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INFORMATION SUPPORT OF THE USE OF REAL ESTATE OF MULTI-PURPOSE CADASTER: THEORETICAL ASPECTS AND IMPLEMENTATION PRACTICE

Summary. *It is established that at the present stage of transformation of land relations, use of real estate there are problematic aspects of the formation of their information support. In particular, most of the data are non-uniform, unrelated, not tied to modern subjects and objects of land relations, the cadastral identification of real estate is insufficient. During the years of Ukraine's independence, a multi-purpose cadaster, the use of which is based on modern European experience, has not been introduced into domestic practice. At the theoretical and methodological level, the conceptual apparatus for the formation and use of multi-purpose real estate cadaster, taking into account the peculiarities of domestic land relations.*

The author's definition of information support for the use of real estate of multi-purpose cadastre is offered, which is characterized as a complex information, value elements of real estate identification, which is formed by applying a multilevel system of indicators, tools of geospatial and mathematical modeling for the development and implementation of multi-purpose real estate cadastre.

The goal of developing theoretical and methodological provisions and practical recommendations for the formation has been achieved information support for the use of real estate multi-purpose cadastre.

As a result of the research the following tasks were solved: the definition of information support for the use of real estate of the multipurpose cadastre is offered; identified areas and features of cadastral accounting and registration of real estate based on the harmonization of domestic practices to the European experience; the structure of the identification number of the real estate object is offered; methodical provisions of identification of real estate objects in the multi-purpose cadastre as an important element of information support are formed; the identifier of real estate objects by the faceted method of classification and the parallel method of coding depending on a kind, structure, purpose of real estate objects is offered; an integrated method for assessing the level of information support of real estate of multi-purpose cadastre has been developed; scientifically substantiated recommendations on formation of information support of use of real estate objects of the multipurpose cadastre are offered; methodical provisions of thematic identification of real estate objects in the modern multi-purpose cadastre are developed; forecasting of the integrated indicator of the level of information support of the multi-purpose cadastre is carried out.

Key words: *use of real estate, multi-purpose cadastre, information support, integrated approach, identification*

Introduction. At the present stage of transformation of land relations, use of real estate there are problematic aspects of the formation of their information support. In particular, most of the data are non-uniform, unrelated, not tied to modern subjects and objects of land relations, the cadastral identification of real estate is insufficient.

Multi-purpose cadaster is a modern information system that takes into account the multifaceted formation and use of real estate to meet the interests of different groups of stakeholders. During the years of Ukraine's independence, a multi-purpose cadastre, the use of which is based on modern European

experience, has not been introduced into domestic practice. At the theoretical and methodological level, the conceptual apparatus for the formation and use of a multi-purpose real estate cadastre needs to be clarified, taking into account the peculiarities of domestic land relations. There is no information support for the use of real estate of the multi-purpose cadastre, which affects its development and implementation. Thus, the research topic is relevant, its development is timely.

Analysis of the recent research and publications. Scientists are engaged in solving issues related to the use of real estate, providing information support for this process, the formation of the cadastre: Yu. Gubar [1], Yu. Dekhtyarenko [2], V. Zayats [3], Yu. Kirichek [4], M. Likhogrud [5], A. Lyashchenko [6], K. Mamonov and S. Nesterenko [7], A. Martin [8], Y. Palekha [9], V. Shipulin [10].

Along with this, the issues of development and implementation of information support for the use of real estate of the multi-purpose cadastre remain unresolved.

As a result of generalization the author's definition of information support of use of real estate of the multipurpose cadastre which is characterized as a complex of technical, technological, legal, informational, value elements of identification of real estate formed by application of multilevel system of indicators, tools of geospatial and mathematical modeling for development and implementation of a multi-purpose real estate cadastre.

The goal of research. The purpose of this work is to develop theoretical and methodological provisions and practical recommendations for the formation of information support for the use of real estate cadastral multi-purpose cadastre.

To achieve this goal the following tasks are solved:

real estate of multi-purpose cadastre;

- to analyze the state of registration and accounting of real estate;

- to determine the directions and features of cadastral accounting and registration of real estate based on harmonization of domestic practices with European experience; - to propose the structure of the identification number of the real estate object;
- to substantiate the composition of the thematic identification code of the real estate objects;
- to offer the identifier of real estate by faceted classification method and pairs allelic coding method depending on the type, composition, purpose of real estate;
- to develop an integrated method for assessing the level of information support of real estate cadastral multi-purpose cadastre;
- to offer scientifically sound recommendations for the formation of information support real estate objects of multi-purpose cadastre;
- to develop methodical provisions of thematic identification of real estate objects in modern multi-purpose cadastre;
- to forecast the integrated indicator of the level of information support of multi-purpose cadastre.

Results of research. To develop information support for the use of real estate of the multipurpose cadastre, the system of their identification has been improved, which does not meet the requirements of unambiguity, immutability, security, does not ensure the performance of the functions of the cadaster of multipurpose use. The methods of identification of cadastral objects need to be improved based on the development of information support for their use. This is in line with international practices, in particular European trends in the development of land and property relations. multi-purpose nature of the cadastral system, which takes into account spatial, urban, environmental, investment factors. This complicates the registration process, real estate transactions, does not comply with the principle of fair taxation, prevents the filling of the budget through real estate taxation on an arbitrary basis.

The concept of information support for the use of real estate multi-purpose cadastre, the distinguishing feature of which is taking into account technical, technological, legal, informational, value elements of real estate identification based on its multilevel system of indicators, tools of geospatial and mathematical modeling, which allowed to form theoretical methodical platform for the development and implementation of a multi-purpose cadastre.

An approach to the transition from identification factors to indicators for assessing the level of information support for the use of real estate multi-purpose cadastre, which in contrast to the existing is based on quasi-geometric models, which provided opportunities to build a multilevel system of factors to implement an integrated assessment method .

An integrated method for assessing the level of information support for the use of real estate multi-purpose cadastre, which in contrast to the existing is based on the use of qualitative and quantitative indicators that determine the level of use of real estate, taking into account technical, legal, value characteristics, which aims to assess integrated indicator, which allowed to create information support for the formation of a multi-purpose cadastre.

An integrated model for assessing the level of information support for the use of real estate multi-purpose cadasre has been developed:

$$I_{IBK} = I_A \text{x} k_{v_1} + I_\text{B} \text{x} k_{v_2} + I_\text{C} \text{x} k_{v_3} + I_D \text{x} k_{v_4} + I_\text{E} \text{x} k_{v_5} + I_G \text{x} k_{v_6} + I_H \text{x} k_{v_7} + I_I \text{x} k_{v_8} + I_J \text{x} k_{v_9} + I_K \text{x} k_{v_{10}} + I_L \text{x} k_{v_{11}} + I_M \text{x} k_{v_{12}} + I_T \text{x} k_{v_{13}} + I_V \text{x} k_{v_{14}} + I_X \text{x} k_{v_{15}} + I_W \text{x} k_{v_{16}} + I_N \text{x} k_{v_{17}} + I_\text{O} \text{x} k_{v_{18}} + I_\text{P} \text{x} k_{v_{19}} + I_Q \text{x} k_{v_{20}} + I_R \text{x} k_{v_{21}} + I_S \text{x} k_{v_{22}}$$

I_{IBK} – integrated indicator of the level of information support for the use of real estate of the multipurpose cadastre, rel. units;

k_{v_i} – weights of mutual and influence of factors on the integrated indicator of the level of information support of the use of real estate of the multipurpose cadastre, rel. units.

To develop an integrated model, weights are determined using the method of hierarchy analysis, which is implemented by: identifying experts who evaluate weights that characterize the mutual influence of generalizing criteria and their joint impact on the integrated indicator of the level of information support of real estate cadastre; formation of a scale of mutual influence of generalizing factors and their influence on the integrated indicator; development of a matrix that reflects the mutual influence of generalizing factors and their influence on the integrated indicator of the level of information support for the use of real estate of multi-purpose cadastre; determining the components of the eigenvector of factors; estimates of weights; interpretation of the obtained results.

The model for determining the weights that reflect the mutual influence of generalizing factors and their impact on the integrated indicator of the level of information support for the use of real estate multi-purpose cluster k_{v_i} is as follows:

$$k_{v_i} = \frac{K_{VLi}}{\sum_{i=0}^{n} K_{VLi}}$$

K_{VLi} – eigenvector indicators, rel. units.

As a result of the assessment, an integrated assessment indicator of 3.95 was determined, which indicates an insignificant level of information support for the use of real estate of the multi-purpose cadastre. This indicates the need for its development, the formation of information support, increasing the completeness and quality of information, taking into account technical, technological, functional, legal, evaluative factors.

Thus, the weighting criteria based on the application of the method of hierarchy analysis have been improved, which makes it possible to determine the degree of mutual influence of factors and the impact on the integrated indicator of the level of information support of multi-purpose cadastre real estate.

An approach to assessing the reliability of models for determining the level of information support of real estate cadastral cadastre by applying the method of cluster analysis McKean based on a hierarchical agglomerative structure, which in contrast to the available results to confirm the reliability of the integrated method with an accuracy of 70.6%.

Methodological provisions for the identification of real estate have been developed, which, in contrast to the existing ones, has allowed the development of real estate identifiers by spatial, technical, legal, value, functional properties to assess the level of information support for real estate cadastre use.

Scientifically substantiated recommendations of information support of use of real estate objects of multi-purpose cadastre by application of structural-functional model of information-technological support of complex identification of real estate objects, models of database of identifiers, web service of formation of thematic and decoding of complex identifiers are formed. Identification numbers of real estate, increase the level of security and reliability of information and the possibility of using geographic information systems. It is proved that increasing the level of information support more than 2 times will lead to a high level of values of the integrated indicator based on the application of technological, technical, economic, legal measures, taking into account the interests of different stakeholder groups and the level of spatial support. real estate cadastre.

In accordance with the developed methodological provisions of thematic identification of real estate in the multi-purpose cadastre and the selected structure of the facet code of identifiers developed a structural and functional model of information technology support for the identification of real estate.

The proposed structural and functional model of information technology support for the identification of real estate in the context of the development of scientifically sound recommendations allows users to ensure reliable protection of the rights of owners; guarantees the accuracy of the received information; to

exercise effective control over the observance of the requirements of legislation and regulations by the state; increase the confidence of ad valorem taxpayers in the real estate appraisal system; implement incentives or sanctions in accordance with the adopted state, regional, local real estate management policy; provide continuous real-time access to up-to-date legal, technical and economic information on cadastral objects and ensure personal responsibility for the accuracy of the entered data.

The proposed functional model of the web service for the formation of thematic identifiers of multi-purpose cadaster objects provides collection and processing of information for the purpose of unambiguous secure identification of real estate objects in the multi-purpose cadastre and information service for information users.

In accordance with the conceptual principles of thematic identification of real estate in the multi-purpose cadastre developed a conceptual model database of property classifiers, which contains descriptions of objects, schemes, tables, means of their processing, procedures with information objects and organization, respectively to the accepted structure of the facet code of identifiers of objects of cadastre of multipurpose use.

Conclusions. The definition of information support for the use of real estate of multi-purpose cadastre is proposed. As a result of the analysis of the state of registration and accounting of real estate it is determined that the composition of information of national real estate cadasters does not correspond to the information provided in developed countries, as well as the purpose, tasks and functions of multi-purpose cadastre, its strategic directions. in the cadaster of multipurpose use, automation based on the use of computer technology, information network of a wide range of stakeholders.

Methods of identifying cadastral objects need to be improved based on the structuring of cadastral information, a high level of systematization of data on objects taking into account the purpose of multi-purpose cadastre, areas of

information and needs of stakeholders using modern geographic information systems. Based on the typification of the identifiers of the multi-purpose cadastre objects, the structure of the identification number of the real estate object in the form of a tape digital code is proposed.

Based on the results of the analysis of the areas of application of information support for the use of real estate multi-purpose cadastre, user needs, the composition of the thematic identification code of real estate, including land, construction on the basis of rights, encumbrances, restrictions on use, quality, quantitative characteristics and values of real estate. Methodological provisions for the identification of real estate in the multi-purpose cadastre have been further developed. The identifier of real estate by faceted classification method, parallel coding method depending on the type, composition, purpose of real estate is offered.

An integrated method for assessing the level of information support of real estate of multi-purpose cadastre has been developed, the application of which allowed to determine the level of information support and form a quantitative basis for decision-making in the field of cadastral information.

Scientifically substantiated recommendations for the formation of information support for the use of real estate of the multi-purpose cadastre have been developed. A structural and functional model of information technology support for the identification of real estate is proposed. The developed structural model of the identification number of multi-purpose cadastre objects provides for the unification of the unique and thematic identification code of the real estate object in order to increase the protection and realization of information needs of users by providing free access to open information.

Methodical provisions of thematic identification of real estate objects in the modern multi-purpose cadastre are developed. In order to develop scientifically substantiated recommendations and form a quantitative basis for increasing the efficiency of real estate use, the forecast of the integrated

indicator of the level of information support of the multi-purpose cadaster was carried out. It is established that increasing the level of information support by more than 2 times will lead to a high level of values of the integrated indicator based on the application of technological, technical, economic, legal measures, taking into account the interests of different stakeholder groups and the level of spatial support.

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