

Research and studies of land information system in some European countries – Efficient tool to understand and manage urban development in Romania

SORIN I. HERBAN

Department of Land Measurements and Cadastre

POLITEHNICA University of Timisoara

300006 Timisoara, P-ta Victoriei no. 2

ROMANIA

sorin.herban@ct.upt.ro, http://www.upt.ro

Abstract: -The multitude of property rights in cadastre other way and the recording of these rights are addressed by a number of studies, from international associations and regional offices. This paper presents the situation following case studies from the implementation of a land cadastre in these regions, and the current development in these countries versus a developed cadastral system from Europe. Also, emerging demands on cadastral design suggest that cadastral system is a functional component of land administration being redesigned to respond to initiatives in technology, governmental needs and business opportunities. Many European countries are developing new strategies to improve cadastre management. Geographic information system (GIS) technology offers cadastral a method of quickly accessing and producing maps, leveraging database information, and automating enterprise work processes. Although, conceptions of cadastral systems and land administration are different among the countries, their basic function is similar, namely systematic and official recording of property rights in urban land management. During the last three decades, scientific research on cadastral development covering aspects of cadastral systems and later land administration systems has been increasing. These initiatives have been performed based on different theories and research methodologies.

Key words: property rights, urban land management, cadastral development, public administration, cadastral maps, parcel.

1 Introduction

Conception of an efficient cadastral system is an important element in the development of each country. For an efficient operation of the real estate market, the security and liberty of making transactions, registering a property, planning operations, the introduction of an ad valorem tax on property and more rational use of space become crucial. In Europe there are different types of cadastral systems, because the countries in Europe have different cultural, economical and social backgrounds and development.

This paper presents studies and results of some projects and comparisons of the performance of cadastral systems all over the world by creating appropriate integrated indicators of a cadastral system using statistical technique. Such indicators allow us to compare different cadastral systems and present them hierarchically in relation to their quality, structure, as well as legal, organizational and technological solutions. The 21th century is related to the phenomenon of rapid urbanization. By 1900, 13% of the world's population was urban. During the next years, improvements in medicine and science allowed higher city densities. According to UN reports, the urban population increased from 220 million in 1900

to 732 million in 1950 (29% of the world's population). By 2007, 50% of the world population was living in cities (Figure 1).

According to latest predictions, 4.9 billion people, or 60% of the world's population, are expected to be urban dwellers by 2030 (Table 1).

Investigations show significant differences in urban population change between the more developed and the less developed regions.

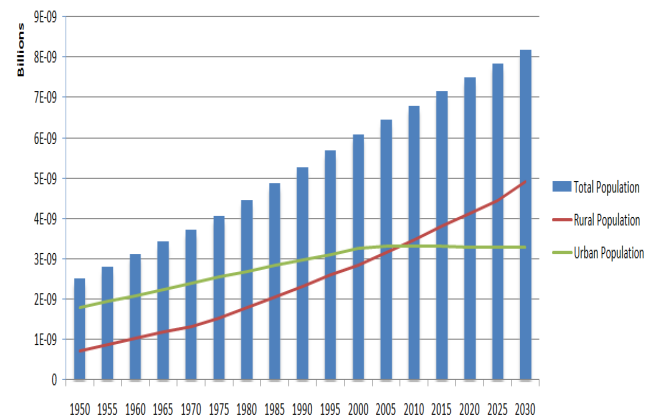


Fig. 1, The urban and rural population of the world.
(Source: UN Population Division)

The majority of the inhabitants of the less developed regions still live in rural areas, but in the more developed regions the population is already highly urbanized.

Table 1, Global proportion of the urban population increase.(Source: UN Population Division)

Year	Urban population (million)	Proportion
1900	220	13%
1950	732	29%
2005	3.200	49%
2030	4.900	60%

2 Problem Formulation

In this paper, the author conducted a study in regarding land informational system in several European countries to understand and try to give some solution and direction for Romanian context. The countries that were the object of our study are Austria, Hungary, and Romania.

The Austrian constitution is based on the Federal Constitution Act of 1920 as amended in 1929 and on the principles of democracy, the republic state form, federalism and the rule of law. The constitution also includes a number of instruments of direct democracy, such as popular initiatives, plebiscites and referenda. Fundamental rights and freedoms have always been of the utmost importance and continue to be accorded height priority in the Austrian constitution.

In 1718 the Austrian Administration introduced a registration system for all buildings and parcels based on a surveying and mapping in the field within the Italian provinces, which then belonged to Austria.

In 1871 the Land registry system was added to the Cadastre introducing legal processes for documentation of owners and mortgages in Austria and in 1883 the maintenance of the Austrian Cadastre, the so called “Evidenzhaltungsgesetz”, was enacted.



Fig. 2, Initial Cadastral map (1:2880, about 1850)

This law regulated that all changes in parcels (boundaries and/or ownership) have to be registered in the cadastre and the Land Registry. Since that time, there has been a constant process of updating the Austrian cadastre. The register was structured in 3 pages: (a) page A for objects, (b) page B for owners and ownership and (c) page C for obligations. The concept of this structure as well as the dual system of land register and cadastre is still in use nowadays known as Central European Land Registry system.

In 1969 Austria enacted the Surveying Law and established the fundament for the functions of the surveying authorities. Within this law, the parcel cadastre was extended to a legal boundary cadastre which represents a legally binding proof of boundaries of parcels and secures individual rights on boundaries. Within the “Cadastre of boundaries” the state guarantees the boundaries of a parcel. The requirements for receiving the qualitative attribute are a written consent of all owners neighboring the specific parcel, a precise survey of the whole parcel and the documentation in a surveying document. Within the last three decades, the Austrian cadastre and land register have been converted into a digital common data base (Grundstücksdatenbank).

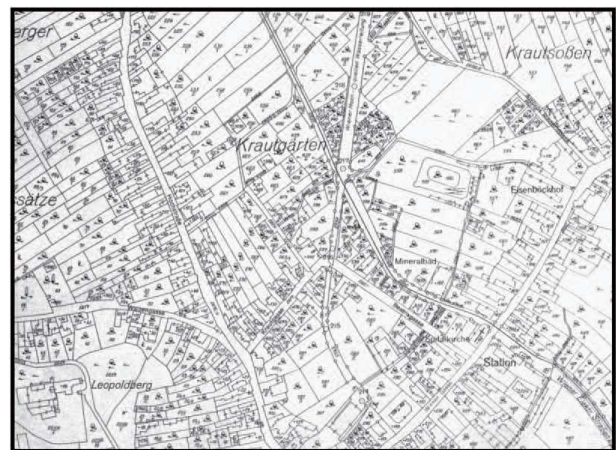


Fig. 3, Cadastral map (1:2880, about 1970)

In addition to all the benefits of digital databases (access, queries, etc.), the redundant information within the cadastre and land register (cadastre being a complementary register to the ownership register and vice versa) has been eliminated. The unified data base has completely replaced the analogue registers and since beginning of 1990ies access by web based services are offered.

In Hungary, in those times being part of the Austrian Empire, cadastral survey started in 1786, following the decree („Law on Parcel Survey for Hungary”) of Emperor Joseph the Second. German was the official

language and Latin the language used in public administration, the decree was published also in Hungarian. This kind of survey was completed by 1790; the corresponding maps were produced just incidentally. The triangulation work started in 1853, the detailed cadastral survey in 1856, at scale of 1:2880. The first Hungarian Cadastral Map Archives opened in Sopron, 1860, in ZÁGRÁB (Zagreb), 1861 and in Kassa (Košice), 1865.

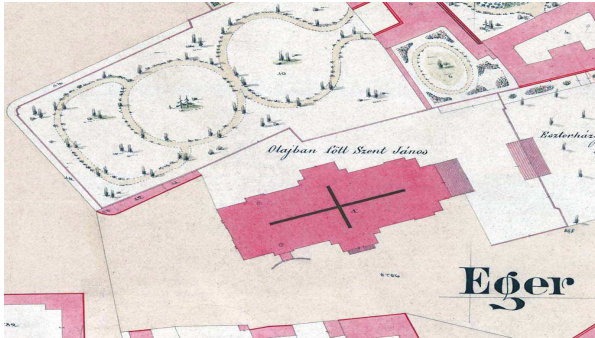


Fig. 4, Extract from the town plan of Eger at scale 1:1440 in stereographic projection, produced in 1887

The National Cadastre Programme Non-Profit Company was established in 1996 under the Ministry of Agriculture and Rural Development in order to coordinate the implementation of digital cadastral mapping programme in Hungary. This programme was financed by commercial bank loan with the guarantee of the Hungarian Government, without any support from State budget. This loan will be paid back by land administration organization from the generated revenue. The quality of digital cadastral mapping was checked by the county land offices countrywide.

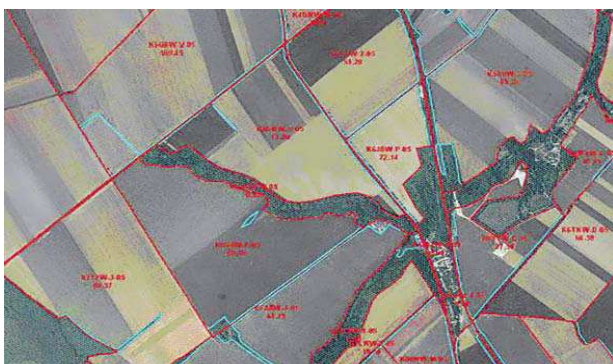


Fig. 5, Physical block based parcel identification system

In the Romanian provinces, cadastral and land registration activity began differentially, depending on historical circumstances, as of the 19th century: • In

Transylvania, Banat and part of Bucovina, specific works began after the Austro-Hungarian regime, as of 1794, and went on after 1850 as „Concrete Cadastre” (consists in delimitation, description and representation of localities’ borders, plot limits, rivers and roads);

In Walachia and Moldavia, as of 1831 and 1832, the first attempts for cadastre introduction were made by the first border-settling engineers prepared in Iasi by Gheorghe Asachi (since 1813) and in Bucharest by Gheorghe Lazar (since 1818);

In the rest of the country, the cadastre would be established after the First World War, at the same time with land reform.

In 1919, “Directorate for Cadastre and Technical Works” was set up, which limited its activity, especially to measurement of domains and their parceling for the land assigned after the First World War. Surveys were carried out according to local reference systems, with differences in accuracy and content, as there was no homogeneous geodetic triangulation network.

For cadastre execution, technical data was prepared in the Topography School (1919) within the Directorate for Cadastre.

A big step was made in 1930 when the stereographic projection system was adopted, as a result of cooperation between the Directorate for Cadastre and the Geographic Institute of the Army.

Between 1947 and 1990, the land was removed from the civil circuit and cadastral and land systems adapted to this situation, being however carried out cadastral plans and maps, as well as land evaluations, especially for centralized economic planning, considering the real estate owners of that time (public and cooperative sector).

After 1990, at the same time with the enactment of the Land Property Law no. 18/1991, real estate’s were returned to their rightful owners, which led to a significant increase of the society’s interest in property.

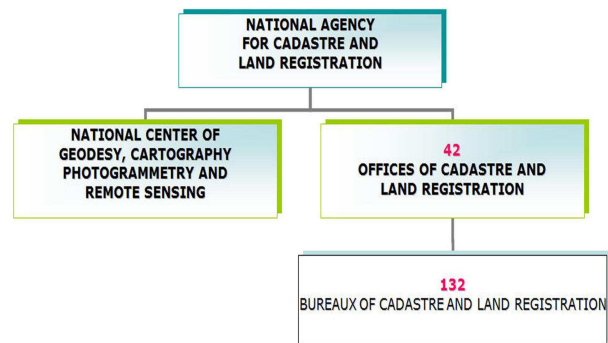


Fig. 6, Organizational structure in Romania

3 Problem Solution

In Austria you have to be authorized to produce surveying documents for registration in the cadastre and in the land register: the cadastral authority itself, licensed surveyors, a few governmental authorities and the provincial agrarian authority. In order to be authorized for cadastral surveying, certain legal requirements have to be fulfilled:

- University degree in surveying;
- Professional practice;
- Licensing Examination.

Private licensed surveyors are within the cadastre in charge of surveying parcels, subdivision of parcels and recovering boundary points. They are commissioned and paid by the owner of the parcels. Within their tasks, they also try to reach conformity with local construction authorities (Baubehörden) and regional planning authorities (Raumordnung). Notaries (private but licensed) are offering their service for transfer of ownership, inheritance, mortgages and others.

A plot of land (parcel) shall be the part of a cadastral community referred to as such with an individual number in the cadastre. Cadastral units shall be those parts of the surface of the earth explicitly registered as such in the cadastre. Therefore a plot of land is a part of the surface of the earth with an individual number (unique identifier).

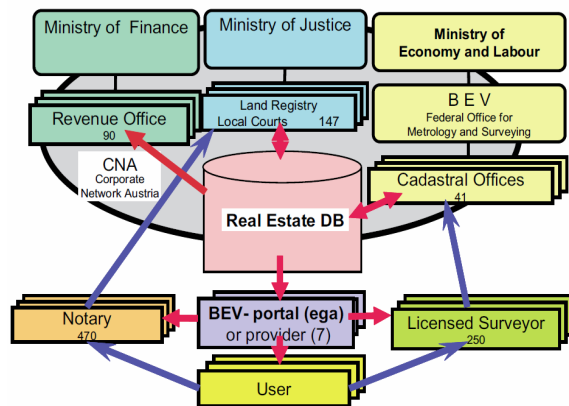


Fig. 7, Players and Data Flows within the Austrian Real Estate Data Base

The territory of Austria has been completely surveyed during the years 1817–1861 and since 1883 all changes in parcels (boundaries and/or ownership) have to be registered in the cadastre and the Land Registry. Since that time there has been a constant process of updating of the Austrian cadastre.

In Austria, the taxation of land is based on yearly averaged yield estimation. The main parameters for

the land valuation are the natural yield conditions (such as soil quality, topography, climatic and water conditions) and economic yield conditions (traffic systems, together with the location and distribution of agricultural parcels). Soil specialists, employed by the Finance Authorities, estimate the value of land by using sample holes with a depth of 1m and by comparing it with sample standards. All matters connected with surveying, mapping and the parcel-wise evaluation of soil estimation is performed by the Federal Office of Metrology and Surveying. Parcel-related results of soil estimation are stored in the Real estate database (GDB). The purpose of official soil evaluation is to create the basics for evaluation for revenue purposes, as for instance:

- real estate transfer tax, tax on assets, inheritance tax;
- assessment of the contributions to social insurance and religious communities;
- assessment of claims relating grants and loans.

In Hungary land offices and FÖMI provide legal and cadastral mapping information, data and other services for external users and citizens generally for fees. The products are available both in analogue and digital form. The sufficient revenue is very important because of self-financing status of land administration.

The majority of basic laws supports the generation of revenue, for example, the Survey Law prescribes the compulsory use of cadastral mapping database for local governments, municipalities, public utility companies for different activities (town planning, public utilities registration etc.). But there are exceptions defined by law concerning the legal data/property sheet data services; local authorities, governmental institutions, ministries, etc. can receive data and services free of charge.

The TAKARNET network introduced in 2003 is the base of the land and real estate properties information services. FÖMI and Land Office network provides information (legal and mapping) of properties not only for internal use, but both for public and private users.

The Hungarian unified land registry system has been totally self-financing since January 2007, without any support from the State budget. As the income has to be generated from data selling and services, it is extremely important for the organization to provide wide range of quality services and products both to public and private clients (authorities, citizens, major players in the economy and other external users).

This system is largely in place, and coupled with the decentralized nature of the Hungarian system. This system provides the large-scale basis for the collection and recording of other land related data (land use and classification, land protection) and thus forms a true multipurpose integrated system. The structure of the services is shown in Figure 10.

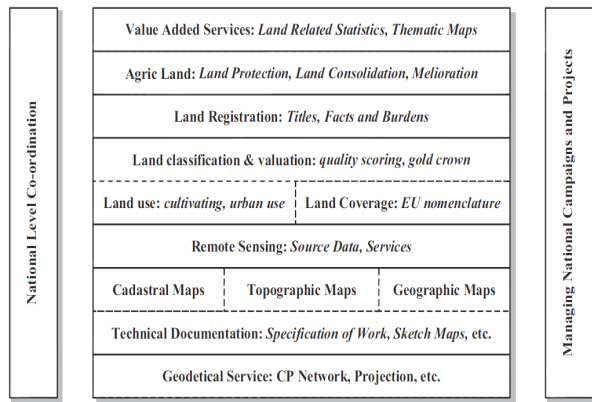


Fig. 8, Layer Model of Services in Hungary

From national economic point of view, the unified land registry system operating in Hungary is one of the most important databases of the country. The land registration databases are currently decentralized, i.e. the land registration databases are stored – in accordance with the principle of territorial competency – in the district land offices keeping the records up-to-date, and those databases are separated physically from one another too.

The latest development idea is to organize the data into one database (data warehouse) synchronized with the central land office database, and in another one, which serves for the data market and data mining. Consequently, data maintenance and data supply will be separated. This way, through organized centralization of data, a „round-the-clock” land office information service can be realized. This will be accessible for citizens through the Central Clients’ Gate on the Governmental Portal. In the first phase of the long-term “Digital Land Office” development plan, the central system will only supply data, but it is also the basis of the future electronic case management procedure supported by countrywide uniform formats. In Romania, cadastral numbering is performed for every administrative territorial unit, which is identified in the SIRSUP taken from the “Permanent Register of Administrative Territorial Units”, as published by the National Commission for Statistics.

One or more adjacent parcels situated on the territory of one administrative territorial unit, regardless the land use and belonging to the same owner, define an immovable which is identified by a cadastral number and registered in one land book. Immovables are numbered within an administrative territorial unit following the order of applications for inscribing, with numbers from 1 to n, using Arabic numerals. Where the immovable was not registered in the land book before, this is assigned a whole cadastral number, after

the last number assigned for that administrative territorial unit.

The integrated cadastre and land registration IT system (eTerra) is NACLRL’s main operational computer system that ensures the management of the electronic cadastre and land registration records.

The purpose of this computer system is to unify, standardize and automate the processes of updating and inquiring the cadastral and juridical records administered by NACLRL, having as final target the increase of quality of services delivered to the citizens and the institutions of this country.

The system manages a unique database containing the graphical and textual data related to cadastral and legal record, having as primary element of information organization and presentation, the administrative territorial unit represented by the commune, town or municipality.

The Information managed is grouped into the cadastral land registry, which, together with the real estate cadastral register, the owner’s alphabetical index, the owner’s cadastral register, the cadastral plan and the annexes to part I of the land book form the organizational structures of the cadastral and legal records.

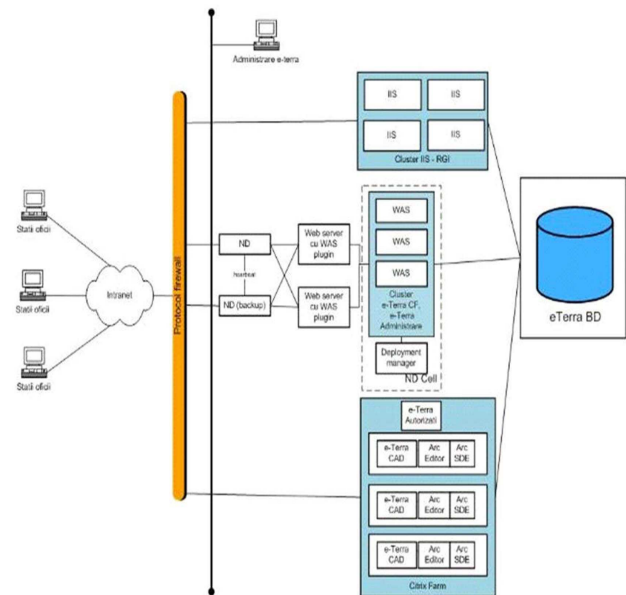


Fig. 9, System Architecture – eTerra- in Romania

A unified cadastre and land registration system developed at national level was implemented in Romania and is administered, in compliance with the European and international standards in the field of cadastre and land registration. The system performs the efficient and secure registration of real estates,

ensuring a much improved coordination between the technical and legal components.

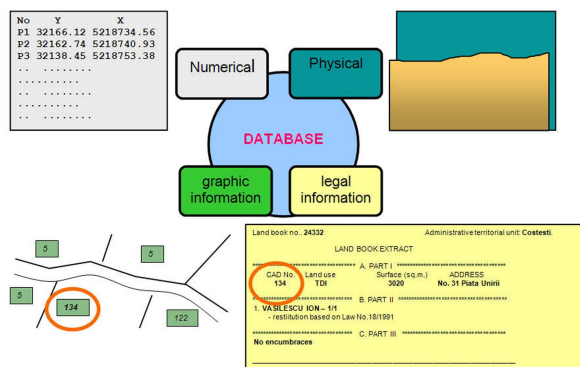


Figure 10. Cadastre and land registry unified database

The interested persons may also access online, on The National Agency for Cadastre and Land Registration (NACLRL) web site, the list of the natural and legal persons licensed to perform technical specialized works.

4 Conclusion

Due to their great importance, cadastral maps, soil evaluation results are used not only as a basis for fiscal purposes, but also for regional and supra-regional planning work, analysis for regional policy, for solving environmental problems, and market value estimations etc..

Adaptive use of GIS technology as a decision-making support system would foster green development and environmentally friendly growth patterns. The ability to acquire, display, and disseminate accurate data allows us to analyze the spatial patterns of issues and forces influencing the relationship between humans and the environment, which is crucial in understanding the intricate nature of this bidirectional relationship. Humans impact nature and in return nature equally impacts us.

Deploying advanced GIS technology enables policy makers to explore various alternatives and implement more successful and potent strategies to combat the many adverse impacts of climate change. GIS can help scientists and researchers investigate this issue, monitor implications, and recommend sound and environmentally sustainable policies to promote peaceful interaction between humans and nature in a way that mitigates harm to either the environment or future generations.

A European multipurpose cadastre may include fiscal cadastre (for tax reference), legal cadastre (title

registry), planning cadastre (city planning), and so forth. Common denominators in these types of cadastres are the unambiguous identification of spatial property and a standardized numbering scheme that is uniformly referenced. This identification method allows different vertical application areas, such as taxation, legal, and planning offices, to refer to the same real property. Thus, when the fiscal cadastre promulgates a change on the tax record of a specific parcel, a GIS map shows the tax information changes on the same parcel for the legal cadastre.

References

- [1] Musat C.C., Herban I.S., *Geoinformation System for interdisciplinary Planning of Landslides Areas, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SEE'09)*, Timisoara, may 2009, pp ;
- [2] Grecea C., Bala A., *Spatial planning-modern tool of urban management and control*, International symposium, May 2010, Alba Iulia, Romania;
- [3] Altan O., *Role of Geospatial Professionals in Risk and Disaster Management and Preventing Natural Catastrophies*, Proceedings of the FIG Working Week 2009, Eilat, Israel, <http://www.ortra.com/fig/>;
- [4] McLaren R.A., Coleman D., Mayunga S., *Sustainable Management of Mega Growth in Megacities*, Proceedings of the FIG Working Week, Cairo, Egypt, 2005 http://www.fig.net/pub/cairo/papers/ts_19/ts19_01_mclaren_etal.pdf.
- [5] United Nations Population Division, *World Urbanisation Prospects: The 2005 Revision*, New York, 2006;
- [6] Grecea C., Herban I.S., *Present Experiences in Romanian Cadastral Engineering*, GIS Open 2008 Conference - Szekesfehervar, Hungary (www.geo.info.hu/gisopen/gisopen2008);
- [7] Cadastral Information System a resource for the E.U. policies, *OVERVIEW ON THE CADASTRAL SYSTEMS OF THE E.U. MEMBER STATES PART III*. Gävle, December, 2009;
- [8] Cadastral Information System a resource for the E.U. policies, *OVERVIEW ON THE CADASTRAL SYSTEMS OF THE E.U. MEMBER STATESPART II*. Gävle, June 2009
- [9] <http://www.un.org/esa/population/>
- [10] <http://www.ancpi.ro/pages/home.php>
- [11] https://www.fig.net/news/news_shortstories.