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## **THE FEATURES OF THE STATE REGISTRATION OF OBJECTS WHICH INSEPARABLY LINKED WITH THE GROUND IN FOREIGN COUNTRIES**

The article substantiates the need to move to three-dimensional state registration of objects which inseparably linked with the ground based on the experience of foreign countries: such as Sweden, Norway, the Netherlands, Australia, of Denmark, Russian Federation. Since one of the main disadvantages of three-dimensional cadastre is the lack of adequate mapping of underground facilities, it complicates setting on cadastral records of underground buildings and, consequently, registration of rights to them. It is concluded that in the beginning, a state need to build and approve a single concept and three-dimensional cadastre of relevant legislation. Currently in Ukraine it is possible to use some three-dimensional features in the existing cadastral system because it does not entail a general structure of global change cadastre information large economic costs.

**Key words:** state registration, three-dimensional cadastre, underground space, underground objects, cadastral system, cadastral registration.

Recently, the state land cadastre, based on two-dimensional registration does not meet modern requirements of market land relations. The development of urban infrastructure leads to the fact that two-dimensional registration is not enough to display complex multilevel buildings. In particular, there is not allowed to be any mutual overlap of land and real estate. In fact, a huge number of real objects especially in urban areas overlap in the two-dimensional projection on the cadastral map. Among them can be named different underground and air communications, buildings, hanging over the road, and others. Partially the issue of joint use of land and space above and below them can be solved by using servitudes. However, a three-dimensional record of the space (height, depth, width) (whether on the ground or under it) is used today. It is called a three-dimensional inventory (3D cadastre).

The need for three-dimensional inventories is caused by the increasing complexity of building area, above ground and underground infrastructure, the emergence of dimensional requirements for registration of rights to real estate, both private and public. All the needs that arise today only cannot be fully provided by the existing methods of two-dimensional property registration. The possibility of registration of real estate and rights to it in three-dimensional measurement will optimize the use of space. The functionality is limited all the times, especially by registration of land as a surface, the lack of three-dimensional cadastral maps, the limited registration of specific objects half three-dimensional decisions.

Many scientists lawyers tried to explore this problem. Among them we can call V. Andreytsev, T. Kovalenko, P. Kulinich, A. Miroshnichenko, V. Nosik, A. Ripenko, M. Shulga, and also – D. Dobriak, P. Kazmir, A. Martin, S. Osypchuk, I. Rozumnyy, M. Sohnych and others.

The purpose of the article is a justification of the establishment of a three-dimensional state registration of objects inseparably linked with the ground based on the experience of foreign countries.

Currently, the system of state registration of real estate rights and encumbrances and state land cadastre is based on the two-dimensional representation of the property. One of the main disadvantages of two-dimensional inventory is the lack of adequate mapping of underground facilities. The current approach does not cover all situations in a real three-dimensional world, including underground space. This can complicate the setting of accounting for inventory of underground buildings and, consequently, registration of rights to them.

The other problem is the cadastral accounting and state registration of underground line objects, especially utilities. The construction of them has the different typological diversity. Typically, they are under several land plots crossing each other on different depths or, laid in a trench collector so, in addition to the design height or depth, these objects have their own spatial (three-dimensional) status. But the state registration of rights to line objects is not made today. There is an actual question of whether it is necessary to carry out the registration of rights to the cavity space – air or ground space (for example, in order to

maintain the existing pan) or the registered right must be linked to existing or future structure. However, the state registration of rights to the cavities of space also isn't made.

It is obvious, that such level of state regulation almost ignores the specifics and importance of underground buildings, does not respond to the spirit of the law on cadastre and as a system act and can be regarded only as a very first step towards a truly unified state cadastre of real estate and construction of objects of state registration of rights to them.

It can be assumed that without taking into account the factor inherent spatial extent of the underground structures it is difficult to expect the inclusion of underground real estate into the civil circulation, its management, guaranteeing the rights of owners and the efficient collection of taxes and payments for this property. It is hard to expect the optimization of programs of development works and design decisions with incomplete information about the relative positions of objects (and sometimes on their location) on the depth of their occurrence, the interactions with ground buildings and structures, the nature of the relief and subsoil.

It seems that before the introduction of the three-dimensional cadastre it is necessary to understand which of the possible variants of dimensional cadastre systems may be applied in Ukraine. There are three solutions for the registration of the three-dimensional situations: a complete three-dimensional cadastre (3 D), the hybrid cadastre (2,5 D), three-dimensional signs in the current cadastral registration system<sup>1</sup>.

The complete three-dimensional cadastre means that it is necessary to introduce the concept of ownership in three-dimensional space. The legislation, civil law agreements and the cadastre must support and provide the transaction of the three-dimensional rights. Of course, from a practical point of view it is better to support a two-dimensional set of rights and only in difficult situations, to use the complete three dimensional complex.

The hybrid cadastre provides for the continuation of dimensional cadastre and registration of situation in the third dimension of the fixation with three-dimensional objects in two-dimensional boundaries of two-dimensional inventory. This will lead to a hybrid combining of two-dimensional land plots and three-dimensional real objects.

The hybrid cadastre is intermediate between two- and three-dimensional cadastre. It suggests a three-dimensional representation of real estate while maintaining the legal structure and display of property and other rights. The hybrid model of the cadastre has several advantages over traditional models such as: it can be used to describe the majority of capital construction; set the right to object accounting in volume; much easier and more cost-effective to operate than the three-dimensional model of inventory. The use of this model in Belarus, for example, has allowed this country to take a leading position in the global ranking of countries in part of the registration of real estate transactions. This country is significantly ahead of Ukraine in this rank.

Three-dimensional features in the current cadastral registration system provide the preservation of the two-dimensional cadastre, but with external links to digital representations of three dimensional environments.

The difficult three-dimensional situations are registered by using special decisions. The simplest decision is to mark the three-dimensional situation during the registration, so that the user can receive a consultation from the registrar of the details. A more difficult decision is to add to the database a link to the digital description of the object. Then the design contours of dimensional object can be registered on the cadastral map<sup>2</sup>.

It should be noted that the creation of the most efficient prototype of three-dimensional model of cadastre in Ukraine ineffective without studying the experience of foreign countries in the implementation and maintenance of three-dimensional cadastre. The issue of the formation of three dimensional cadastres devoted more and more attention in international practice and theoretical development of Western scholars. Currently, the system of three-dimensional cadastre is introduced in many countries, such as Sweden, Norway, the Netherlands, Australia, Denmark. The pilot project is provided in Russian Federation. In recent years, various countries conducted research in this area. Simultaneously legislation was improved.

Due to dynamic development of building, especially underground parking, shopping centers, building

<sup>1</sup> Billen, R., Zlatanova, S. *3D spatial relationships model: a useful concept for 3d cadastre*. <[http://www.geo.tudelft.nl/frs/papers/2001/Paper\\_Billen\\_Zlatanova.pdf](http://www.geo.tudelft.nl/frs/papers/2001/Paper_Billen_Zlatanova.pdf)> (2016, January, 29).

<sup>2</sup> Stoter, J., Salzmann, M. A., Oosterom, Peter Van, Der Molen, Paul Van. *Towards a 3D Cadastre*. <<http://www.juritecture.net/docs.htm>> (2016, January, 29).

over roads, Swedish legislation was updated according to the requirements of today and the concept of three-dimensional inventory. Swedish land information system consists of real property Registry; Land Registry; building Registry; apartment Registry. The information about land plots, water areas, buildings, apartments and underground facilities (such as pipelines), registered rights is submitted to the cadastre.

Swedish legislation of real estate provides spatial separation of ownership of the land, surface and underground facilities (tunnels and so on). Forming of objects of real property for universal cadastral procedure and the registration in the cadastre of these objects as independent property units put forward to them the same requirements in the field of land law as to the ground of the property. The ownership as far as it possible must be autonomous from land rights over underground buildings and structures, but should be «tied» to the real building (construction). The legal requirements for their description and mapping are still pending, but the range of using of easements is expanding.

There is an automatic multipurpose cadastre system in the Netherlands. The information about land, buildings, apartments, underground facilities, registered rights, permitted use, area, cost, and other legal aspects is submitted in the cadastre<sup>1</sup>.

The cadastral registration of three-dimensional components carried on ownership; limited ownership; right of superficies; the long term lease; easement rights; condominium rights; joint property. Every property right has a unique code of ownership in the system of registration.

Ownership in the Netherlands always relates to surface areas. Therefore, the ownership of real property is always set on surface areas. If there are no rights set on a land plot, it corresponds to the rules of vertical and horizontal connection. The vertical connection means that the owner of the plot owns all structures and facilities assigned to this area. The horizontal connection is structures that are in ground, but only if this construction is not a part of another property. You cannot build a structure that will intervene into someone else's property without permission of the owner of the property. Rules of vertical and horizontal connection are consequence of the factual situation and do not approve rights. So they lead to conflict in many cases.

Land plots and rights to them have to be registered in the cadastre. But the underground buildings as the real estate are not directly registered. Underground facilities have a special regime and called «OBD» – Ondergronds Bouwwerk (underground construction). The code «OB» is associated with the land plot and with the subject to the law. The code «OBD» indicates the factual situation, but does not represent the right or the restriction directly. Although such coding is registered as a objective limitation, it does not carry any legal effect. It also does not indicate how the legal status of underground facilities was set. To find it out, we will have to explore how other rights, restrictions and legal messages on the surface area are set. Now you can add boundaries and transportation systems to telecommunication networks of topographical format LKI (which is not part of cadastral maps). If these are under the surface, they are encoded with visibility code «2» (means – «cannot be seen from above»). This code also reflects the factual situation, but not rights or restrictions<sup>2</sup>.

The modern cadastral system of Norway is based on the Oslo Method<sup>3</sup>. Conditions for the registration of three-dimensional objects are created in the system. This cadastre creates conditions for the allocation of plots under and above ground, but so far only has been used for underground sites: 1) to describe of underground areas the notion «construction parcel» was provided; 2) building plots cannot be identified without a built object on them or they should be relevant to the current building. Thus, the «three-dimensional plot» cannot be formed without regard to the concrete building or structure. In this way excludes the possibility to register a volume of air or the mountains only to confirm the ownership and reservation of this space for future use; 3) a cadastral shooting have to be made on the underground areas, but in most cases a construction drawings is used, so the underground area identified as well as the area on the surface, but with its registration number. The vertical boundaries of the land plot are fixed on the cadastral map. A land certificate similar to the certificate for the land plot is given for the «construction parcel». The task of mapping of underground utilities in Norway is solved by creating the cadastre of utilities.

<sup>1</sup> Molen, Paul van der. *Country report 2010 / Cadastral Template*.

<<http://www.geo21.ch/cadastraltemplate/countryreport/Netherlands>> (2016, January, 29).

<sup>2</sup> Stoter, J. *Needs, possibilities and constraints to develop a 3d cadastral registration system*. <<http://www.juritecture.net>> (2016, January, 29).

<sup>3</sup> Tor Valstad «How Is the Development in the World of Cadastre towards More than Two Dimensions?». – In *Proceedings of FIG Working Week*. – Eilat (Israel), 2006. (2016, January, 29)

The main disadvantages of the system of registration of rights to the underground facilities in Norway as follows: 1) building plots cannot be identified without a built object on them or they should relate to the existing structures on the surface; 2) the differentiation in depth using and use of rights is not provided.

One of the basic principles of the Norwegian land law is that the ownership of real estate outside of the defined surface and extends vertically up and down as long as there is economic interest of the owner of such a surface. All that extends below the economic interests of the owner of the surface is considered as a «no man's land». Some municipalities decided to register the «volume» of underground space as an individual property in the cadastre. As an example, it can be called building of a big playground in the interior of the mountain for the game of hockey to the Olympic Games in Lilihameri in 1994. In other cases, this practice was extended to legalize structures above the ground as an individual real property<sup>1</sup>.

Significant progress in the application of three-dimensional technology cadastral was reached in some states in Australia. For example, the legislation of the State of Victoria clearly defines how should three-dimensional measurements be made and how the data should be recorded. In the Australian state of Queensland three-dimensional sign is supported by the system of registration of property rights, and it can be registered as «Building Format Parcel» created according with the plan of building object (Building Format Plan).

In the digital cadastral base of the country (spatial layers of estate unit, including underground) specified as attributes, and all information relating to the three-dimensional objects on the plan. Plans for building object size are only for those buildings for which the necessary legal title on the three-dimensional spatial objects. The database of titles and cadastral database are separate from each other, and its renewal is part of a sequential process. Three-dimensional information is not displayed in the viewer database.

All this together allows, in particular, solving very difficult for the development of underground urban problems – to provide formation and cadastral registration of facilities engineering and transport infrastructure as a three-dimensional parcels of real estate.

The law of Denmark is based on the same principles as other international property rights; ownership is established on the site and is not limited in the vertical dimension. Despite the fact that the legal requirements and regulations of allocation of plots in underground objects facilities of Denmark there is no in the cadastre of Denmark borders are not visible in the field, do not appear on the cadastral map. In specific cases of transport and engineering infrastructure are taken practical solutions from adoption of formalize rights to land space using to accommodate them. For this can be used special types of servitude (restriction of rights). For example, the legal status of the metro in Copenhagen provided by the easement. Under this project were developed special easements tunnels (tunnel-servitudes), easements stations (stations-servitudes) and easements emergency exits (emergency-exits-servitudes). These easements imposed restrictions on the owners of construction plots are located above and to the owners of neighboring plots.

In 2010, the Federal Service for State Registration, Cadastre and Cartography announced on a project to develop three-dimensional real estate cadastre in Russian Federation. Already in April 2011 Russian register formed a working group to implement the Russian-Netherlands cooperation project «Creating a three-dimensional model objects of real estate cadastre in Russia», whose goal was to create a prototype of three-dimensional cadastre for future implementation throughout the Russian Federation. In this regard, in Nizhny Novgorod<sup>2</sup> were selected three objects, each of which is directly related to the usage of underground space. The prototype consists of three objects – building, apartment building and pipeline.

The purpose of the project is to assess the feasibility of the introduction of three-dimensional cadastre, which would more accurately reflect the real situation, to improve the cadastral records and to guarantee rights. The proposed in a pilot project three-dimensional conceptual model of cadastre based on the principles of ISO 19152. Model Land Administration Domain Model (LADM) was adapted to Russian conditions and focused on five types of real estate subject to the cadastral records. Nizhny Novgorod pilot project is certainly a breakthrough in improving the national cadastre system.

LADM Standard provides two-dimensional and three-dimensional integration using space-based

<sup>1</sup> Ріпенко. А.І. Правові проблеми тривимірного (3d) кадастру в Україні <[http://www.academia.edu/9335024/Правові\\_проблеми\\_тривимірного\\_3d\\_кадастру\\_в\\_Україні](http://www.academia.edu/9335024/Правові_проблеми_тривимірного_3d_кадастру_в_Україні)> (2016, January, 29).

<sup>2</sup> NataliaVandysheva, Petervan Oosterom. 3D Cadastre Modelling in Russia. <<https://rosreestr.ru/wps/portal/cc/news?news id=16202&news line id=11662>> (2016, January, 29).



topological units, putting layers of land administration, development of spatial information infrastructure (SII), gradual transition to the three-dimensional through hybrid cadastral system. Also LADM these outer classes with describing in detail components of land administration (including underground facilities). It is expected that by 2025 access to information in Russia associated with the land, will be provided to everyone (through the Internet), this concept of «space capable society».

At present three-dimensional cadastre used and applied in 24 EU countries. The validity of the transition to a three-dimensional presentation of objects and its application dictated by increased need in modern updating of information to be displayed on the digital topographical plans of the country.

Options for implementation of information about underground objects facilities in modern land cadastral system can be grouped into several standard types: the availability of three-dimensional maps in cadastral operating system, for example, in the Netherlands; another example is a method of Oslo in Norway; full three-dimensional cadastre (at the moment it is not in any country, but attempts to create are made); cadastre of installations (under establishment of pilot projects in several European countries).

At the moment for Ukraine most it is possible to use some three-dimensional features in the existing cadastral system because it does not entail a general structure of global change in cadastre information large economic costs. The first step for the implementation of this system are made, in particular, introduced the State Land Cadastre and State Register of Rights to Real Estate and Their Encumbrances, the next step would be the introduction of accounting and registration of real estate in three dimensions space.

The introduction of three-dimensional registration in Ukraine should be associated with the integration of land management and urban systems cadastrals, planning and designing, and with harmonization of legal regimes «land» and «non-land» property. Before the introduction of full three-dimensional system of cadastre registration it may be made at least some «three-dimensional situations» when such a need does exist<sup>1</sup>.

Obviously, the transition to three-dimensional cadastre is strategical character this should not only to strive in the future, but seriously prepare. Changing the paradigm of spatial cadastre the importance and complexity of the tasks requires a systematic approach to their solution at national and local levels. It seems that it is advisable to develop by national authorities and local authorities which operate in the field of cadastral activity, an action plan for the transition to three-dimensional cadastre. In particular, to develop an effective mechanism for co-development and technological cooperation in the planning area (especially in the preparation of the draft survey), land zoning, development of information systems in urban planning, etc. It should focus on creation and maintenance of the three-dimensional cadastre. To ensure correlation development of cadastre and systems formed on spatial data infrastructure, record of a three-dimensional aspects in the further integration of cadastre and registration. The common task is also to develop a system of classification of three-dimensional objects of real estate, integration with GIS. Of course, those measures should perform research and development provisions relating to more specific and accurate records of underground objects typology of buildings and structures (e.g. tunnels, underground structures, underground complexes, streets, squares and so on).

But it is necessary to start to build and approval by a single concept and three-dimensional cadastre development of relevant legislation. Among the priority legislative measures should include making changes and additions to the regulations that will ensure the development and harmonization of standards not only legislation on cadastre and registration, but the Civil Code of Ukraine, the Land Code of Ukraine, the Law of Ukraine «On regulation of urban development», Code of Ukraine on mineral resources.

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