UDC 332.2:528.9:004.01

USE OF THE IDEOLOGY OF SPATIAL DATA INFRASTRUCTURE FOR CREATION OF ACCOUNTING SYSTEM AND MANAGEMENT OF LAND AND PROPERTY COMPLEXES OF ENTERPRISES AND TERRITORIAL COMMUNITIES

Dorosh Y.M., *Doctor of Economic Sciences, e-mail: dorosholgas@ukr.net*

Tarnopolskyi A.V., *Land Management Institute of the National Academy of Agrarian Sciences of Ukraine*

e-mail: andrey0037@gmail.com

Ibatullin Sh.I., *Doctor of Economic Sciences, professor,*

e-mail: shamilibatullin@gmail.com

Tarnopolskyi Ye.A., *PhD*

e-mail: zeka0037@gmail.com

Land Management Institute of the

National Academy of Agrarian Sciences of Ukraine

Kravchenko O.M. *postgraduate*

e-mail: olena.kravchenko.1995@gmail.com

National University of Life and Environmental Sciences of Ukraine

Abstract. *The possibility and expediency of using the ideology of geospatial data infrastructure (hereinafter NSDI) to create a system of accounting and management of land and property complex of enterprises and local communities, including new territorial communities, is considered.*

The need to create accounting systems and management of land and property complex is due to: a large-scale transition to digital technologies in the management of enterprises, institutions and territories, real estate taxation, decentralization processes, the creation of a national geospatial data infrastructure.

The necessity of taking into account the principles and standards of the national infrastructure of geospatial data is substantiated. To form directions according to which the information on land and property complexes can be used for

filling of the National infrastructure of geospatial data and a substantiation of adoption of administrative decisions.

Among the key issues that will ensure the use of the ideology of NSDI to create a system of accounting and management of land and property complex enterprises and local communities need to address issues of interoperability of data on land and property complex, the use of a single cartographic basis, principles and data validation procedures, data error correction, data access mechanisms for process participants, the possibility of multiple data reuse and data licensing.

Keywords: *land resources, land monitoring, automated management systems, spatial data infrastructure, land management, land cadastre, information and analytical system.*

Formulation of the problem. Management of land and property complexes of large enterprises and local communities is complex and multifaceted, as it is carried out within several different spaces: social, economic, environmental, cultural, historical, aesthetic, climatic, institutional and other dimensions.

Among the features of the land and property complexes of enterprises and communities at the present stage are the following: development of real estate and capital markets, restructuring of the national economy and changing business needs in local resources, spatial development and urbanization, decentralization and transformation of administrative bodies and management. . The systemic nature of land use and real estate affects the interests of different social and economic groups, which also leads to complex multilevel interdependencies in management and requires further institutional settlement.

Solving the problems of functioning of land and property complexes is significantly complicated by the incomplete formation of institutions of ownership and use, as well as the lack of systematic separation of state and communal property at the conceptual level. Market transformations and processes of capitalization of land and real estate cause changes in methodological approaches to managing their use.

On the other hand, increasing the efficiency of the land management system both as a part of enterprises and in territorial formations is now characterized by a large-scale transition to digital technologies and the development of approaches and algorithms for processing large volumes of data. This makes it extremely important to develop in terms of applying the ideology of geospatial data infrastructure to improve the system of accounting and management of land and property complexes of enterprises and local communities, including UTC (united territorial communities).

The purpose of the study is to determine the main approaches and requirements to the structure and processes of application of the ideology of geospatial data infrastructure to create a system of accounting and management of land complexes of enterprises and local communities, including UTC.

Results of research and discussion. By land and property complex we mean a set of land resources and other related property, in all its variety of forms of connections, relationships and management, taking into account the uniqueness of land as a natural resource and the basis of society and its productive forces.

The peculiarity of land management is that the concept of the latter is broader than the concept of a single real estate object. On the one hand, the real estate object is an elementary component of the land-property complex, a necessary precondition for its formation. On the other hand, the land complex is not just the sum of individual plots of land and individual real estate. Neither from the standpoint of value, nor from the standpoint of property rights, the land-property complex is not reduced to a single real estate or a simple set of them.

In our opinion, the functional orientation, the spatial multilevel organization of the formation of the land and property complex is what should be reflected in the ordering of its composition and structure as a whole system.

The mechanism of effective management of the land and property complex should become a platform for coordination of interests of all subjects of the land and property relations arising concerning set of objects which are a part of the given land and property complex. Thus, the effectiveness of managing the use of a separate land plot for its owner is reduced to maximizing the value of the plot and obtaining the

maximum land rent from it. The criterion for assessing the effectiveness of land management for an agricultural enterprise that leases land is the maximum profitability of products grown on it. And this is achieved through the creation of arrays of sustainable land use as effective complexes. For the territorial community, the criteria for the effectiveness of land management are the integrated value, the capitalization of the territory of the whole community, increasing its investment attractiveness, increasing land tax revenues.

These management goals are achieved by increasing the coherence and orderliness of the components of the land and property complex and by improving the communication processes between the individual subjects of land and property relations. The geospatial data infrastructure can and should be such a means of communication.

Geospatial data infrastructure is a set of spatial information resources, organizational structures, legal and regulatory mechanisms, technologies for creating, processing and exchanging spatial data that provide wide access and efficient use of spatial data to citizens, businesses and authorities.

At the same time, we can distinguish some differences between the spatial data infrastructure of land and property complexes for enterprises and local communities. First, the object of such a system in the enterprise will be land and property owned and used by the enterprise. While for a territorial community, the object is all land and property located within the community, which is a higher level of systemic organization and spatial hierarchy. Secondly, the subjects of the information system of the enterprise are related persons: owners, managers, contractors, employees and others. For the information system of the territorial community, its subjects are all individuals and legal entities related to the territorial community: local self-government bodies of the community; community residents; business entities that carry out economic activities in the community and use its local resources, potential investors and others. Third, the purpose and objectives of such systems for enterprises and communities necessitate different data sets and indicators for the management of land complexes. Accordingly, fourth, the data sources will be slightly different.

However, common to both businesses and communities in terms of real estate management information is the ideology and principles of geospatial data infrastructure, including data collection, processing, storage, analysis, transportation, visualization and use in management processes - administrative, organizational and economic decisions on land and property complexes.

The basis for the management of the land and property complex is the availability of relevant and reliable information about its objects, phenomena, processes and connections, defined in the system of space-time coordinates (Fig. 1).

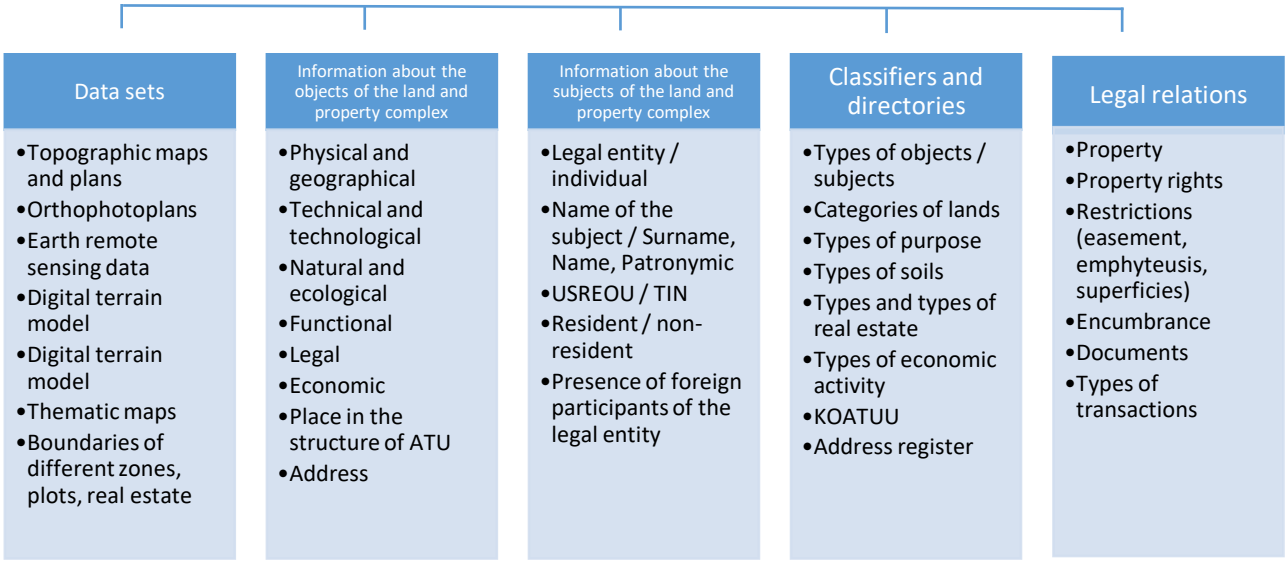

Fig. 1. Basic data sets in the system of accounting and management of land and property complexes [6,7]

In general, any geospatial data infrastructure includes: basic spatial data, which serve as a basis for geopositioning of all spatial and attributive data; spatial metadata and mechanisms for accessing them; spatial data standards, including exchange formats, classifiers, data models, etc.

The basic set of spatial data (as a digital cartographic basis of geographic information mapping) is largely determined by the content of the main elements (layers in GIS) topographic maps and plans of a certain level, which actually form an effective core information infrastructure, combining different characteristics of real objects. reality [4].

Given the purpose of such systems to meet management needs, one of their most important functions is analytical. The formation of analytical data in the

necessary sections and forms is based primarily on logical, reasonable and balanced classifiers and directories. Since each object of the land and property complex has a clear geospatial definition, an integral part of the analytical method in these systems is spatial analysis [8].

Stages of data analysis should be built separately for each management task, starting from ensuring data collection and ending with providing access to the results of their analysis (Fig. 2). And the latter can also have different levels of implementation: from OLAP-technology with solutions of the Business Intelligence class, ending with expert systems based on artificial intelligence and machine learning [9].

Fig. 2. Stages of the analytical process

Among the principles of creation and operation of the geospatial data infrastructure for our purposes are the following:

- relevance, reliability, completeness, integrity, accuracy, validity of geospatial data;
- interoperability and integration of geospatial data obtained from different sources;
- indefiniteness and continuity of operation of the geospatial data infrastructure;
- innovative methods, approaches, technologies and algorithms for the creation and operation of information systems.

Conclusions. Management of land and property complexes at any level should be strategic in nature and should be linked to the development strategy of the enterprise and the local community. When creating an automated system of accounting and management of land and property complexes of enterprises and local communities should take into account their features and needs for subject and object composition.

The use of the ideology of geospatial data infrastructure in the management of land complexes of enterprises and local communities will increase the transparency of the formation, implementation and control over the implementation of management decisions, which will be based on reliable, up-to-date information about the real situation in real time.

References

1. Dishlik, O. P., Dorosh, A. Y., Tarnopolsky, A. V., Tarnopolsky, E. A. (2018). Infrastruktura heoprostorovykh danykh v Ukrayini: stan ta metodolohichni problemy zakonodavchoho rehulyuvannya [Geospatial data infrastructure in Ukraine: position and methodological problems of legislative regulation]. Land management, cadastre and land monitoring, 1, 33-43. DOI: http://dx.doi.org/10.31548/zemleustriy2018.01.004

2. Tarnopolsky, A. V., Malashevsky, M. A., Tarnopolsky, E. A., Palamar, A. Y. (2018). Deyaki aspekty pobudovy infrastruktury heoprostorovykh danykh [Some aspects of a geospatial data infrastructure creation]. Young scientist, 2 (54), 28 - 31.

3. Cherniaha P. Lahodniuk O., Romaniuk O. (2010). Pryntsypy formuvannia infrastruktury heoprostorovykh danykh dlia zabezpechennia staloho rozvytku turyzmu. Heodeziia, kartohrafiia i aerofotoznimannia. Vyp. 73. S. 115-121.

4. Bondarenko E. L., Korenets O. V. (2010). Invariantni skladovi infrastruktur prostorovykh danykh dlia riznykh terytorialnykh rivniv heoinformatsiinoho kartohrafuvannia. Problemy bezperervnoi heohrafichnoi osvity i kartohrafii. Vyp. 11. S. 30-36.

5. Pro natsionalnu infrastrukturu heoprostorovykh danykh : Zakon Ukrainy vid 13.04.2020 № 554-IX. Baza danykh «Zakonodavstvo Ukrainy» Verkhovna Rada Ukrainy. URL: https://zakon.rada.gov.ua/go/554-20.

6. Malashevskyi M., Tarnopolskyi Ye., Malashevska O. (2020). The Issues of Land Cadastre in Ukraine. Materials of the XVI International scientific and practical Conference Trends of modern science. May 30 - June 7, 2020: Sheffield. Science and education LTD. P. 26-28.

7. Malashevskyi M., Palamar A., Malanchuk M., Bugaienko O. (2020). The possibilities of sustainable land use formation in Ukraine. Geodesy and Cartography. № 46(2). P. 83-88.

8. Chabaniuk Viktor, Dyshlyk Oleksandr (2018). GeoSolutions Framework Reinvented: Method, pp. 115-138 in Analysis, Modeling and Control. Vol. 3, Collection of Scientific Papers of the Department of Applied Nonlinear Analysis. Edited by prof. Makarenko A.S.- Institute for Applied System Analysis at the Igor Sikorsky Kyiv Politechnic Institute, Kyiv, 250 p.

9. Chabaniuk V., Dyshlyk O. (2017). Obhruntuvannia strukturnykh pryntsypiv pobudovy IPD metodamy Reliatsiinoi kartohrafii, s. 102-113. Suchasni dosiahnennia heodezychnoi nauky ta vyrobnytstva. Zbirnyk naukovykh prats Zakhidnoho heodezychnoho tovarystva UTHK, Vypusk II (34). Lviv: Vydavnytstvo Lvivskoi politekhniky, 138 s.

Дорош Й.М., Тарнопольський А.В., Ібатуллін Ш.І., Тарнопольський Є.А., Кравченко О.М.

ВИКОРИСТАННЯ ІДЕОЛОГІЇ ІНФРАСТРУКТУРИ ГЕОПРОСТОРОВИХ ДАНИХ ДЛЯ СТВОРЕННЯ СИСТЕМИ ОБЛІКУ ТА УПРАВЛІННЯ ЗЕМЕЛЬНО-МАЙНОВИМИ КОМПЛЕКСАМИ ПІДПРИЄМСТВ ТА ТЕРИТОРІАЛЬНИХ ГРОМАД, В ТОМУ ЧИСЛІ ОТГ

Розглянуто можливість та обґрунтовано доцільність використання ідеології інфраструктури геопросторових даних (надалі НІГД) для створення системи обліку та управління земельно-майновими комплексами підприємств та територіальних громад, в тому числі ОТГ.

Необхідність створення систем обліку та управління земельно-майновими комплексами зумовлено: масштабним переходом на цифрові технології в управлінні підприємств, установ та територій, оподаткуванням нерухомості, процесами децентралізації, створенням Національної інфраструктури геопросторових даних.

Обґрунтовано необхідність врахування принципів і стандартів національної інфраструктури геопросторових даних. Сформовано напрями, за якими відомості про земельно-майнові комплекси можуть бути використані для наповнення Національної інфраструктури геопросторових даних та обґрунтування прийняття управлінських рішень.

Серед ключових питань, які забезпечать використання ідеології НІГД для створення системи обліку та управління земельно-майновими комплексами підприємств та територіальних громад, в тому числі ОТГ необхідно вирішити питання забезпечення інтероперабельності даних про об'єкти земельно-майнового комплексу, використання єдиної картографічної основи, принципів та процедури валідації даних, виправлення помилок в даних, механізми доступу до даних учасникам процесу, можливість багаторазового повторного використання даних та ліцензування даних.

Ключові слова: *земельні ресурси, моніторинг земель, автоматизовані системи управління, інфраструктура геопросторових даних, землеустрій, земельний кадастр, інформаційно-аналітична система.*

Дорош Й.М., Тарнопольский А.В., Ибатуллин Ш.И., Тарнопольский Е.А., Кравченко Е.М.

ПРИМЕНЕНИЕ ИДЕОЛОГИИ ИНФРАСТРУКТУРЫ ГЕОПРОСТРАНСТВЕННЫХ ДАННЫХ ДЛЯ СОЗДАНИЯ СИСТЕМЫ УЧЕТА И УПРАВЛЕНИЯ ЗЕМЕЛЬНО-ИМУЩЕСТВЕННЫХ КОМПЛЕКСОВ ПРЕДПРИЯТИЙ И ТЕРРИТОРИАЛЬНЫХ ОБЩИН

Рассмотрена возможность и обоснована целесообразность использования идеологии инфраструктуры пространственных данных (далее – ИПД) для создания системы учета и управления земельно-имущественными комплексами предприятий и территориальных общин.

Необходимость создания систем учета и управления земельно-имущественными комплексами обусловлена: масштабным переходом на цифровые технологии в управлении предприятий, учреждений и территорий,

налогообложением недвижимости, процессами децентрализации, созданием Национальной инфраструктуры геопространственных данных.

Обоснована необходимость учета принципов и стандартов национальной инфраструктуры геопространственных данных. Сформированы направления, по которым сведения о земельно-имущественные комплексы могут быть использованы для наполнения Национальной инфраструктуры геопространственных данных и обоснования принятия управленческих решений.

Среди ключевых вопросов, которые обеспечат использование идеологии ИПД для создания системы учета и управления земельно-имущественными комплексами предприятий и территориальных общин необходимо решить вопрос обеспечения интероперабельности данных об объектах земельно-имущественного комплекса, использования единой картографической основы, принципов и процедуры валидации данных, исправление ошибок в данных, механизмы доступа к данным участникам процесса, возможность многократного повторного использования данных и лицензирования данных.

Ключевые слова: *земельные ресурсы, мониторинг земель, автоматизированные системы управления, инфраструктура пространственных данных, землеустройство, земельный кадастр, информационно-аналитическая система.*