Infrastructural Real Estate Issues

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Abstract. In recent years, the approaches to address the issue of whether an object is real estate have been developed, but this problem has not received a legislative solution, which, both is associated with a two-level system of real estate, land plots and objects; and the modern needs of civil real estate turnover and the interests of its participants. All these make it necessary to fix at the legislative level more and more new real estate objects, including complex infrastructure objects. The article deals with the issues of information support for infrastructure real estate objects that arise, conducting accounting and registration actions. It is shown that the most optimal model for accounting and registration actions in relation to a complex infrastructure object is the unified real estate complex (UREC) model, based on complex cadastral works. The purpose of the study is to consider the issues of information support for infrastructure real estate objects, for the analysis of accounting and registration actions and for identifying new opportunities and optimal solutions in the Unified State Register of Real Estate in order to provide consumers with fast and high-quality public services.

1. Introduction

Modern problems of classifying real estate objects, carrying out registration and registration actions, are caused by numerous attempts to divide and combine the considered set of objects, depending on the goals and tasks to be solved, which is a broad definition consequence of real estate, defined by Article 130 of the Civil Code of the Russian Federation [1]. At the moment, the concept of real estate includes not only a land plot, but also everything connected with it, which movement is not allowed without disproportionate damage. In the absence of clear legislative criteria for classifying objects as immovable, this formulation makes it possible to register ownership of other objects that do not have pronounced signs of real estate, which are most often referred to as infrastructure facilities. In recent years, certain approaches were developed to resolve the issue of whether an object is real estate, but this problem has not yet received a legislative solution, which, on the one hand, is associated with a two-tier system of real estate, land plots and objects on them; on the other hand, the modern needs of civil real estate turnover and the interests of its participants make it necessary to consolidate more and more new real estate objects at the legislative level, including complex infrastructural ones. The Urban Planning Code defines programs for the integrated development of communal, transport and social infrastructure of settlements, urban districts. Practice shows that the problems of creating urban infrastructure corresponding to the socio-political organization of the Russian Federation are solved mainly empirically, without using adequate scientific and methodological tools [2].
2. Accounting and registration of rights to real estate

Recently, the registration system’s accounting has been improved. Reliable source of information about real estate has been created, and a unified accounting system has been developed thanks to the connection of the Unified State Register of Legal Entities and the State Property Committee. This allowed not only to reduce the specific resource intensity of the public services provision in the field of rights and cadastral registration, but also to increase the taxable base of taxes on real estate. Civil law regulation in the field of cadastral registration is developing and improving in continuous interaction with legislative changes. The legal structure "Unified Real Estate Complex" (UREC) determined the need to study prospects for further development, to conduct complex scientific, including civil studies [3-5].

Two conditions can be distinguished, according to organizational and technological actions of the Eurasian National Commission formation. Firstly, it is rational to use a well-developed technical inventory toolkit to combine existing facilities in the Eurasian National Commission, with methods for describing existing infrastructure of a land plot "improvements" and a concept of "home ownership". Secondly, a great achievement in the accounting system is the involvement of project documentation directly in the process of generating cadastral information. It should be noted that the lack of proper technical accounting, which is partially compensated by regulations in the field of housing legislation [6-8]. The information model of the Unified Real Estate Complex object is one of the main factors in the optimizing processes of working with real estate objects. Building an information model of a single real estate complex will not only keep time in organizing an individual modeling process, but also to create the basis for combining information models into a single information resource.

At present, one of the most pressing problems facing the city authorities is the management of infrastructure facilities. As a studies’ result, it was revealed that the most optimal model for registration and registration actions in relation to a complex infrastructure facility is the model of a unified real estate complex (UREC), based on carrying out complex cadastral works.

Determination of the capital of buildings. It is important to know the terms and definitions, enshrined in legislative and regulatory documents for their unambiguous, compiling any classification, interpretation [9]. The terms "capital construction", "capital construction object", "infrastructure object" and "real estate object" are widely used in research of the real estate market, performing registration and registration actions, in design, construction, reconstruction and other fields of activity. The peculiarities of capital construction objects (CCO) classification are in the choice validity of classification signs and technical criteria for evaluating an object as immovable property that have legal significance. It is worth paying attention to two key concepts: "real estate object" and "capital construction object". These are not identical concepts, but the signs of capital are used to describe each of them. The duality of the "capital" concept is, both in the classification features description as a set of requirements for the durability and fire resistance degree of the object and in the description of the properties inherent in the object as a whole, its national economic and urban planning significance for the state registration of the object, which must be recognized as real estate. For the first time, the classification of buildings by capital groups was presented in the collections of increased indicators of replacement cost (IIRC). At present, the capital of a building is established in the design documentation. In practice, the determination of the object capital is carried out in an expert way in the uncertain situations.

In order to classify a building as immovable property, there are legislative criteria such as "strong connection with the land", "independent economic purpose" and "ability to participate in circulation regardless of other things", etc. Thus, there are many difficulties, studying the features of capital construction objects classification, including infrastructure facilities, which is associated with a discrepancy in terminological concepts. So, it becomes necessary to change the intra-system classification of building types with the appointment of itself classification, including the purposes of cadastral registration of real estate objects [10].
3. Materials and Methods

3.1. The use of unmanned aerial vehicles for shooting infrastructure real estate objects

The use of a quadrocopter for surveying infrastructural real estate objects helps to increase the data reliability for the state real estate cadastre, primarily by identifying unaccounted real estate objects. Geographic coordinates saving and obtaining a clear geofixation of images, examining infrastructural real estate objects’ facilitates help the binding and subsequent processing of the data. Obtaining shooting positions in global geographic coordinates allows you to reduce the time for computer processing and accurately obtain the investigated object scale. Visual inspection with photographic fixation allows you to obtain additional data for building a 3D model of an object. The use of unmanned aerial vehicles is especially effective, carrying out inventory work.

Figure 1 shows a fragment of work to identify unregistered real estate objects.

![Figure 1](image1.png)  
**Figure 1.** Recorded and identified unaccounted objects that are part of a single real estate complex.

3.2. Measurement work during the survey of real estate objects

Measurement work is a set of measures necessary to determine building structures dimensions and their elements. The composition, volume and types of measurement work are determined in accordance with the tasks set by applicants. Measurement of internal premises is carried out in cases of an object commissioning, redevelopment, re-equipment, repair, leasing and other purposes. Floor plans of all floors, facades drawings, drawings of individual structural units, drawings of foundations and other necessary documents are drawn up, based on the measurement work results. Requirements for measurement work, measurements and their accuracy, registration of measurement drawings, during cadastral work are determined by order of the Economic Development Ministry of the Russian Federation, dated March 1, 2016 No. 90 [11].

At present, three measurement methods are mainly used in practice. Photogrammetric method, which essence is to determine the size of an object, based on photographs. The subject is photographed at close range from various positions to obtain data. The most popular, this method turns out to be, performing measurements of dilapidated buildings. The geodetic method is non-contact; the production of work is carried out with the help of geodetic instruments and practically coincides with the geodetic survey of the area. The coordinates of all characteristic corner and turning points of a construction object are determined by external measurement of the building to obtain a dimensional drawing. The natural method is used to measure small buildings, most often rooms and apartments, architectural details of historical buildings that are available for direct measurement. Measurement work is carried out using laser rangefinders, tape measures, levels and plumb lines. Dimensional drawings, based on field measurements, are prepared in electronic form using graphic editors. Construction tolerances serve as the basis for calculating the measurement accuracy. In the general case, carrying out measurement work includes: studying the documentation of previous measurement work, performing preparatory measures (drawing up crocs and outlines); taking natural dimensions; office processing of the received data and making measurement drawings; registration of work, using computer programs; submission of documentation to a customer [12].
The planning of measurement works is especially important in the preparation of complex cadastral works in the territories with complex infrastructure facilities location. In this case, it is possible to obtain adequate information for subsequent registration and registration actions.

3.3. Modeling the territory of home ownership

Home ownership is a residential building (a complex of houses) and buildings serving it, and structures, located on a separate land plot, in other words, serve the building, infrastructure facilities.

At the stage of project documentation development in "Buildings section, structures and sites included in the infrastructure of a linear object", infrastructure facilities can be designed only for linear facilities in accordance with the provisions of the Urban Planning Code of the Russian Federation.

Direct instructions for the infrastructure facilities development, included in capital facilities construction of industrial and non-production purposes, do not exist, which leads to large discrepancies and contradictions in determining the purpose of a real estate object, referring it to one type or another in the classification hierarchy. Types of multifunctional complexes (residential, public, public-residential, industrial, public-production), which is presented in Appendix B to SP 160.1325800.2014, various objects and capital construction objects, may be included in the list of infrastructure facilities. It is very effective to use the device for recording and describing objects, used in technical inventory, to identify the classification signs of objects, located on the household territory and then to carry out registration and accounting actions.

On the territory, the main structure is allocated. Infrastructure of ownership is described in conjunction with the main structure, corresponding to the purpose of land plot, and remaining objects that make up the territory.

The classification capabilities preserve both hierarchical and faceted subordination. At the same time, it is important to use the construction information classifier, which will make it possible to uniformly extract the necessary data from CCO information models.

New modern technologies for their modeling provide great opportunities for carrying out reliable registration and registration actions of real estate objects in SP 333.1325800.2017 "Information modeling in construction. Rules for the objects information model formation at various stages of the life cycle", five basic levels of models development from LOD 100 to LOD 500 are distinguished. LOD 100 (200) corresponds to our goals, where the elements are presented as a three-dimensional object with a spatial position, orientation and the necessary attributive information, used to develop architectural and urban planning solutions. Such models are notable for their low consumption of electronic resources and highly visual.

Thanks to three-dimensional modeling, it is possible to solve the issues of not only CCO 3D construction, but also optimal placement of all infrastructural objects on the land plot, taking into account the requirements for the rules of land use and development [13-14]. This, it allows you to optimize the process of developing architectural and urban planning solutions.

An example of placing objects on a land plot, based on modeling the territory of home ownership, taking into account the rules of land use and development, is shown in Figure 2.

Prerequisites for the development of a three-dimensional inventory. At the moment, three-dimensional cadastral is under development, three-dimensional display of territories and objects, located on it, will expand the possibilities of cadastral registration and mechanisms for ensuring property rights, planning and design. The main limiting factor in the implementation of three-dimensional real estate cadastr\textbf{e is an insufficiently developed regulatory legal base.}

The tool for accounting for three-dimensional cadastral information also remains a technical plan, which a new manufacturing procedure in three-dimensional dimensions will be determined for.

The technical plan will be formed in a file generated from CCO information models. At the same time, issues of information interaction between design organizations, developers, managers and other organizations remain very important tasks.
Figure 2. Modeling of the home ownership territory taking into account the rules of land use and development.

Figure 3 shows a three-dimensional model of a real estate object and fragments of project documentation, which are the initial data for entering into a three-dimensional real estate cadastre [15].

Figure 3. 3D model and design documentation for the preparation of cadastral information.
3. Results

Currently, one of the most pressing problems, facing city authorities, is the management of infrastructure facilities. As the research result, it was revealed that the most optimal for registration and registration actions in relation to a complex infrastructure facility is the model of a unified real estate complex (UREC) on the basis of complex cadastral works. In the study of the features of capital construction facilities classification, including infrastructure facilities, there are many difficulties, associated with a discrepancy in terminological terms.

The solution to this issue can be the use of a technical inventory apparatus to describe the main and auxiliary facilities, which is associated with the need to change the in-system of building types classification, with the appointment of itself classification, including for cadastral registration of objects real estate.

References

[1] Klyushnichenko V N, Kiseleva A O, Kaverin N V 2015 On the question of identifying real estate objects, News of Higher Educational Institution Geodesy and aerial photography, 5, pp132-134
[2] Ivanova N A 2012 Theoretical aspects of the concept of regional infrastructure, Modern high technologies, Regional supplement, 4 (32), pp 30-36
[3] Pylaev I A 2018 Features of cadastral registration of a single real estate complex, International Scientific and Practical Conference Ufa, OMEGA SIGNS, p 376
[4] Stebleva I V 2018 Improvement of the cadastral registration procedure on the example of the implementation of complex cadastral works, Innovative development of science and education: collection of articles of the II International scientific and practical conference, Part 1, Penza, ICNS "Science and Education", pp 265-268
[5] Poloyan R A 2020 Unified Real Estate Complex: Problems of Legal Regulation, Collection of scientific articles following the results of the second round table with All-Russian and international participation, Mines, LLC "Convert", pp 174-176
[6] Zhigulina T N 2017 Transformation of systems of technical and cadastral registration of capital construction objects in the urban land use management system, Bulletin of Altai State Agrarian University, 3, pp. 55-60
[7] Maksimenko L A 2011 Development of the real estate registration system, Geo-Siberia, Vol. 3, 2, pp 48-51
[8] Stefanskiy Ya V 2013 Problems of rights registration of external improvement objects, Bulletin of the Krasnoyarsk State Agrarian University, 4, pp 148-150
[9] Asaul A N 2015 Features of state cadastral registration of a land plot, Tavrichesky Scientific Observer, 5-1, pp 107-115
[10] Dudinova O S 2018 Improvement of the system of state accounting and registration of rights to real estate objects, Technical Oil and Gas Institute SakhSU pp 33-34
[11] Korobova O A 2017 Modern methods of inspection and monitoring of the technical condition of building structures.
[12] Maksimenko L A 2014 On the preparation of technical plans for real estate objects, Interexpo Geo-Siberia, T 3, 2, pp 192-198
[13] Maksimenko L A, Tanygina E A, Kalyuzhin V A 2018 Application of Autodesk software products for training students in the direction of "land Management and cadastre" Bulletin of the Siberian state University of geosystems and technologies, Vol 23, 1 pp 240-249
[14] Maksimenko L A, Kovalenko M I 2019 Regulation of land and property relations in Russia: legal and geospatial support, real estate appraisal, ecology, technological solutions, Vol 1, pp 174-176
[15] Sos'kova K A, Maksimenko L A 2018 On the preparation of design documentation for IZhS objects, Sat articles of the 26th Regional Scientific Conference "Intellectual potential of Siberia", Novosibirsk: Publishing house of NSTU, 2018 - Part 2 pp 444-445