Development and Potential for Improvements of the Austrian Land Administration System

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Key words: Improvement, land administration systems, innovation, i-cadastre

SUMMARY

In Europe the conceptual roots of Land Administration Systems (LAS) have been shaped during the last 200 years. The continuously on-going modernisation of the system was driven by the changing needs of the society with the objective to improve the efficiency of the land market. Recently objectives, such as social justice and poverty reduction, have been added.

The achieved improvements made land administration services more accessible, more efficient, and more effective. In this process the activities were focused on the development of a legal, institutional, and organizational framework, on computerization efforts, on knowledge transfer, and on the definition of standards for data and processes. The activities always were related to the land policy framework.

This paper analyses the drivers for the improvements of LAS, it documents examples from Austria, and it outlines potentials for future innovations. The topics are discussed corresponding to six fields of activities for innovation: organization, strategy, technology, processes, products, and marketing.

ZUSAMMENFASSUNG

Die Konzepte der Landadministrationssysteme in Mitteleuropa haben sich in den letzten 200 Jahren entwickelt. Die sich ändernden Bedürfnisse der Gesellschaft waren der Motor zur kontinuierlichen Weiterentwicklung der Systeme und zur Steigerung der Effizienz des Liegenschafts-Marktes. Dabei wurden in letzter Zeit auch Ziele wie soziale Gerechtigkeit und Armutsbekämpfung berücksichtigt.

Die erzielten Verbesserungen machten die Landadministrationsdienste zugänglicher, effizienter und effektiver. Dabei konzentrierten sich die Aktivitäten auf die Entwicklung rechtlicher, institutioneller und organisatorischer Rahmenbedingungen, auf die EDV-Umstellung, auf den Wissenstransfer und auf die Definition von Standards für Daten und Prozesse. Die Aktivitäten standen dabei immer im Zusammenhang mit der Bodenpolitik.

Der Beitrag analysiert die Triebfedern für die Verbesserung von Landadministrations-Systemen, er dokumentiert einige – österreichische - Beispiele und er zeigt Potentiale für zukünftige Entwicklungen auf. Das Thema wird anhand von sechs Handlungsfeldern für die Innovation aufbereitet: Organisation, Strategie, Technologie, Prozesse, Produkte und Marketing.

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1. INTRODUCTION

Sustainable use of land requires a wide range of interrelated systems including the acquisition and administration of land and land use as rather static elements and land development as the dynamic element. The focus of this paper is on innovations in land administration systems which have been established as registers among other public registers in most European counties. Observing the development of these registers on regional, national or European level allows the assumption of similar innovations within the systems. This might be due to the same technological improvements applied, but also due to related processes and data. Land Administration Systems (LAS) belong to the category of ***asset registers*** and are closely related to ***citizen registers*** and ***business registers***.

It is valuable to analyze existing ***registers*** and the way such existing registers are designed and organized. Some European registers are harmonized to a certain extend. For example the ***European Business Register*** has achieved institutional cross-border cooperation of various actors. Similar goals have been addressed by the national **registers of vehicles** following the requirements of EC Directive 1999/37/EC. In the field of land administration approaches like the Integrated Administration and Control System - which follows the framework defined within the *EC-IACS-Regulation 1782/2003* (Inan *et al.* 2010) - and the European Land Information Service *EULIS* (www.eulis.eu) have to be mentioned. EULIS provides a unique portal to different existing national land administration systems (Ploeger and van Loenen 2005). There is also a potential impact from the *EC-INSPIRE-Directive 2007/2/EC* establishing "Infrastructure for Spatial Information in Europe" *(www.inspire.eu)* and from benchmarking e-Government activities in the European Community (http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm).

These are examples of innovation on a European level, which brought a paradigm shift in the way the business is done even when innovations and implementations principally took place on a national level. The impact from e-government activities resulted in closer institutional cooperation, in business partnerships, and even in strategic alliances for acquisition, maintenance, and distribution of data on a regional and a national level. Efficient land administration requires continuous innovation and adaptation according to the changing needs of society and land market. De Soto (2000) addresses the positive effects of land administration within a stable formal property system.

In terms of economics, innovation is linked to performance and growth through improvements in efficiency, productivity, quality, and competitive positioning or market share and is a driver

for growth and sustainability. General rules for „Innovation Economics" imply innovations in the fields of marketing, organization, strategy, technology, processes, and products (Schumpeter, 1934, OECD 2010).

2. THE DYNAMIC FRAMEWORK OF LAND ADMINISTRATION SYSTEMS

All the different approaches to introduce land administration in Central Europe before the 19th century were not able to overcome social obstacles like the resistance of the leading class (the nobility and the clergy) and technical shortcomings like missing graphical representation or lack of a proper geodetic reference frame. Thus they focused on purpose on a certain subject like the landbook ("Landtafel") for the nobility (Hofmeister 1989) and never reached a countrywide coverage.

At the beginning of the 19th century the land administration systems in Central Europe with the approach to collect and maintain data about each parcel for the whole country had been introduced systematically. These paper-based land administration systems had quite similar conceptual approaches and which also determined the data structure of the digital systems (Figure 1).

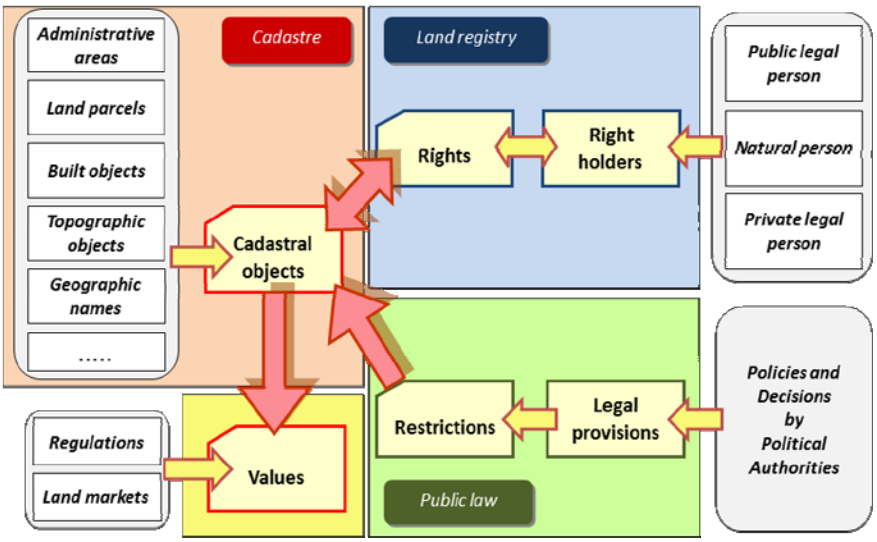

Figure 1: Land Administration System (Source: Jean-Luc Horisberger, 2010)

The reasons for the success of these approaches were manifold, but some principal motives should be outlined:

- *The economic shortages* of state budget during and after the Napoleonic Wars paved the way for a new paradigm - a reform of the tax system including land tax. The land administration system was no longer considered as a tool to protect property of the leading class, it became more and more a basic instrument and resource for taxation. In Switzerland, Bavaria, Prussia, and Austria such systems were developed at almost the same time.

- *The goals and aims* for introducing such systems were clearly defined including the estimation of required resources in terms of time, costs and quality.
- *Improved tools for surveying, for archiving, for mapping, and for printing* land related data were available including definitions and specifications of reference frames and coordinate systems – all the proper ingredients for a countrywide land administration system. The development of the Bavarian land administration system, for example, benefited from the inventions and cooperation of scientist like Söldner (coordinate reference system), Fraunhofer and Reichenbach (optical instruments for geodetic purpose), and Senefelder (lithography) (Frankenberger 2010).

The development of the land administration system in Austria - which is still in use - started 1817 with the purpose of real property taxation. Since that time the system was improved and extended step by step. The innovations were driven by different disciplines and had impact to legal as well as to technical requirements (Muggenhuber and Twaroch 2008).

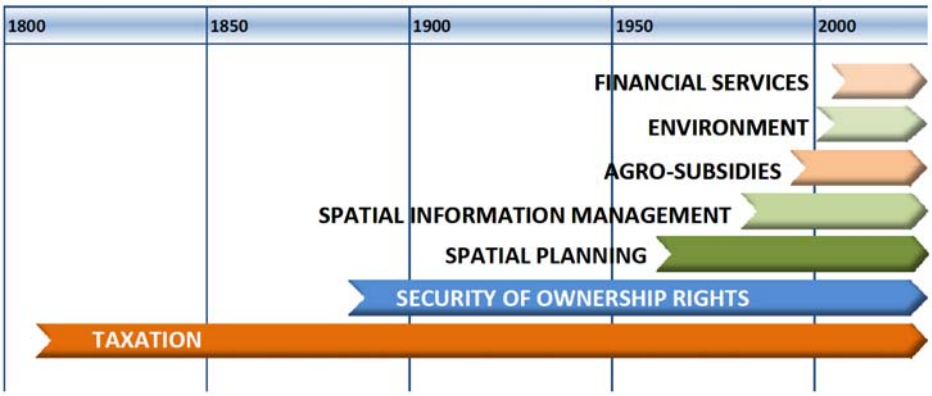

Figure 2: Dynamic framework of Land Administration

Figure 2 shows the steps of innovative extensions to the land administration system by means of Austria. Obviously the time span between innovations becomes shorter and shorter:

- *Taxation:* The original task of land administration is still fulfilled by the system. However, as the conceptual roots were mainly linked to rural land, the system could not fully cover the demands of taxation in urban areas. In the meantime this lack was removed.
- *Ownership rights*: In 1870 the system was extended to serve as evidence and proof of private real property rights. This role is still fully covered by the system. In Austria also the boundary of a real property is secured by the register, if the parcel data are registered in the highest quality category ("Boundary Cadastre"). The increasing amount of public restrictions on real properties requires an extension of the system - as already applied in Switzerland.
- *Spatial planning:* The land administration system serves as a basis for spatial planning on all administrative levels.

- *Agricultural subsidies:* Cadastral data provides a basis for establishing the Land Parcel Identification System in Austria. Today, however, the Integrated Administration and Control System (IACS) is not linked to the land administration system.
- *Geodata infrastructure:* The cooperation between public and private partners is established. An example for good practice of cooperation between public institutions is the Austrian address data base: The maintenance of this register is done in a cooperation of municipalities with federal agencies (statistics, cadastre and population register). In general the installation of an Austrian geodata infrastructure is working well on a technical level, but there are some obstacles on the administrative and on the financial level (Mansberger *et al.* 2010) that could be solved by the implementation of the EU-INSPIRE-Directive.
- *Environment:* Data on soil quality as well as on actual land use are available in a digital format. However, for decision making processes on environmental issues these available data has to be extended by additional information, like data related to water air, and/or noise.
- *Financial services:* At the moment only the management of mortgages is handled by the land administration system Additional requirements of financial services have not yet been identified.

The on-going developments concerning e-government, National Spatial Data Infrastructure, and tools for environmental decision making (EU-INSPIRE) require a closer cooperation within the network of spatial data service providers. In this context, the vision *Cadastre 2014* (Kaufmann and Steudler 1998) still serves as milestone for innovations in land administration systems including technical and economic aspects as well as business models and customer orientation.

3. INNOVATIONS IN AND POTENTIALS FOR IMPROVEMENT OF THE AUSTRIAN LAND ADMINISTRATION

> *"My work across three regions has shown me cadastres over-engineered, with little attention for the real need to build and maintain sustainable cadastral systems. Considerations should always be based on fitness for purpose! Improvements should be demand-driven and achieved incrementally over time. Technology should be enabler not driver. Investments must be sustainable and relevant to the needs of broader society, not about strengthening technocratic geospatial silos."(*Bell 2010).

In this chapter innovations and potentials of land administration systems are discussed. Milestones of innovations of the Austrian cadastre and land register are documented chronically. The outlined potentials are mainly focused to the actual situations of the Austrian land administration system. The main structure of the chapter is based on the six spheres of activities of innovation.

3.1 Product Innovation

Some milestones of product innovation are:

- ***Implementation of land administration systems:*** The concept of various systems currently implemented in Europe was initiated by Napoleon I. to finance his wars by collecting taxes. Improved versions were launched in Switzerland (1804), Prussia (1808), Bavaria (1808), and Austria (1817).
- ***Implementation of books of mortgages:*** Prussia was one of the first countries in Europe that registered mortgages (1783). In Austria records of mortgages became part of the land administration system in 1871.
- ***Digitalisation of cadastral records*****:** In Austria the alpha-numeric part of cadastral records was transferred to a digital medium in 1973. The digitalisation of the cadastral maps started in 1991 and was finished in 2004 (in Switzerland the digitalisation of the cadastre was done between 1989 and 1999.
- ***Digitalisation of land registry books*****:** The conversion from the analogue land registers to a digital media was done in Austria between 1984 and 1991 (in Bavaria between 1994 and 2002).
- ***Harmonization of the reference frame on the national level***: A first effort was started in 1917, when Germany, Austria, Bulgaria, and some other countries agreed to use a uniform reference frame based on the Bessel ellipsoid and the Gauss-Krueger-projection system.
- ***Harmonization of reference frame on the European level***: The discussion of the transformation of cadastral data into a harmonized European Reference Frame currently is discussed in many European countries, but the process of production had not started yet.

Potential for product innovations are:

- ***i-Kataster***®: Cadastral data should be available in real time for decision making and as tool for and link to related spatial information using the same unique identifiers (parcel, coordinate, postal address, etc.). Mobile applications, like location-based services and applications for smartphones will be state of the art in the near future.
- ***Change detection und crowd-sourcing*** will be used as tools for indicating and improving the quality of data and even for updating information of land administration systems.
- ***3D / 4D - Cadastre*** will become a basis for 3D-applications in spatial planning and in the documentation of (temporal) historic developments (time series).
- ***Cadastre providing technical parameters for valuation of real estate***: This approach has recently been implemented successfully in Slovenia.
- ***Cadastral information to be linked up with many other sources*** of data on real estate in order to provide an all-embracing information for customers. This innovation

especially has to include environmental information and will be a proper tool for risk assessment.

- ***Land administration systems to provide the full picture of real property rights:*** The land market requires the full picture of real property rights including the whole new range of public restrictions and responsibilities imposed on land. This approach has recently been developed and introduced in Switzerland as result of the e-government strategy to increase legal certainty.

Conclusion on product innovation:

New technology often results in new products which create valuable market opportunities but also increases transparency regarding quality of data. For the purpose of customers confidence in the land administration system it is necessary to introduce new products. New digital products enable customers to cross-check real estate data with other geo-information, e.g. orthophotos. The transformation of analogue data to digital media was an innovation, which included risks and opportunities at the same time: Inconsistency of data sets became obvious, e.g. inconsistency of geometric shape and positional accuracy can be recognized by comparing coordinates from analogue maps with transformed data or with actual data from field survey (Grillmayer and Navratil 2007). Land administration authorities have to take responsibility to improve the quality. The alternative would be that the customers have to cope with the weaknesses of quality.

3.2 Organisational innovations

Organisational innovations can be realised in two different approaches: Firstly - in a horizontal approach - by merging agencies with overlapping tasks in order to achieve an integrated workflow from the customers point of view. Secondly - the hierarchical approach - which includes the level of hierarchy / management level as well as the adaptation of the organizational setup in order to introduce quality management through units of auditing and controlling.

Some examples of organizational improvements are:

- ***Merge of institutions***: In Austria the organizational setup of military mapping, cadastre and geodetic surveying (each under another ministry) was merged and unified into one organization - the national cadastre and mapping agency BEV in 1923.
- ***Implementation of the system of private licensed surveyors:*** In 1888 this system was installed to ensure the continuous updating of the Austrian cadastre. Until 1969 the cadastral surveying was done by the licensed surveyors in competition with the governmental bodies, since 1969 the subdivisions of parcels are done exclusively by the licenced surveyors.
- ***Installation of public-private-partnership***: Maintenance of cadastral records as Public-Private-Partnership was introduced in Austria in 1969.

- ***Improvement of inter-institutional cooperation:*** The Austrian cadastre agency applied this approach of restructuring the organisational setup from a hierarchical structure into a cross-functional matrix-structure in the late 1990ies.

Potential for organizational innovation identified:

- The benefits and synergies of institutional mergers have to be considered against the risks of the cultural clash of two different institutions. A ***virtual cooperation based on ICT might ensure*** similar ***benefits*** and results from the customer's point of view.

Conclusion on organizational innovation:

The land administration sector only can remain of value for the society, when it is able to respond to developments and changes in society in a meaningful way (Barnasconi and van der Molen 2010).

3.3 Strategy-Innovation

Some milestones for innovation in strategy are:

- ***Free access to land administration data:*** In Austria cadastre data became public in 1817 and land register data were opened for the public in 1871.
- ***Trust in data and documents vs. evidence in the field:*** The evidence of public documentation is legally binding also when the records are disaccording to the facts in the field.
- ***Implementation of e-government:*** In Austria e-government-initiatives and spatial data infrastructure became drivers for institutional cooperation since the 2000ies.

Potentials for organizational innovation identified:

- From the economic point of view the focus shifted from agricultural to urban assets within the last decades. This fact might have an impact on the ***land administration services to reshape accordingly their conceptual setup.***
- There is an increasing need for services and tools for real estate taxation. ***Land administration services have to provide proper information***.
- ***Data of land administration has to be linked with geodata from other providers*** *in order to form a spatial data infrastructure*.

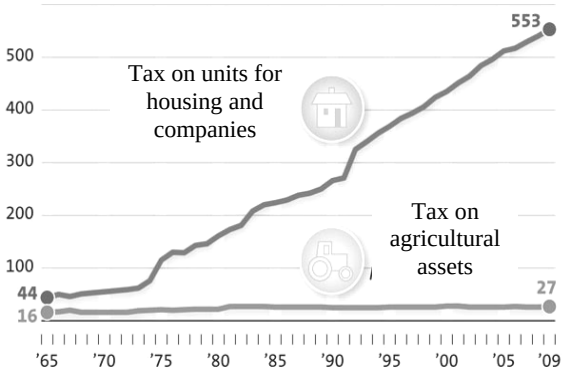

Figure 3: Income from property tax since 1965 in Austria (in million Euro per year)

- ***Land administration services have to cover all the real property rights*** (including restrictions imposed on land and real estate by public administration).

Conclusion on innovation in the strategy:

Up to now there is no central information source for public law encumbrances in Austria. There are only sporadic hints in the land register. Receiving a comprehensive view requires information from different sources followed by comparison and combination of the results. Switzerland recently introduced such a cadastre for public law encumbrances (ÖREB-cadastre). One of the core questions of geodata politics with regard to data acquisition and data providing is "cooperation versus competition between institutions". The answer to this question cannot be given at an administrative or a technical level because this requires framework to be developed on political level.

3.4 Process-Innovation

Some milestones and examples of process-innovation are:

- ***Maintenance of land administration data:*** In Austria in 1883 a law was enacted to keep cadastral data up-to-date (Evidenzhaltungsgesetz).
- ***Implementation of the Parcel Data Base (GDB)***: In 1978 the implementation of the Parcel Data Base enabled customers a simultaneous access to land register data as well as to cadastre data.
- ***Maintenance of postal addresses of parcels:*** This application is an example for best practice in public-public partnership. The process of updating postal addresses is done in cooperation between municipalities and centralized governmental service providers (cadastre agency and the population register).
- ***Simplified procedures for specific parcels:*** Since 1930 in Austria changes of specific parcels (parcels with a value of land below a specified threshold) are handled in simplified processes. This minor improvement accelerated the processes and enables a short-term execution for lots of cases.

Potentials for process-innovation identified:

- ***Process-based innovations*** with the focus on core business have to enable customised and procedures for the delivery of up-to-date products and real-time services. Shared services between different organizations of public administration allow modularization and parallelization of processes.
- ***Digital workflow bridging traditional institutional barriers***: Digital workflows avoid multiple checks and enable an automatized incorporation of existing data sets.
- ***Unified processes as alternative to organizational changes:*** The implementation and optimization of cross-organisational processes using modern Information and Communication Technology (ICT) can be an alternative to the merging of organizations.

- ***Standardisation of processes and products:*** Standards are drivers for innovation of products as well as of innovation of processes; e.g. the land administration domain model as an annex of the ISO 19152 (Lemmen *et al.* 2008).

Conclusions on process-innovation:

Process-innovation is closely linked with ICT. Improving processes in-house is a rather easy issue compared with the challenge to improve processes across institutional borders (Schuppan and Reichard 2010). It is a typical challenge for e-government applications to organize processes as parallel, modular and cross-institutional workflows. The land administration system has to cope with the trend of business application providing their services 24 hours / 7 days as one-stop-shops.

3.5 Technology-Innovation

Some milestones and examples of technology-innovation are:

- ***Launching of punch cards:*** In the 1950ies the first stage of automation was installed in cadastral process by using punch cards.
- ***Transition to a digital land administration system:*** Between the 1970ies and 1980ies the transition from a separate analogue cadastre and land register to a digital unified land administration system was realised by the implementation of a common database.
- ***Digitization of the cadastral map:*** In 2004 the digitization of the cadastral map was finished in Austria.
- ***Availability of new technology:*** In the 1990ies new technologies for the acquisition and documentation of land information (GIS, GPS, remote sensing) were launched on the market.
- ***Implementation of web-based services:*** In the 2000ies web-based -services for geographic information are implemented in many countries. In Austria these services are available on federal level (e-Geodata Austria – www.bev.gv.at as data portal of the BEV) and Geoland-Portal as cooperation of all federal provinces (www.geoland.at).

Potentials for organizational innovation identified:

- ***Harmonization of reference systems*** for the transformation of all the different datasets into the new systems.
- ***Using new technologies for data acquisition*** (digital photogrammetry, airborne laser scanning, high resolution satellite images)

Conclusion on technology-innovation:

Initiatives such as the implementation of concepts on spatial data infrastructures in many jurisdictions achieve remarkable progress. These initiatives replace the former approach of multi-purpose cadastres.

The transition from local reference frames to globally defined reference frames like the International Terrestrial Reference System (ITRS) is supported by the increasing use of Global Navigation Satellite Systems (GNSS). This transition has not been implemented in cadastral systems although suitable solutions are existing (Grillmayer and Navratil 2007). Most of the technical innovation affected the implementation of process, which are normally visible for the customers.

3.6 Marketing-Innovation

Some milestones and examples of marketing-innovation are:

- ***Free access to LAS-information:*** The principle of access to land administration data for everybody was applied in several European countries.
- ***Free remote access to LAS-information:*** In the 1980ies Austrian people had the possibility of an electronic access to land administration data.
- ***Web-based-access to LAS-information:*** In the 1990ies the public access to land administration data was implemented by using World-Wide-Web-Technology.
- ***Web-based-services for the simultaneous access to different geo-data:*** In the 2000ies the combined visualization of geodata from several sources (land administration, land use planning, and environmental data) was enabled. In Austria this service – called Geoland Portal - was initiated as cooperation of all federal provinces.
- ***E-geodata-portals:*** In the 2000ies e-geodata portals for integrated digital query of land administration data become state of the art. In Austria the BEV started with an integrated digital "e-geodata Austria" service in 2008.

Potentials for organizational innovation identified:

- The cadastre is an essential base system to acquire and to represent our living space. Therefore the ***cadastre has to be part of the national infrastructure*** (Schulte 1983).
- ***Land information has to be opened for new potential users.*** Organizations like banks or insurance companies are not specifically trained to use all possible benefits of a cadastre. Training them to use cadastral data for risk management can increase the number of users of cadastral data.
- ***Advancement of in-situ and real-time applications for modern communication technology*** (Location Based Services, i-Catastre®). This may help keeping the cadastre in the public focus.

Conclusion on marketing-innovation:

Innovation is not always initiated by customer requests (Henry Ford: "*If I had asked people what they want, they would have said faster horses*"). Of course, requirements and proposals of customers have to be taken into account, but there are also other approaches and options to be considered.

Marketing innovation tries to achieve better market penetration for existing products or to find niches for new products. The first task is usually fulfilled by communicating the advantages of the produce (the cadastre) and addressing new markets. The second task is more difficult since it requires finding niches and filling them with products. However, niche products may be more profitable than just increasing the number of customers.

4. FINAL REMARKS

The concepts of land administration systems applied in many countries of Europe are based on more than 200 years of continuous improvements, often initiated by the changing needs of society. Technological developments have typically led to process innovation. This finally led to further innovation in the field of products, organization, strategy, and marketing.

Innovation requires a lot of resources and thus often meets resistance. During the last century the land administration authorities proofed themselves as managers of the strategic resource "land" and played a significant role as enabler of innovations in this field of activity. The number of customers increased continuously: nowadays the spectrum of users ranges from public institutions (land tax), private persons (securing land ownership), credit institutes (mortgages), spatial planning institutions (large scale mapping), and farmers (agricultural subsidies) to insurance companies (value determination for parcels).

Land administration systems require continuous development which often starts from innovation in technology and processes. Potentials for innovation have been identified and listed in this paper.

Marketing is a necessity for public awareness about the benefits of the geo-spatial data provided by the land administration sector. Continuous innovations form a stable basis to guarantee the provision of up-to-date and proper information about land for public administration as well as for private business. And continuous innovation is an indispensible ingredient for an efficient and sustainable use of the resource land.

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BIOGRAPHICAL NOTES

Gerhard MUGGENHUBER currently works as vice head of the Department for International Affairs at Federal Office of Metrology and Surveying (BEV). In his present function at BEV – Federal Office of Metrology and Surveying - he contributed to international initiatives in Eastern- and Central Europe like the Word Bank "Initiative on Real Property Rights". Until 2006 he chaired the FIG Commission 3 and was representative of the commissions in the FIG Council. From 1996-2001 he was member of bureau of the Working Party on Land Administration, an advisory body on land registration matters to the UN-ECE in Geneva.

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