UDC 004.9:528.44:332.3

THE ROLE OF GEOGRAPHIC INFORMATION SYSTEMS (GIS) IN LAND CADASTRE

teacher, Aleuov A.S.

PhD., Jaksibaev R.N.

Nurnazarov S.J.

Karakalpak State University named after Berdak, teachers of the Department of Geodesy, Cartography and Natural Resources

Abstract. This thesis delves into the crucial role that Geographic Information Systems (GIS) play in contemporary land cadastre systems. Traditionally, land cadastre, which entails a comprehensive registry of the boundaries and measurements of real estate, heavily relied on manual and paper-based records. However, the emergence and integration of GIS technology have brought about a revolutionary transformation in this field, offering a dynamic and efficient approach to recording, managing, and analyzing land-related data. The research investigates the historical evolution of land cadastre, the shift towards digital systems, and the specific benefits that GIS brings in terms of precision, accessibility, and decision-making.

Key words: Land cadastre, GIS technologies, land arrangement, and land registry.

Introduction. Geographic Information Systems (GIS) have been developed for the purpose of capturing, storing, manipulating, analyzing, managing, and presenting spatial or geographic data. The incorporation of GIS technology into land cadastre systems has brought about a fundamental change in approach, enabling the digitization and automation of processes that were previously reliant on manual labor. This advancement in technology not only enhances the accuracy of land records, but also enhances the accessibility and usability of land data for a range of stakeholders, including government agencies, private sector organizations, and the wider public.

The role of Geographic Information Systems (GIS) in land cadastre extends far beyond the scope of simple data storage. It encompasses a diverse range of functionalities that greatly contribute to improved decision-making and policy formulation. By employing spatial analysis techniques, GIS facilitates the identification of patterns and relationships inherent within land data, thus offering invaluable insights that are essential for effective urban planning, environmental conservation, and disaster management initiatives. Moreover, the integration of GIS with other advanced technologies like remote sensing and global positioning systems (GPS) bolsters the capacity of land cadastre systems to deliver up-to-date, precise, and all-encompassing information.

Main part. The objectives of this research are threefold:

to analyze the evolution and current state of land cadastre systems;

to evaluate the technical and functional contributions of GIS to these systems;

to propose strategies for optimizing the use of GIS in land management.

In doing so, this thesis aims to provide a comprehensive understanding of how GIS technology can be leveraged to enhance the efficiency, transparency, and sustainability of land cadastre systems.

If we examine the historical development of the geographic information system (GIS) within the context of land cadastre, one notable early instance of GIS utilization for land registration can be found in the land information system of Minnesota. Established in the mid-1960s, this system has proven to be highly efficient. Notably, it operates on a raster, with a significant raster size exceeding 0.16 km^2.

Experiments on the computerization of cadastral data and the establishment of a database were initiated at an early stage in Sweden and Austria. Institutions in these countries, as well as in England, France, and Germany, have demonstrated significant success in effectively adopting and utilizing new technologies.

Automated systems based on Geographic Information Systems (GIS) are increasingly being employed in the domain of land cadastre in the Russian Federation. This trend can be attributed to the stringent demands for data storage and processing within GIS. In this context, a range of software applications such as Arclnfo, Maplnfo, Intergraph, AutoCAD, as well as system packages like Panorama, GeoDraw/GeoGraph, and ObjectLand, are utilized for the execution of these tasks.

However, in many geographic information systems, there is a limitation regarding the ability to define relationships between objects at different levels. For instance, land parcels are unable to extend beyond the boundaries of their cadastral quarter. This kind of verification requires the utilization of all available methods, including the examination of supporting materials. When employing a GIS, it becomes imperative to acquire a comprehensive list of all land plots that are either fully or partially situated within a particular territorial zone. This is essential for inputting specific data on each land plot, a task that presents additional challenges. Consequently, the developers of such cadastral systems have gradually shifted towards using GIS solely for map-related tasks. The processing of specific data and the maintenance of database integrity are now performed using specialized software.

Currently, the organizations involved in the land cadastre of the Russian Federation utilize various geographical information systems such as Maplnfo, ObjectLand, Geopolis, GeoMedia, and SICAD/SD.

The application of GIS technologies enables the storage and documentation of information pertaining to land formations, encompassing both the objects themselves and any subsequent alterations. Additionally, GIS technologies offer the capability to address numerous land management issues in a more expedient and effective manner.

GIS technologies in land management enable the utilization of contemporary electronic geodetic tools and global positioning systems (GPS),

ensuring a constant access to the most dependable and current information. Furthermore, the implementation of specialized tools facilitates the analytical processing of data, enabling the tracking and management of various events, such as those pertaining to area pollution.

Nevertheless, when utilizing these technologies, it is imperative to consider the following factors when working with cadastral databases:

1. Ensure regular updates of the data after entering all the necessary information into the database;

2. Incorporate three-dimensional data for the efficient utilization of land and leverage relief data to enhance evaluation processes.

In order to effectively implement the aforementioned processes, the utilization of remote sensing data (RS) and photogrammetric processing procedures is elucidated, particularly for specific time intervals and large geographical areas. Through the application of this information, it becomes possible to determine the dimensions, configuration, and spatial positioning of objects based on the analysis of their images. Employing methods such as remote sensing for data acquisition facilitates the resolution of the following issues:

Creation of thematic maps of varying scales with the purpose of land use planning;

establishment of digital relief models;

conducting land inventory assessments;

monitoring land conditions and evaluating losses caused by natural disasters;

precise preparation of soil maps and settlement plans;

provision of operational support for digital databases;

forecasting profitability, and so forth.

The presence of various opportunities facilitates land managers in effectively and expeditiously arranging cadastral registration objects with utmost

precision. Furthermore, the integration of Geographic Information Systems (GIS) guarantees the coherence and compatibility of different coordinate systems.

In the field of civil land surveying, Geographic Information System (GIS) technology is employed to work with cadastral maps, including duty maps (duty cadastral documents). The utilization of GIS in relation to civil contract documents encompasses various actions, which can be outlined as follows:

1. Preparation of the initial format of cadastral registration object plans;

2. Development of boundary plans for new cadastral registration objects based on land surveying data;

3. Examination of the conditions required for the formation of said objects;

4. Organization and printing of cadastral registration objects as legal documents;

5. Creation of a cadastral map that incorporates information on the presence, location, and boundaries of registration objects within the cadastral quarter, drawing from diverse sources;

6. Organization and printing of graphic documents pertaining to the subsection of the state register;

7. Compilation and printing of graphic documents for the cadastral plan of land plots;

8. Implementation of any necessary modifications to the results, such as registration of rights, boundary clarification, and transactions involving accounting objects;

9. Preparation of cadastral documents and production of thematic maps that provide generalized information about a specific area.

Significant efforts are currently being undertaken in the Republic of Uzbekistan in this particular field. The incorporation of geographic information systems (GIS) into the land cadastre system has been identified as a crucial

stride towards the efficient administration of these land resources. The utilization of GIS technology has proven instrumental in the enhancement of land management practices in Uzbekistan, contributing to heightened effectiveness, precision, and accountability throughout the land management procedures.

The main stages of introducing GIS technology to the land cadastre of Uzbekistan can be outlined as follows:

1. Digitization of land parcel data: This involves the transition from paper records to digital formats, thereby facilitating easier data access and preventing loss or damage;

2. Development of a centralized database: A GIS-based centralized database is established to effectively store and manage land data;

3. Education and capacity building: It is crucial to provide the necessary training and skill development to land users to ensure their proficiency in utilizing GIS technology.

As a result of these efforts, several benefits and opportunities have emerged, including:

Enhanced mapping precision and spatial analysis capabilities offered by GIS technology, leading to a reduction in errors and ensuring consistency in land records.

The establishment of a transparent platform in the form of a centralized GIS-based land cadastre, enabling public and stakeholder access to land information.GIS facilitates comprehensive spatial analysis and planning, allowing for better land use management, zoning, and development planning;

Accurate GIS maps and data provide a clear representation of land boundaries and ownership, helping to resolve disputes quickly and fairly;

GIS integrates various datasets, including environmental data, enabling better decision-making for sustainable land and resource management.

GIS automates many aspects of land administration, streamlining processes such as land registration, transfer, and valuation, thus reducing processing times and administrative burdens, va boshqa ko’plab natijalarga erishilganligini misol qilib keltirishimiz mumkin.

Conclusion. The transition from manual, paper-based records to digital, Geographic Information System (GIS)-based systems has greatly improved the precision and uniformity of land administration data. This shift has enabled the precise cartography of land parcels and the capability to conduct real-time computations.

References:

1. Варламов А.А. Земельный кадастр. Том 3. Государственные регистрация и учет земель. Учебное издание/- Москва: КолоСС, -2006. - 528с. ISBN: 5-95320214-8 Серия: Учебники и учебные пособия для студентов высших учебных заведений;
2. Стеклова Г. А., Федотова В. С. Направления использования ГИС- технологий в землеустройстве и земельном кадастре//Журнал «Царскосельские чтения». - 2014. Выпуск No XVIII /том III;
3. Akeh GI, Mshelia AD (2016) The Role of Geographic Information System in Urban Land Administration in Nigeria. MOJ Eoc Environ Sci 1(1): 00004. DOI: 10.15406/mojes.2016.01.00004
4. Adamu GS (2012) Bauchi State Land Transformation. A situation report in computerization and reform on land sector in Bauchi. Professional lecture notes on Estate surveying and valuation. NIESV Bauchi/Gombe Branch 1: 10-23.
5. Egbenta IR, Ndukwu RI, Adisa KR. Application of Geographical Information System to Land Management: A case study of Railway Management Company Limited Kaduna. The Estate Surveyor and Valuer 37(1): 7-15.
6. Jaksibaev R.N., Aleuov A.S. Use of statistical methods in the analysis of land cover change //“Zamonaviy fan ta’lim va tarbiyaning dolzarb muammolari”. – Urganch. 2020. IV-son. – Pp. 291-298.
7. Jaksibaev R.N. Assessment of Natural external influences on pasture and forages in the South Aral Sea regions using remote sensing and

geoinformation technologies // “International journal of advanced research in science, engineering and technology”, ISSN (Online): 2350-0328, vol 9, Issue 11. 2022. Pp. 20051- 20058.

8. Ibragimov L., Tojidinova F., Raximov B. Introduction to GIS Application in the Land Cadastre, International Journal on Human Computing Studies, e-ISSN: 2615-8159 | p-ISSN: 2615-1898, Volume: 04 Issue: 12, Pp. 5