownership, value and use of land when implementing land management policy [3], provides security of tenure. That is to say, only under certain conditions! Case studies show that land administration systems are to fail if they are not supported by an appropriate institutional framework, which is effectively enforced [4]. The benefits of good land administration [5] can only be realised in a context of effective (land) law making processes, mechanisms for mobilising public support, effectiveness of the public administration, effectiveness of enforcement of the law, and the existence of appeal procedures [2]. Not to mention the need for a concerted development of society: after all, what is the benefit of a title to land if you cannot use your title as a collateral for a mortgage because of the lack of a formal credit system? Why issue a title when at the same time a moratorium is valid for land transfer?

That makes the nature of land administration systems so different from all other kind of information systems. Thinking about land administration systems is equivalent to thinking about the 'rule of law', 'good governance', institutional matters like land tenure systems, development policy, land markets, planning and development, management of the environment, history and culture of people! This is especially true in countries with a post-colonial situation, which face the existence of all kinds of indigenous tenure and western individualised tenure in an overlapping and competing relationship, these issues represent a thrilling challenge.

Although these challenges are of a fairly fundamental nature, challenges arise also in a rather pragmatic context of emerging user demands and technology push. One may observe that the so called modern cadastral systems are in quite a problematic situation. The dialectics of progress apply most intensely to developed countries which face huge investments in re-engineering their legacy systems in order to permanently meet the requirements of the modern user: faster procedures for land transfer, good access to data, guaranteed reliable data, fast distribution channels, value for money, fitness for use and tailor-made products. There are only a few land administration institutions, which provide access to their data by the Internet. Electronic conveyancing is implemented in 1 or 2 countries only, so far [6]. None provide access to data by WAP/GSM technology, while the airwaves-frequencies to the successors of GSM are being auctioned right now!

However that may be, the embedding of land administration systems in their institutional context makes careful planning and management of changes a necessity. The interwoveness of strategy and technology, the relationship with legal frameworks, and the care for integrity of systems requires wise leadership. Successful implementation asks for capacity building in order to create sound capacities, skills and competencies. I hope that this issue of CEUS may contribute to this most forcefully.

[1] Agenda21 (1992), HABITAT (1996), Global Campaign for Secure Tenure (1999), UN/FIG Bathurst Declaration (1999)
[2] GTZ, 'Land tenure in Development Cooperation', Wiesbaden (1998)
[3] UN ECE Committee on Human Settlements, 'Land Administration Guidelines', Geneva/New York (1996)
[4] Bruce & Migot-Adholla (ed.), 'Searching for Land Tenure Security in Africa', Kendall/Hunt (1993)
[5] UN ECE Committee on Human Settlement, 'Benefits of good Land Administration', Geneva (1998)
[6] Van der Molen, 'IT re-engineering and legislation with a focus on automated registration of deeds', FIG South Africa 1999

2. The accepted papers

The first paper by Bogaerts and Zevenbergen (Delft University of Technology) tries to reduce the confusion in communication about cadastral systems by describing the pros and cons of the different choices which can be made with respect to seven aspects of cadastral systems. The current trends in land administration are identified by Williamson and Ting (University of Melbourne). These trends are the result of global drivers such as sustainable development, globalisation, urbanisation, economic reform and technology development. The trends form a framework for re-engineering of information systems used in the domain of land administration. Cadastral organisations and national mapping agencies are quite related and in some countries even form one organisation. The paper by Groot (International Institute for Aerospace Survey and Earth Sciences) analyses the dilemma for these organisations between a public and private sector approach for National Surveys, including cadastres. A distinction is made between the natural monopoly products and services and other (value-added) products and services. For the natural monopoly product the goal is to maximise output at a point where the profit is non-negative. For value-added products a 'level playing field' should be created and different private organisations will try to maximise their profit.

Education and staff development are crucial factors in this rapidly changing world. Béla Márkus (University of West Hungary) argues that new approaches based on distance learning offer flexible, effective and above all more accessible education then traditional education in the area of Land Administration. The Open Learning for Land Offices (OLLO) project and the new Staff Development in Land Administration (SDiLA) project are based on the distance learning approach.

The difficult situation in which (relatively) poor countries find themselves is illustrated by two papers. It is widely assumed that good land administration is the basis for sustainable development and (future) prosperity. However establishing and maintaining such a system requires quite a lot of money, effort and consensus within a country. It will be clear that this poses a difficult dilemma. The paper by Mika-Petter Törhönen (Finnmap FM-International Oy) describes the situation in Cambodia. The first part of the paper evaluates the current situation, which turns out to

be quite troubled. The second part describes the attempt to improve this situation by systematic registration, which forms the basis of the new land administration. The specific case of how to deal with the effects of Bolivian Colonisation is the theme of the paper by Robert Dzur (Instituto Nacional de Reforma Agraria, Bolivia). The two most important lessons learned during cadastral mapping of 100 colonies subjected to titling and certification are: good initial information gathering and empowering those most interested in the work, both tenants and technicians.

The first attempt to introduce a cadastral system in Greece dates back to 1836. Since that time Greece has tried several times to establish a cadastral system, but has not managed to devise and operate a reliable system. In 1994 a new and ambitious attempt was made to establish the Hellenic Cadastre, a title registration system in digital form. This time the project was supported by the European Union and it is estimated that it will take 20 years to cover the country at an estimated cost of US$1.8 billion (in US$ in the year 2000). Two papers in this special issue describe the Hellenic Cadastre from two different angles. First, there is an insider view by Chryssy Potsiou, Manolis Volakakis and Periklis Doublidis (Ktimatologio S.A.), followed by a paper from Panagiotis Zentelis and Efi Dimopoulou (National Technical University of Athens).

The next paper covers quite a different topic, a marine cadastral information system. Though the term Cadastre may seem strange in this context, many aspects of a land Cadastre (adjudication, survey, ownership right) are paralleled in the ocean environment. The authors, Cindy Fowler (NOAA, US Department of Commerce) and Eric Treml (Coastal Services Center, South Carolina), argue in the light of a series of claims to areas of the seafloor, the minerals below the surface, the water above, and the marine life within the waters, that accurate, useable and accessible digital boundaries are essential. They also describe the specific problems of a marine cadastre (coastal data, international policy) and illustrate this in a case study.

The last paper of this special issue is written by the guest editors, Peter van Oosterom (during the project working at the Kadaster Netherlands, but currently at Delft University of Technology) and Chrit Lemmen (Kadaster Netherlands). As mentioned in the beginning of this editorial, this work was the inspiration to send out a call for papers for this special issue on cadastral systems. Though the response was more than expected, there were not so many (information) technology papers. This is the topic of the last paper, which describes the renewal of the spatial information system for managing both large-scale topographic maps and cadastral maps. The re-engineering is driven by increasing customer requirements, such as more flexible products and better access to cadastral data, and the new possibilities offered by information technology. The basis of the new system is an object/relational database capable of efficiently handling large volumes of spatial data. The new data model supports nationwide unique object identifiers, explicit topology and full history, that is, a spatio-temporal database.

The guest editors would like to take this opportunity to thank all authors and reviewers for their efforts. From the perspective of the guest editors it has been a pleasurable and very informative job in which a lot was learnt about all kinds of cadastral systems worldwide. It is planned that this first special issue may have a

successor in this Journal as there is still a lot of cadastral material to be covered, and new and revised papers are expected to arrive in the near future. Potential authors, particularly of papers with a focus on information technology, are encouraged to contact the guest editors, by 1 July 2001.

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