LAND CADASTRE AND BUILDING CADASTRE IN SLOVENIA: CURRENT SITUATION AND POTENTIAL OF 3D DATA

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ABSTRACT

The cadastre in Slovenia consists of the Land Cadastre and the Building Cadastre, which is being created. These are records in which data on parcels, buildings and parts of buildings are or will be kept and updated. In connection with the Land Register, the abovementioned records will also include data on title. The Real Estate Registration Modernization Project is in progress. The Project will upgrade the existing situation and interface the real estate records in Slovenia. The data maintained by the Surveying and Mapping Authority of the Republic of Slovenia can be used as the basis for 3D systems as well.

SITUATION

Situation in the Land Cadastre and digital orthophoto plans

The Land Cadastre consists of an attribute and a graphic part. The attribute part has been kept and updated in digital form for more than ten years. The graphic part, however, is being digitized and currently covers three quarters of the territory of the Republic of Slovenia. The digitization of cadastral maps has been implemented in the framework of the Real Estate Registration Modernization Project since the year 2000. The coverage with digital cadastral maps shall be completed by the end of 2002. The same project has also completed the production of digital orthophoto plans. These plans will be updated periodically on a three year basis.
The maintenance of both parts of the Land Cadastre is implemented at 46 Branch Offices of Regional Geodetic Administrations. The attribute part of

the record is maintained continuously and entirely also on the central level. However, the graphic part is currently maintained only partially for digital cadastral maps for individual regions of the Republic of Slovenia have not been completed yet.
The Land Cadastre comprises data on the owner (first name, last name, address, personal identification number), data on the parcel (parcel number, cadastral commune, land parcel area, cadastral class, cadastral culture, land use, cadastral income, title sheet; complying to the newly adopted legislation, the Land Cadastre shall also include data on actual land use and the link with the Land Register, i.e. the Land Register Unit). Land parcels form land cadastre points for which data is kept on their position (coordinates x, y; the z coordinate is optional), as well as the method of survey and the administrative status. Land cadastre data represents the basic layer of spatial data and is kept in 2D form.

Situation in the Building Cadastre

The contents of the Building Cadastre which in being set up, comprises data on buildings and parts of buildings, including common property. The Surveying and Mapping Authority of the Republic of Slovenia commenced with the legal registration of buildings and parts of buildings at the end of 1999. The registration of strata title had already been implemented by the Land Register, however without the participation of the Surveying and Mapping Authority of the Republic of Slovenia. In line with the new legislation, the procedures of the legal registration of buildings and parts of buildings depend upon the application of the owner, which consequently prolongs the legal registration. In the past, the buildings have been registered occasionally and only in the Land Cadastre in 2D form and under special land-use options. Only buildings that have been constructed have been subsequently registered. However, even these were registered merely for some buildings.
The Republic of Slovenia did not have an integral technical record on buildings and parts of buildings. Due to the increasing need for such a database, the Surveying and Mapping Authority of the Republic of Slovenia started implementing activities for the creation of a technical database of buildings and parts of buildings in 1999. The foundation for the creation of the database is formed by the roof outlines of buildings that have been acquired photogrammetrically and will be added data on parts of buildings.
All data on buildings and parts of buildings is kept in the central database of buildings. In order to manage this data, an intranet application has been designed which also makes the data accessible to all national geodetic services (to the Main Office of the Surveying and Mapping Authority of the Republic of Slovenia and to all its local offices). In the years 2002-2003, the database shall be expanded with technical data on parts of buildings. In

order to maintain particular descriptive data on buildings and parts of buildings from the local community level, the database shall be upgraded and made accessible to other users. Figure 1 shows the screen shot of the intranet application used for managing data on buildings and parts of buildings, both graphical and attribute.

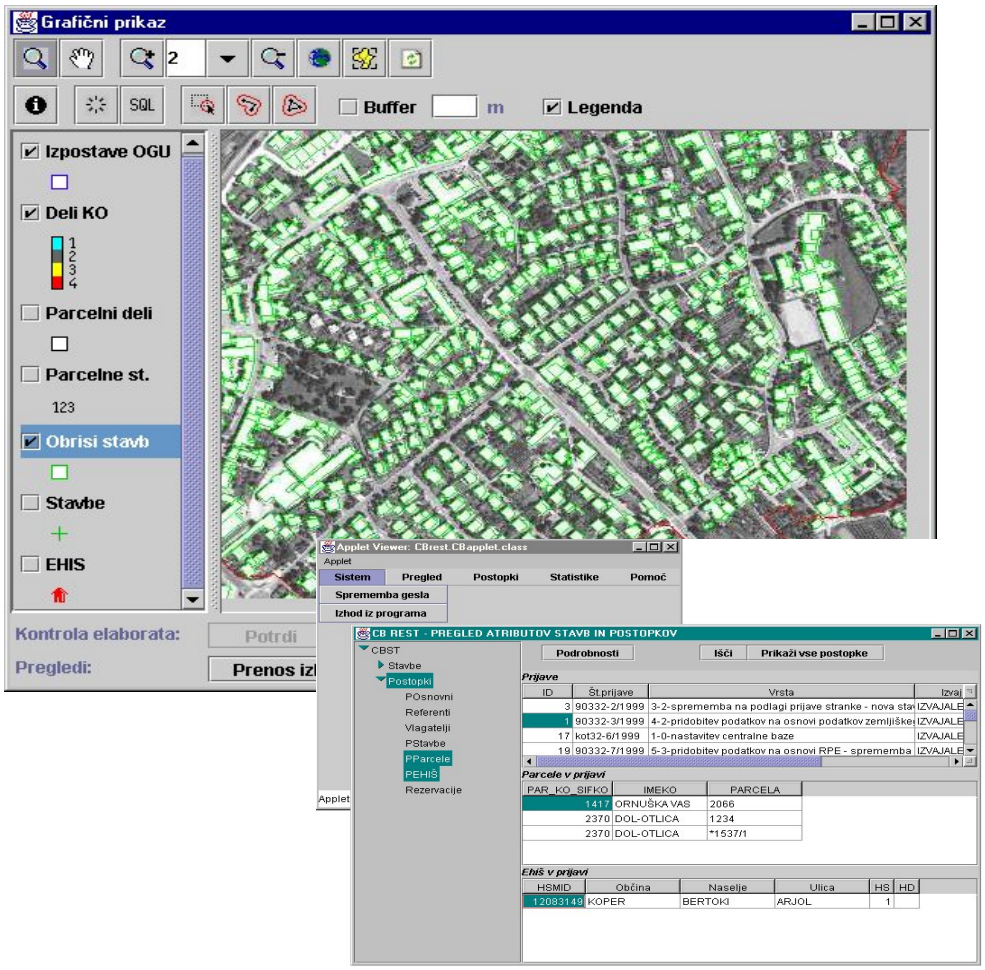

Figure 1: Intranet application for managing data on buildings and parts of buildings.

Current situation with the Land Register

The Land Register comprises data on the owner, his rights and burdens relative to a specific real estate. Data on a specific real estate is taken from the Land Cadastre or the Building Cadastre. The Land Register is still kept in analog form. However, it is being digitized within the Modernization of Real Estate Records Management Project, which is under the auspices of the national Phare program. The existing digital attribute part of the Land Cadastre is intensely used in the setting up of the electronic Land Register.

LINKAGES

The fundamental real estate records are the Land Cadastre, the Building Cadastre and the Land Register. These real estate records are mutually connectible. The connectibility of these records shall be improved in the course of the Real Estate Registration Modernization Project, especially after their digitization.

Data on buildings and parts of buildings is linked with the use of house numbers, which are kept by the Surveying and Mapping Authority of the Republic of Slovenia in the Register of Spatial Units. Data on buildings and with this data on parts of buildings are linked with the Land Cadastre data with the use of a parcel or parcels on which the building stands. The maintenance of the parcel-building link is partially automatic and partially manual, which is mainly due to different sources used in the Land Cadastre (graphical and numerical cadastre). The reason for the said manner of maintenance is also fact that the database of graphic cadastral data has not been set up yet for the entire territory of the Republic of Slovenia. The data of Building Cadastre is linked with the Land Register data when the legal registration of buildings and parts of buildings is taking place.
The Real Estate Registration Modernization Project and the Phare Twinning Project, which include the setup of the electronic Land Register, foresee the maintenance of title data at a single location and its use by the three real estate records (Land Cadastre, Building Cadastre and Land Register).
The Real Estate Registration Modernization Project includes the acquisition of actual land use and the production of digital cadastral maps. The two processes should be completed by the end of 2003.
In this way, data on actual land use will be collected and linked with the parcel number determined by the Land Cadastre.

MODERNIZATION OF REAL ESTATE RECORDS KEPT BY THE SURVEYING AND MAPPING AUTHORITY OF THE REPUBLIC OF SLOVENIA

The implementation of adequate real estate policies in any country requires current real estate records, which underpin the operation of the real estate market and represent one of the first conditions for a successful transition into a market-based economy. The homogenous registration of real estate and quality real estate data are the foundation of spatial planning, land policy making, real estate valuation and taxation, registration of real rights in real estate, spatial data referencing, statistical analyses and the like. In Slovenia various implementing agencies and individuals have been striving for a long time to regulate the real estate records managements on the state level and under a joint project. All the efforts were joined in a single project called the

Real Estate Registration Modernization Project, which commenced in January 2000 and shall be completed in December 2004.

The results obtained during the Project and in relation with other accompanying projects and activities should lead to the realisation of the following long-term objectives:

1 Harmonised real estate records (connectible real estate data will enable the creation of harmonised real estate records available to users as homogenous and integral databases);
2 Market-based valuation and taxation of real estate (the methodology for the market-based valuation of real estate for taxation purposes will enable the calculation of the market value of a real estate; this will contribute to a higher degree of objectiveness in real estate taxation);
3 A more efficient operation of the real estate market (regulated and maintained records will enable more transactions on the market; the knowledge of the market value of real estate will contribute to the balanced operation of the market; there will be less speculations for similar and identical types of real estate, for both Slovenian citizens and foreigners);
4 Efficient support to the needs of the government, local communities and individuals (reliable, adequate and quality data will provide efficient support to decision-making and management on the government level and on the level of local communities; such data will also meet the interests of individuals);
5 Acquisition and monitoring of the use of agricultural land and forests (first the acquisition and later on the monitoring of the changes in land use will make an important building block of the information system related to the fields of agriculture and forestry; the said information system will be a sound basis for implementing adequate agricultural policies);
6 Implementation of spatial, environmental and housing policies (quality and linked real estate data provide the foundation for the implementation of various policies being of key importance for the development of any national economy).

The achieved results will provide a uniform, maintained and current real estate registration system, which will increase the reliability of data and decrease in the long run the cost of real estate registration. Not only will it be much easier for the users to obtain data, it will be also faster.

Uniform and integral fundamental databases of real estate will be easy to upgrade with other databases containing spatial data. In contrast to the basic real estate databases, the databases containing spatial data will be created for:

1 a specific area;
2 a specific regime of space use;
3 a specific point in time or date;
4 a specific (strictly-defined) purpose.

By the end of 2002, a layer of the digital Land Cadastre will be produced for the entire territory of the Republic of Slovenia and in a single state coordination system (Gauss Krueger coordination system). This layer will be linked with the digital layer of the Building Cadastre. Land use is planned to be also acquired. The latest situation recorded in the paper-based Land Register will be digitized by the end of 2004. In all cases, the linking element is the land parcel. The digital orthophoto plans have already been produced for the entire territory of the Republic of Slovenia.

Land Cadastre

The conversion of analog cadastral maps into digital form has started in 1991. The digitization of all cadastral maps and their integration into the single state coordination system will be completed in under the Real Estate Registration Modernization Project.

Building Cadastre

The Surveying and Mapping Authority of the Republic of Slovenia will survey, for the first time, all the buildings in the Republic of Slovenia. This activity is being implemented within the Real Estate Registration Modernization Project. The total number of all buildings in Slovenia will become available for the first time. It is estimated that there are 1.5 million buildings in Slovenia.

The photogrammetric acquisition of data on buildings will be completed by the end of 2002.
The basic source of acquisition are the aerial photographs, which may not be older than two years. Apart from building roof outlines, the characteristic heights of buildings are collected as well. These heights are the fundus height, the eaves height and the ridge height. Data on heights is regarded as and kept under attribute data. In addition to the abovementioned data, data on buildings also include the unique building identifier, which is defined within the Cadastral Commune. The Cadastral Commune is a basic unit of the Land Cadastre and it is seldom subject to alterations. At their introduction into the database, each building is automatically assigned an interagency identifier, which are uniformly defined across Slovenia.
Photogrammetrically acquired data on buildings are 2D data. Nevertheless, by adding the height attributes, these data can be successfully used in 3D systems. This method proved efficient on several occasions.
In the years to follow, the photogrammetric acquisition of data on building will be amended with data on parts of buildings that will be acquired from the existing records kept by local communities and other institutions, such as data on electric-power consumers and the Census 2002 data.

Such a technical register on buildings and parts of buildings will represent the fundamental database applied in real estate taxation, which the Republic of Slovenia intends to introduce in the years to come. This register will also prove useful to many other users, such as real estate agencies and the entire real estate market. It will also support the Government in its efforts to implement housing policies and to manage buildings and to plan future developments. The private sector and other users will benefit as well for this data can be used for statistical purposes, in relation to the European Union, in case of natural disasters and the like.
Prior to the creation of the technical register of buildings and parts of buildings, the Surveying and Mapping Authority of the Republic of Slovenia carried out an cost-benefit analysis, its results justifying the setting up of such a register. It is estimated that approximately SIT 8,752 million in real estate taxes will be colleted each year. The estimated costs related to the creation of the technical register of buildings and parts of buildings does not exceed SIT 715 million. Therefore, the net benefit/cost reaches approximately SIT 8,000 million (EUR 36.4 million). However, the abovementioned figures also include the so-called »soft benefits«, which currently cannot be defined in figures.

In terms of location, the data on parts of buildings are cross-referenced to building location data. Data on parts of buildings are kept in attribute form, e.g. the number of the apartment within the building, storey number, type of use and the like. All the technical data on buildings and parts of buildings acquired in such manner will serve as the technical basis at the time of registration of a real estate into the Building Cadastre, which is the precondition that has to be fulfilled if the real estate is to be registered into the Land Register. In addition to attribute data required for the legal registration of parts of buildings into the Building Cadastre as stipulated by the existing legislation, it is also necessary to submit the blue print of the building or the blue print of the parts of the building (floor plans). These floor plans are requested for they precisely define the location of the part of the building within the building itself. Each part of the building is allocated a unique identifier relevant only within the building in which the part of the building is located.
The need for a technical register containing data on buildings and parts of buildings, which has been described above, proved to be justified for the legal registration into the Building Register progresses at a very slow pace, for the registration into the Building Cadastre involves the participation of building or apartment owners. The legal registration has been divided in two parts. The first part of the registration is carried out at the Surveying and Mapping Authority of the Republic of Slovenia, which reviews the technical data and the floor plan/blueprint of the building and issues an administrative decision or certificate allocating identification numbers to

buildings and parts of buildings and stating the area of the building or part of the building. The second part of the legal registration procedure entails the Land Register using the identification number to implement the legal registration of the owner into the Land Register, and notifying the Surveying and Mapping Authority of the Republic of Slovenia on the performed registration.
In order to stimulate the registration of apartments into the Building Cadastre, the Surveying and Mapping Authority of the Republic of Slovenia prepared and proposed a series of measures, such as the simplification of procedures occurring in the registration of buildings and parts of buildings, and the co-financing of apartment registration. The efforts exerted to stimulate the registration of buildings and parts of buildings are also being implemented within the framework of the Real Estate Registration Modernization Project.
One of the assignments that need be carried out in the future is the provision of uniform and compatible IT solutions that will support all real estate records managed by the Surveying and Mapping Authority of the Republic of Slovenia. The hardware which was urgently needed was purchased in 2001 through the Phare pre-accession assistance program.

POTENTIAL USE OF 3D

Data on buildings (data acquired photogrammetrically) have already been used as 3D data, despite the fact that characteristic heights data has been acquired and kept in attribute form. One of potential uses that marks the acquired data as satisfactory is the use of data in cases of natural disasters (e.g. landslides), where photogrammetric data on buildings and the digital terrain model have been successfully used in a 3D system.
Below we can find the example of the Log pod Mangrtom landslide[1] that occurred in November 2000. The landslide claimed human lives and caused extensive material damage. During the process of restoring normal life in the Log valley, the Surveying and Mapping Institute of the Republic of Slovenia has successfully used the photogrammetric data on buildings, the digital terrain/elevation model with a 25 m cell, digital orthophoto plans, and aerial photographs taken during cyclic aerial surveys including orientation parameter data. They also used the additional photographs taken from a helicopter and the photographs of a subsequent aerial survey of the affected area. Figure 2 shows the situation before the landslide, while figure 3 indicates the situation after the disaster.

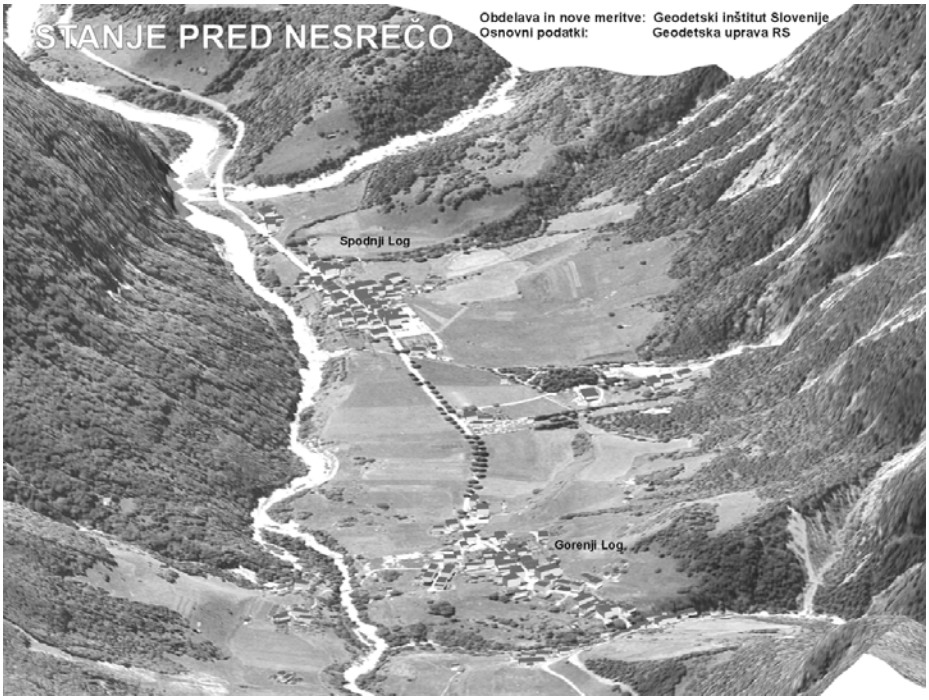

Figure 2: Visualization of situation prior to the landslide[1].

Figure 3: Visualization of situation after the landslide [1].

Keeping actual 3D data on buildings on the national level is not feasible due to financial and methodological limitations. However, there is an emerging interest and there have been attempts on the part of individual local

communities as well as other users to produce 3D data for smaller areas, such as city centers. One of the examples is the 3D model produced by the Municipality of Ljubljana. The Surveying and Mapping Authority of the Republic of Slovenia supports these and similar efforts, but it mainly supports the amendment of data, which already exist and are kept by the Surveying and Mapping Authority of the Republic of Slovenia with more detailed 3D data on the local level. Such amendment of data is possible with the use of unique identifiers defined by the Surveying and Mapping Authority of the Republic of Slovenia.

The creation of a system, which is being set up by the Surveying and Mapping Authority of the Republic of Slovenia, is based upon the applicability of data and the possibility of their updating. Previous studies and analyses have shown that the existing users do not need more than the photogrammetric building roof outlines including some characteristic heights. The largest users of existing data are the municipalities which use these data mainly for collecting the compensation for the use of building land as well as for other uses.

The area of land parcels is acquired and maintained with two coordinates, with the exception of geodetic points and several land cadastre points the height of which has been surveyed in the field. Data providing us with spatial information is linked to land thorough parcel numbers. The joint application of land cadastre data kept in 2D form and other data (e.g. digital terrain model, data on buildings, acquisition of actual land use) sets up the foundations of the 3D Land Cadastre.

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Ema Pogorelčnik has obtained her B.Sc. in Geodesy at the University of Ljubljana, Faculty of Civil Engineering and Geodesy. After graduation she stated working at the Surveying and Mapping Authority of the Republic of Slovenia, where she first worked in the Department of the Register of Spatial Units. She continued her career by heading the Project for the Setup of the Register of Geographical Names. For several years she was also an active member of the government commission for the standardization of geographical names. She actively participated in the process of data quality control. She is also a member of the CERCO working party, specializing in operation and data quality control. She continued to work in the Real Estate Sector, specifically as the Head of the Building Cadastre Department. Ema Pogorelčnik is responsible for the component of the Real Estate Registration Modernization Project called Photogrammetric Acquisition of Buildings Outlines. She is also the Head of the Apartment Registration Development Subproject.

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