

The Cadastre in Poland – The Current Status and Possibilities of Transformation into 3D One*

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SUMMARY

In the present form the polish cadastre has been operating since the Act - Surveying and Mapping Law was passed in 1989. At the moment, cadastre in Poland is the database comprising data on parcels, buildings and premises. This is basically the database of 2D data. Scientific and technological development taking place recently, causes demand for third dimension introduction.

To introduce problems of polish cadastre, the two databases managing data on real estates in Poland are described in the paper. They are the Cadastre for Grounds and Buildings and the Land Register. The Land Register objects does not have spatial reference, so focus was put on the Cadastre for Grounds and Buildings. The objects of cadastre (parcels, buildings and premises), the legal regulations and technical instructions having references into third dimension are presented in the paper. According to the author the present state of cadastre and binding legal regulations are basis for “adding the third dimension” into cadastre in Poland, but determining of 3D cadastre development direction seems to be necessary beforehand. The existing or developed standards like Land Administration Domain Model, INSPIRE Data Specification on Cadastral Parcels and INSPIRE Data Specification on Buildings may be helpful here.

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1. SYSTEMS CONTAINING INFORMATION ON CADASTRAL PARCELS AND REAL ESTATES

There are two systems containing information on cadastral parcels and real estates in Poland. The first is the Land Register, whereas the other is the Cadastre for Grounds and Buildings. The Land Register in Poland (The Act, 1982) captures, keeps and reveals information concerning legal objects (real estates). This information generally concerns description and designation, rights, responsibilities and restrictions (including mortgage). Data concerning description (parcel number, area and boundaries) are taken from the Cadastre for Grounds and Buildings. The Land Register is managed by the courts of law. The Land Register objects in Poland are mainly real estates. The real estate may consist of land parcels, buildings or premises/apartments. The most typical real estate consists of land parcel (parcels) and building (buildings). The main aims of Land Register are revealing the legal state of every estate and assuring the proper real estates turnover.

The Cadastre for Grounds and Buildings (The Act, 1989) data are mainly objects spatial description, cadastral objects attributes, values and corresponding official documents. The Ground and Building Cadastre is managed by the local authorities at the county (powiat) level. The Ground and Building Cadastre objects are cadastral parcels, buildings and premises/apartments being separately owned estates. The most common cadastral objects are land parcels.

The cadastral objects definitions in Poland are as follows:

The cadastral parcel – continuous area of land, situated in one cadastral precinct, legally homogenous, separated from surroundings with boundary lines.

The building – it is such the building object that is permanently attached to the ground, separated from space with separating barriers. It has foundations and roof. Buildings are the roofed objects, that have built-in installations and technical devices, used for permanent human needs. They are adopted for staying of people, animals and protection of property.

The premises/apartment is the independent dwelling used for housing or other purposes. Independent premises/apartment is the room or set of rooms, separated by permanent walls contained within one building, that is intended for human residence and together with auxiliary spaces meets their housing needs.

The detailed information concerning cadastral objects in Poland and legal regulations defining them are given in (Karabin, 2011).

2. REFERENCES INTO 3D SITUATIONS IN LEGAL REGULATIONS IN POLAND

Apart from The Surveying and Mapping Law there are references into 3D in several binding and just prepared regulations in Poland. They are the Act on Ownership of Premises, the technical instruction G-7, the order concerning database of geodetic registration of utilities,

topographical objects database and base map and the Act on Transmission Passageways.

The concept of independent premises/apartment is defined in the Act on Ownership of Premises (The Act, 1994). The ownership of apartment usually goes with share in common parts of real estate. This common parts are land and these elements of building and installations that are no for exclusive use by apartments owners.

There are two regulations concerning the utilities network database. They are the technical instruction G-7 “Geodetic registration of utilities networks” (Instruction, 1998a) and “The order concerning database of geodetic registration of utilities, topographical objects database and base map” (The Order, 2011). The order is in final draft version and is going to replace the instruction G-7 and other instructions as well. The main idea of this regulation is to create the database that contain information containing location and attributes of public (or possibly private) utilities like electric, water, sewage, gas, telephone and so like. Such a database should concern information not only like location in 2D, but also the one concerning third dimension.

The instruction that defines objects of base map is the technical instruction K-1 (Instruction, 1998b). According to this instruction, the numbers of the highest floor is placed on the map. The numbers of floors are given for each part of the building having varying floor numbers, according to the draft order mentioned above. Other elements showing better the spatial character of buildings like aboveground connector or the subterranean part of building are also introduced there.

The general issues concerning rights, restrictions and responsibilities, among them easements are contained in the Civil Code (Code, 1964). The rapid development of public utilities networks causes that present regulations seem to be insufficient, so the work concerning the Act on Transmission Passageways has started (The Act, 2011). The Act on Transmission Passageways defines the rules for establishing the transmission passageway. Establishing the passageway concerns issues like establishing the passageway for new objects, granting building permit for transmission devices, determining transmission passageway for existing objects, establishing transmission easements, land management inside the transmission passageway and issues concerning compensation for restriction resulting from granting the transmission passageway easement.

3. REFERENCES INTO 3D IN INTERNATIONAL REGULATIONS

There are some references into 3D situation in international regulations that Poland is or will be obliged to implement. There are Land Administration Domain Model (in future ISO 19152) and INSPIRE Directive.

3.1 Land Administration Domain Model

Land Administration Domain Model (LADM, 2011), that is in the final draft version and is going to become an International Standard in 2012 or 2013. LADM allows the representation of 3D objects. Generally, according to LADM, the LA_SpatialUnit (alias LA_Parcel) have the reference into third dimension. LA_SpatialUnit (LA_Parcel) are refined into two specializations LA_LegalSpaceBuildingUnit and LA_LegalSpaceUtilityNetwork. Building units are instances of class LA_LegalSpaceBuildingUnit. They do not necessarily coincide

with the physical space of building. Utility networks are instances of class LA_LegalSpaceUtilityNetwork and they do not necessarily coincide with the physical space of utility network.

For real 3D boundary representations LADM uses boundary faces, which can be vertical or non vertical 3D boundaries. On the threshold of 2D and 3D representations the liminal spatial units can be used.

3.2 INSPIRE Directive

The European Union countries are obliged to implement the Directive establishing an Infrastructure for Spatial Information in the European Community (INSPIRE, 2007). Under the directive the member states are obliged to prepare and make public Spatial Data Sets listed in annexes to the directive. There are data themes “Cadastral parcels” and “Buildings”, among them. The INSPIRE Data Specification on Cadastral Parcels (INSPIRE, 2009) has already been prepared and published. The INSPIRE Data Specification on Buildings (INSPIRE, 2011) is in its draft version.

The INSPIRE Data Specification on Cadastral Parcels has not got the harmonized solutions for rights and owners on 3D cadastral objects. However, in recapitulative check-list, it is mentioned that some use cases are at least of interest for 2,5D cadastral parcels and there are possible need for 3D parcels, in future. It is also mentioned that 3D parcels may be useful now for non-environmental or environmental use cases in future. Moreover, some users have expressed the requirement (in future) to combine cadastral parcels with 3D data like DTM or buildings. So it is possible to extend the INSPIRE Data Specification on Cadastral Parcels for 3D data if there is requirement and consensus to do so.

The last version of INSPIRE Data Specification on Buildings is of 15th June 2011. The INSPIRE Data Specification on Buildings contains four data models. There are core 2D profile, Extended2D profile, core 3D profile and Extended3D profile. Generally the modelling of 3D building changes with level of detail (LoD). It starts from LoD1 (the same H coordinate for all object), LoD2 (shape of roof added) to LoD3 (accurate description of exterior - openings like doors, windows added.)

4. EXAMPLES OF 3D SITUATIONS IN POLAND

The 3D situations with regular objects usually don't cause too much problems. The problems appear when we have the irregular 3D objects. The problem may be more serious when the ownership changes or overlaps vertically. It usually concerns buildings. According to the polish regulations the projection of outer walls contours represents building on the cadastral map.

The author would like to present four cases when there is the strong need for 3D cadastre in Poland. They are:

- Different owners or users of “spatial” real estates, especially owner of parcel varying from owners of building or its parts located over cadastral parcel,
- Varying number of floors in the different part of the building and some additional elements like connectors between buildings or way under the aboveground building parts,

- Projections of aboveground and underground parts of the building are different,
- Nonstandard shapes of buildings.



Photo. 1. The ownership of parcel different than the building (photograph by the author).

The example of the first case is presented on the photograph 1. It is the street situated under the aboveground parts of building. The building is managed by housing cooperative and the parcel containing street belongs to the city of Cracow.



Photo. 2. Building with varying number of floors (photograph by the author).

The second case is presented on the photographs 2 and 3. We can see very common instance of building with varying number of floors (photo. 2). The photograph 3 shows the aboveground connector between buildings. This both instances are already taken into the draft version of the order (The Order, 2011). According to this new regulation, the presentation on the map for various 3D situations is going to be better than before, but it is far from being 3D or even 2.5D solution.

The third case occurs when aboveground and underground parts of the building do not

coincide vertically and its projection on the map is different. It is shown on photo. 4. The underground parking outstands the aboveground parts of the building. Such a situation is also taken into account in (The Order, 2011).



Photo. 3. Building with aboveground connector (photograph: www.panoramio.com).



Photo. 4. Building with aboveground and underground parts do not coinciding vertically (photograph by the author).

The contemporary architecture offers many cases of buildings irregular shapes (photo. 5, photo. 6). It results in difficulties in presenting such shapes in both computer database and maps, so in such cases we can see the very strong need for some 3D registration.



Photo. 5. Building having irregular shapes (photograph by the author).



Photo. 6. Building having irregular shapes (photograph: www.panoramio.com).

5. POSSIBLE IDEAS ON DEVELOPING 3D CADASTRE IN POLAND

In the previous chapters author tried to describe the objects of nowadays ground and building cadastre in Poland and Polish and international standards that may have influence on the creation of future 3D cadastre in Poland, as well. Author thinks that there is the strong need to create the 3D cadastre in Poland and it should be done in several stages. They may be as follows:

- Requirements collecting and feasibility study,
- Pilot projects,
- Implementation.

The first stage seems to be the most important. The future 3D cadastre model, suggested legislation and estimated costs of implementation should be determined there. Author thinks that such study should be prepared in several scenarios, first of all taking into account planned

costs and necessity for new legislation. Some iterative methods may also be used here. In author's opinion the most time consuming part may be elaborating the model of future 3D cadastre in Poland, that takes specific conditions of Poland. The idea of applying base map data to start building the 3D cadastre in Poland suggested in (Karabin, 2011) appears proper and worth further development.

It seems that it is not necessary to suggest complex and very specific solutions that are proposed in Asian countries (Khoo, 2011) and (Hassan and others, 2011), for the space in these countries is used very intensively, both vertically and horizontally, with many irregularities and ownership changes. The European solutions will surely be more appropriate. Because of many similarities the Hungarian solutions seem to be worth attention (Ivan, 2011) here.

The international standards and legal regulations especially future ISO 19152 and INSPIRE Directive should also be taken into account. The INSPIRE data specification on Buildings, that is being in its final stage seems to be very important, for the attributes of buildings may not only be used for filling the requirement of INSPIRE Directive, but to creating the future 3D cadastre in Poland.

After completing the stage of requirements collecting and feasibility study, the pilot project should be introduced. In author's opinion it seems necessary to chose several localizations in different parts of Poland for such a project.

REFERENCES

European Parliament and Council (2007): Directive 2007/2/EC of The European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

D2.8.III.2 INSPIRE Data Specification on *Building* – Draft Guidelines. 2011-06-15.

D2.8.I.6 INSPIRE Data Specification on *Cadastral Parcels* – Guidelines. INSPIRE Thematic Working Group *Cadastral Parcels*. 2009-09-07.

Geographic information — Land Administration Domain Model (LADM) ISO/DIS 19152, Draft International Standard, International Organization for Standardization, 2011

Hassan M. I., Ahmad-Nasruddin M. H., Yaakop I. A., Abdul-Rahman A. (2008): An Integrated 3D Cadastre – Malaysia as an Example. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. Vol. XXXVII. Part B4. p.121-126. Beijing.

Iván G.: 3D Cadastre Development in Hungary. Proceedings, p. 453-460. 2nd International Workshop on 3D Cadastres 16-18 November 2011, Delft, the Netherlands.

Karabin M. (2011): Rules concerned Registration of the Spatial Objects in Poland in the Context of 3D Cadastre's Requirements. Proceedings, p. 433-452. 2nd International Workshop on 3D Cadastres 16-18 November 2011, Delft, the Netherlands.

Khoo V.H.S. (2011): 3D Cadastre in Singapore. Proceedings, p. 507-520. 2nd International Workshop on 3D Cadastres 16-18 November 2011, Delft, the Netherlands.

The Act – Land Register and Mortgage (1982), published in Polish.

The Act on Spatial Information Infrastructure –of March the 4th (2010), published in Polish.

The Act on Ownership of Premises of 24 June 1994, published in Polish.

The Act – Surveying and Mapping Law (1989), published in Polish.

The Act on Transmission Passageways, draft version (2011), published in Polish.

The Civil Code of 23 April 1964, published in Polish.

The Order of Ministry of Administration and Digitization in case of database of geodetic registration of utilities, topographical objects database and base map, draft version (2011), published in Polish.

The Order of the Council of Ministers – in case of real estates valuation and preparing appraisal report (2004), published in Polish

The Order of Ministry of Regional Development and Buildings – in case of Cadastre for Grounds and Buildings (2001), published in Polish.

The technical instruction G-7 “Geodetic registration of utilities networks” (1998), published in Polish.

The technical instruction K-1 “Base Map” (1998), published in Polish.

BIOGRAPHICAL NOTES

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