

CADASTRE INFORMATION SUPPORT

Tsvetkov V.Ya.

Doctor of Technical Science, Professor, deputy head, Center for strategic analysis and development, Research and Design Institute of design information, automation and communication on railway transport

Address: 27, bldg 1 Nizhegorodskaya Str., Moscow, 109029, Russia

E-mail: cvj2@mail.ru

Abstract: The article explores the information support of the cadastre. The paper reveals the content of one of the basic functions of the cadastre - the information function. The information function of the cadastre requires information support. The importance of information support for the cadastre consists of two factors: the provision of cadastral work and the subsequent formation of the information content of the cadastre. Information support for the cadastre is disclosed as a set of technologies and data obtained as a result of cadastral work. Information support of the cadastre includes technological support and information filling with cadastral data. Information support for the cadastre includes normative documentation. Information support for the cadastre requires periodic updating, which is due to changes in laws and regulations. The current state of the state cadastre of real estate is characterized by a large amount of information on cadastral objects that are of a high quality and varied in quality. This information situation creates the Big Data problem. Therefore, the role of information support for the state real estate cadastre increases manyfold. Information support for land resources fulfills three main tasks: technological, information, and legal. The technological task provides the implementation of technologies for the collection of surveying and inventory. The information task provides accounting and maintenance of information on the cadastre. It supports land management for the adoption of specific management decisions on the organization of rational use and protection of land. The legal task provides information support to the legal and economic mechanisms for regulating land relations. The article describes the structural scheme for obtaining cadastral information. The scheme for obtaining cadastral information contains three qualitative levels. The article describes the mechanism for the formation of cadastral information. Cadastral documents, which form the basis of information support, are described in the article. The features of creating and using cadastral maps are described. The association of cadastral information with land management information is described in the article. The article describes three foundations in the land management system that violate the integrity of information provision in this area. These funds: the state cadastre of real estate, the information system for ensuring the town-planning activity, the state fund of land management data. The article reveals the relations of the territorial environment and subject property. The article describes the features of cadastral information

Key words: cadastre, cadastral information, information support, state cadastre of real estate, cadastral information funds, cadastral documents, information technology.

1. Introduction

One of the main functions of a cadastre is the information one. It includes information support of people, organizations, state agencies and public services, providing reliable and accurate information on real estate items, their legal status and cadastral value. A cadastre's information function requires information support. It explains the importance of cadastre information support. The current state of the State Cadastre of Real Estate is characterized by bulky and quality-diversified information on cadastral items. Such information situation creates a problem attributable to Big Data. In this context, the importance of information support of the State Cadastre of Real Estate has increased dramatically, including issues of territory management [1,

2]. However, today the above function of a cadastre is performed ineffectively and not fully, as it faces a few problems. Cadastre information support is connected with information support for land resources. Information support for land resources performs the following tasks: information support of land management for making specific management decisions on rational use and protection of land, information support of legal and economic mechanisms of handling of land matters.

2. Overview Diagram of Cadastre Information Support

Cadastre information support can be divided into two types of information support: information support for obtaining ca-

dastral information and information support in application of cadastral information.

Cadastral information support is a complex that includes: technology, hardware, computations, mixed data categories,

maps and spatial models, as well as regulatory documentation. Fig. 1 shows an overview diagram of information support for obtaining cadastral information. It consists of 3 stages and 3 levels.

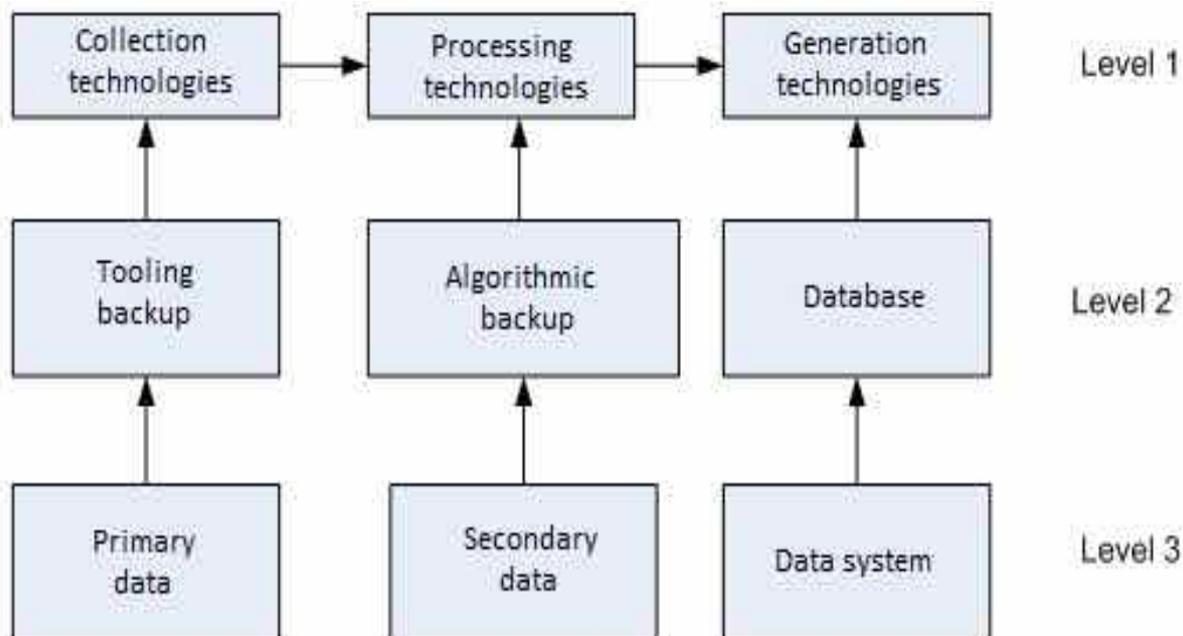


Fig.1. Overview Diagram of Information Support for Obtaining Cadastral Information

Information support (Fig. 1) includes three levels. Level 1 is for technology. This is a technological support level. The first level is responsible for data collection. The second level is for processing. The third level is for systemizing.

Level 2 is a backup for Level 1. It includes tooling backup with a range of measuring devices. Tools ensure support of collection technologies. Collected data are processed using data processing algorithms. Data processing algorithms constitute algorithmic backup. After processing, data are placed into a data store. Databases are most commonly chosen for data storage. Data in a data store or a database are further systemized. Data are either added to the existing data or used to update any outdated data. Data stores, databases and data banks constitute information support for storing cadastral information and other spatial information.

Level 3 is for data. Data collecting results in generation of primary data. Primary data are transferred to the

processing system and transformed into secondary data. Secondary data are systemized and sorted out and placed into the cadastral database. Systemized and approved data refer to level three in the overview diagram in Fig.1.

3. Cadastral Documents

Cadastral documents are a foundation of information support in application of cadastral information [3, 4]. In the course of management of the State Cadastre of Real Estate (SCRE) [5] or development of urban planning documentation, large-scale topographic maps and plans are created. Cadastral maps must be drawn using a generalized base map and contain, in graphic or text form, cadastral data of land parcels, buildings, structures etc. A generalized base map forms a part of cadastre information support.

In practice, in the course of the SREC management and development of urban planning documentation, different

coordinate systems are used. The situation is worsened by the absence of open keys for shifting between coordinate systems. This results in difficulties in re-calculation of coordinates and degradation of their accuracy. [6, 7].

A cadastral agency maintains cadastral maps to be used by general public. Such cadastral maps are called public cadastral maps. Public cadastral maps constitute cadastre cartographic information support.

Scope of information in public cadastral maps or scope of information in other cadastral maps is established by a cadastral statutory regulation authority [8, 9]. Public cadastral maps are made available at the cadastral agency's official website. Nevertheless, in Russia, cadastral maps of territories of municipal entities and territories of constituent entities of the Russian Federation are not widely available. This situation makes it difficult to use cadastral maps by local authorities and common user. All of this creates difficulties for the development of the cadastre and its information support. Mapping scale is the factor that characterizes the relation between cadastral information and its visualization in a plan or other map materials.

4. Three Land Management Databases

Currently in the Russian Federation, land management items are described at least in three information systems. First information system is the State Cadastre of Real Estate. Second information system is the Urban Development Support Information System (UDSIS). Third information system is the Public Database with data obtained from land management activities. Spatial Data Infrastructure (SDI) [10] was supposed to unite these databases. However, work on SDI development has been almost completely wound down, and a disassociation between departmental databases of spatial information still exists.

Availability of three databases provides for three different types of

information support. When using information from different databases, additional work need to be done to transform the information from such databases to ensure correlation of information in documents. Moreover, automated data exchange between the SCRE information system, UDSIS information system and other information systems lacks compatibility of data structures and, most importantly, coordinated regulatory support.

Such information situation creates uncertainty of information support received in different systems. Such uncertainty is not always taken into account in the development of managerial decisions at the level of constituent entities of the Russian Federation, thus resulting in negative consequences in the course of land resources management.

Besides a public cadastre, each state has a land management system. A cadastre is auxiliary to the land management system but serves as a foundation for its activities. Land management system is the main mechanism for carrying out land reorganization. It includes functions of information support of land resources management.

Land resources management includes the following types of activities: land cadastre and land monitoring, topographic-geodesic surveying, soil, geo-botanical and other examinations and surveys, spatial planning, spatial forecasting, spatial modeling, information analysis of rational use and protection of lands, information control over land reorganizations and condition of land resources. All those types of activities require a wide range of information support.

5. Territorial Environment and Real Property

Cadastral information is a foundation of information support of cadastral activities. It provides means for determining the contents of different cadastres and

accentuates cadastral information among other types of spatial information, e.g. geodesic, topographic, urban development, etc.

Qualities of spatial objects are related to the concept of “territorial environment”. Territorial environment is a combination of objects on the ground surface ensuring people’s vital activities. A combination of objects representing the environment can be changed in accordance with the tasks solved by the land management.

Qualities of the environment objects can be subjected to cadastral activities and included in the description of real property. Therefore, the terms “real property” and “role of territorial environment” can refer to the same objects and their qualities. For example, urban environment is represented

by urban objects. Town objects transferred into ownership are considered real property and town property.

The concepts of “territorial environment” and “real property” are interrelated due to common and similar qualities of objects that ensure vital activities of the area residents. Conceptual interpretation of such relation provides that similar qualities of real objects that constitute territorial environment and real property can bring those concepts together, thus supplementing the semantic scope of each of them.

There are other objects that have a variety of qualities and may have different purpose and refer to different types of real property. (Fig. 2).

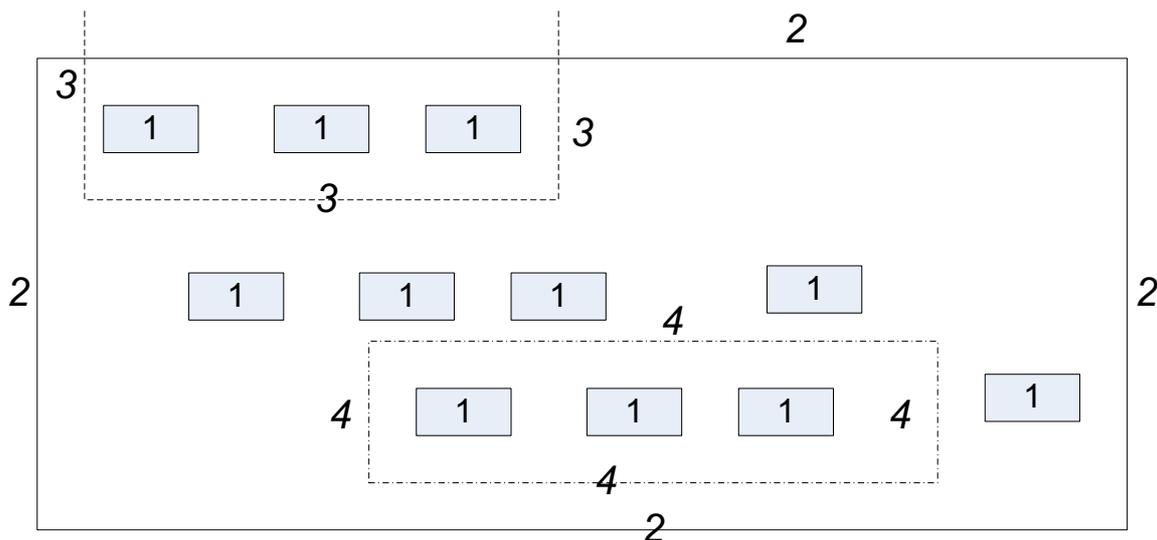


Fig. 2. Variety of Interpretations of Object “Building” for Different Territorial Environments
 Keys to Fig. 2: 1 – object “Building”; 2 – boundaries of urban environment; 3 – boundaries of agricultural environment; 4 – boundaries of industrial environment.

Diversity of land qualities ensures vital activities in such territorial environments as: agricultural, industrial, urban, etc. In the same time, such lands represent different real property. Buildings and constructions constitute urban environment, because their qualities ensure normal conditions for living, recreation and work of people living in this territory.

The same objects can be included into

another environment, for example – industrial, because their qualities can be used for ensuring normal production activities of a plant, factory and constitute their real property.

Diversity of qualities of spatial objects makes it difficult to refer them to a specific territorial environment. However, among a number of spatial objects there are some

that are included into territorial environments with different functionalities, however the type of real property remains unchanged. Such land plots are considered real property in all territorial environments. Let's review it on the example of urban environment and an external environment. In this example we assume that agricultural environment is external to urban environment.

According to its natural qualities, land is the same both inside a town and outside it. In all environments land is distributed into different types of ownership according to the same pattern. Land natural qualities are used in urban environment and agricultural environment in different ways.

In agricultural environment most commonly such land qualities are used that ensure generation of agricultural products; whereas for urban environment such qualities are of little importance. In towns, land is mostly used for roads, buildings, streets, etc. This environment pays attention to such qualities of land as: terrain, physical and mechanical composition, geological composition, ground water level, etc. Two environments – urban and environment – use qualities and functionality of land in different ways.

Qualities of land as real property are used differently, if such property is represented by land parcels. Land parcels as property items cover the ground uniformly, without any gaps; and qualities of such land parcels are closely related to the land qualities, ensuring continuity of the land parcels on the ground and, accordingly, continuity of the land property, irrespective of the territorial environment functionality. Land parcels and land property remain such until they exist, and such continuity cannot be disturbed by any territorial environment whatsoever.

The only connections between territorial environment and land property are those, by virtue of which land property can be classified by the property types. The property types are as follows: regional, state and other. In accordance with this

quality, land property can be given the characteristics of a territorial environment, e.g. urban, regional, state environment. However, it is impossible to give qualities of a land property to a territorial environment.

6. Cadastral Information.

Let's define cadastral information as follows: cadastral information is a combination of systemized parameters that set forth general and particular qualities of a cadastral object, sufficient for evaluation of its condition and making a decision.

Cadastral information has characteristic features that can be attributed to such information only. Such characteristic features include: statutory recognition of a status through cadastral information; rendering of specific cadastral details by multi-faceted values; inclusion of legal status details into the scope of cadastral information.

Main features make it possible to explicitly differentiate cadastral information from other types of information on objects; as such features are attributable to cadastral information only.

Cadastral information forms an interrelated system of information objects. Cadastral information system is a part of information support in application of cadastral information.

In a cadastral information system, elements of input data for description of location of objects are represented by cadastral inventory items, boundaries of which divide the territory of a town without any overlapping or gaps. Cadastral inventory items represented by a district, street, block, street section, crossroad (square) use a cadastral coordinate system of hierarchic structure, where the lowest level is represented by a block, street, street section or a crossroad.

The set elements boundaries that enclose the cadastral coordinate system, can be represented by rectangular (Fig.2) or geodesic coordinates.

Cadastral information, irrespective of

the methods of its generation, is represented in the form of cadastral visual models and cadastral plans, layouts, various tables, entries in cadastral books, etc. [11]. All of those constitute information support in application of cadastral information.

In the context of non-automated methods of cadastre management, cadastral information is provided in the form of paper cadastral plans. Another part of cadastral information is represented by actual values of aspects describing a specific object.

Cadastral information is divided into geometrical, that includes metrical characteristics, and semantic, that includes all other characteristics [12]. In automated systems and geo-information system, geometric information is also separated from semantic information.

7. Conclusion

Cadastre information support is a complex technological system that includes technologies, computations, systematization and legal identification. As of today, cadastre information support has not yet been put together into a comprehensive system. There are many uncoordinated organizational, technological and computation provisions. Cadastral information is an informational foundation of cadastre support. Cadastre information support includes different information types which are not referred to cadastral information, such as geodesic, topographic, economic, town-planning and other types of information. They differ in scope, qualitative content, manner of placement of their data. Cadastre information support is connected with other information types. Diversity of forms and regulatory requirements for other information types creates difficulties for their coordinated use and is an obstacle for effective application of cadastral information.

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ИНФОРМАЦИОННОЕ ОБЕСПЕЧЕНИЕ КАДАСТРА

Цветков В.Я.

Доктор технических наук, профессор, заместитель руководителя, Научно-исследовательский и проектно-конструкторский институт информатизации, автоматизации и связи на железнодорожном транспорте (НИИАС)

Адрес: 109029 Москва, Нижегородская ул., 27 стр. 1. Москва, Россия

E-mail: cvj2@mail.ru

Аннотация: Статья исследует информационное обеспечение кадастра. Статья раскрывает содержание одной из основных функций кадастра - информационной функции. Информационная функция кадастра требует информационной поддержки. Важность информационного обеспечения кадастра состоит в двух факторах: обеспечении кадастровых работ и последующем формировании информационного содержания кадастра. Информационное обеспечение кадастра раскрывается как совокупность технологий и данных, полученных в результате кадастровых работ. Информационное обеспечение кадастра включает технологическое обеспечение и информационное наполнение кадастровыми данными. Информационное обеспечение кадастра включает нормативную документацию. Информационное обеспечение кадастра требует периодической актуализации, что обусловлено изменением законов и нормативов. Современное состояние государственного кадастра недвижимости характеризуется большими по объему и разнообразными по качеству сведениями о кадастровых объектах. Эта информационная ситуация создает проблему Big Date. В этой связи многократно возрастает роль информационного обеспечения государственного кадастра недвижимости. Информационное обеспечение для земельных ресурсов выполняет три основные задачи: технологическую, информационную, юридическую. Технологическая задача обеспечивает выполнение технологий по сбору межеванию и инвентаризации. Информационная задача обеспечивает учет и ведение сведений по кадастру. Она осуществляет поддержку землеустройства для принятия конкретных управленческих решений по организации рационального использования и охраны земли. Юридическая задача обеспечивает информационную поддержку юридического и экономического механизмов регулирования земельных отношений. Статья описывает структурную схему получения кадастровой информации. Схема получения кадастровой информации содержит три качественных уровня. Показан механизм формирования кадастровой информации. Описаны кадастровые документы, которые составляют основу информационного обеспечения. Описаны особенности создания и использования кадастровых карт. Показана связь кадастровой информации с землеустроительной информацией. Статья описывает три фонда в системе землеустройства, которые нарушают целостность информационного обеспечения в этой области. Эти фонды: государственный кадастр недвижимости, информационная система обеспечения градостроительной деятельности, государственный фонд данных землеустройства. Статья раскрывает отношения территориальной среды и предметной собственности. Статья описывает особенности кадастровой информации.

Ключевые слова: Arctic territories, polar geography, geoinformation analysis, complex processing, data integration, information resources.

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