ADVANTAGES OF GIS TECHNOLOGIES IN IMPROVING GEODETIC AND CARTOGRAPHIC SUPPORT OF MAIN GAS PIPELINES

[1]Islamov U.P., [2]Nasriddinov S.R.

[1]PhD, Associate Professor, National Research University "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers"

[2]Chief Design Engineer, Automation and Geoinformatics Department, “Toshvilyerloyiha”, DILI "Uzdavyerloyiha"

https://doi.org/10.5281/zenodo.14543449

Abstract*. In the modern developed era, the emergence of modern electronic software and geographic information systems makes it easier for us to understand the physical world around us and interact with it. This technology has found its application in various fields: from urban planning to environmental protection. Gas pipelines are an important part of the infrastructure in many countries and provide long-distance transportation of various products, such as oil and gas. However, the installation and maintenance of these gas pipelines often require large land resources, which can lead to conflicts with other land uses and potential environmental impacts. Therefore, it is very important to correctly calculate, effectively plan and manage the land occupied by main gas pipelines.*

Keywords*: land, oil, gas pipelines, agricultural land, industrial land, transport, communication, defense and other land, water fund land, reserve land, geodesy, cartography, cadastre and geoinformatics.*

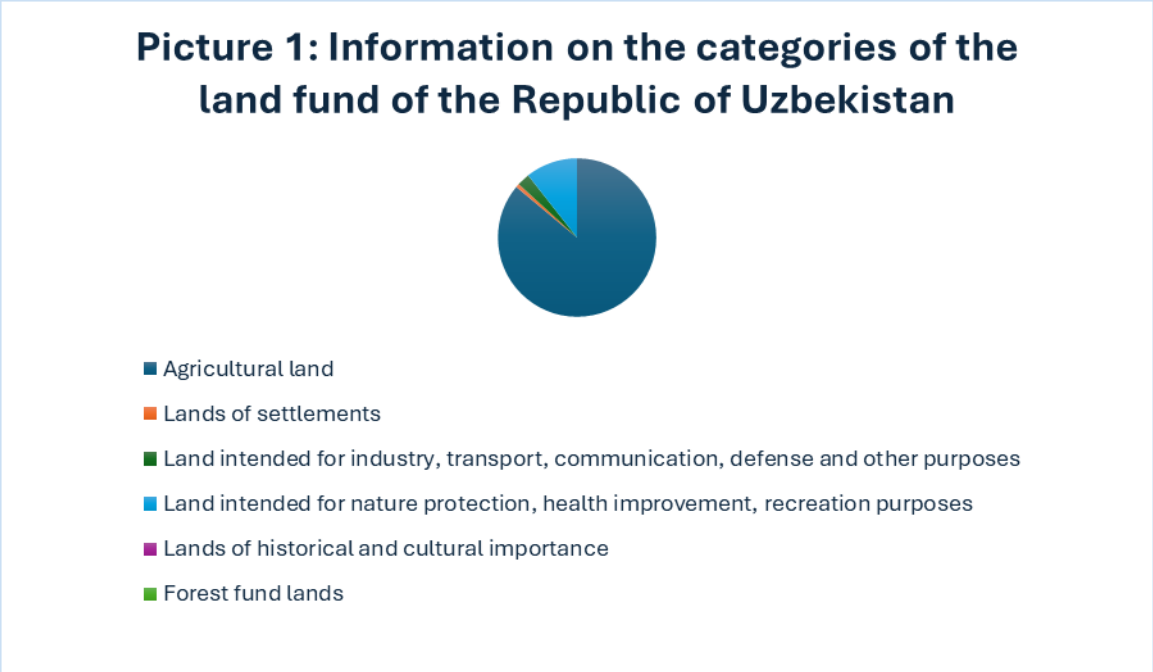
Pursuant to the Resolution of the President of the Republic of Uzbekistan PR-4819 dated September 7, 2020, target indicators for the registration of state cadastre objects and inclusion in the National Geographic Information System of the Republic of Uzbekistan have been defined. In order to maintain the state cadastre of gas pipelines, Uztransgaz JSC laid 7,166 km of gas pipelines, Uzbekneftegaz JSC - 2,359 km, and Khududgaztaminot JSC - 9,117 km. The fourth quarter of 2020 was carried out and included in the National Geographic Information System.

In addition, the adoption of many Laws of the Republic of Uzbekistan "On Geodesy and Cartography" and other regulatory documents is evidence of the high importance of the field of geodesy, cartography and cadastre.

Information on the categories of the land fund of the Republic of Uzbekistan is presented in Table 1. The division of the land fund of the republic according to its economic objectives depends on the difference in the functions performed by the lands provided for use for certain purposes.

The Khojaly district of the Republic of Karakalpakstan is considered to be the object of the study of main gas pipelines, the subject of the study is the creation of electronic maps of main gas pipelines in the ArcGIS software and the creation of a GIS database. Determination of the coordinates of the location, occupied area and length of main gas pipelines using GPS receivers, input of indicator data belonging to the land user into the modern ArcGIS program and the creation of a geodatabase, analysis of data in sections, integration of attribute data. As for the

layers, the periodic updating of the status and information of electronic digital maps has been improved.



Developing theoretical and methodological foundations of agricultural mapping based on GIS is studied by foreign scientists A.M. Berlyant, A.R. Batuev, A.P. Karpik and others. Research on the creation of agricultural maps based on remote sensing of the earth (RSE) was conducted abroad by Yu.F. Kniynikov, V.I. Kravsov, T.V. Krinova, L.A. Plastinina, E.N. Savinykh, A.M. Chandra, S.K. Gosh. In Uzbekistan, research was conducted by E.Yu.Safarov, I.Musayev, S.A.Avezov and other scientists. By analyzing the maps created as a result of these studies, we will create maps of main gas pipelines using the information we need.

In particular, the Khojalili district (the historical name of which is "Shahar Antakya" and the ancient city known as "Khoja Eli" or Khojalar Eli) was founded on July 3, 1927 and is the oldest of the five cities in the Republic of Karakalpakstan. The center of the Khojali district is the city of Khojaly, located 14 km from the capital Nukus. Geographically, the district is located in the southwestern region of Karakalpakstan, on the left bank of Amu Darya River, with Nukus district and the city of Nukus from the north, the Republic of Turkmenistan from the south, Shomanay and Kanlykol districts from the west, in the east it borders with the Takayatash districts. According to data for 2023, the population of the district will be 127.2 thousand people. Most of the population - 81.1 thousand people (63.75%) - live in cities, 46.1 thousand people (36.25%) - in rural areas.

In geographic information systems, the quantities representing the position of a point relative to another point are called the coordinates of this point. Different fields of science and technology use different coordinate systems. In photography, geographic coordinates, rectangular coordinates, and a polar coordinate system are mainly used. The coordinate plays a key role in solving problems in a geographic information system. Solving these problems involves defining an appropriate coordinate system, projecting from a geographic coordinate, and reprojecting the projected coordinates onto other systems. Geoinformation programs usually include the necessary parameters for transforming from one coordinate system to another.

These coordinate systems can be classified by the following main characteristics:

by the position of the coordinate head - geocentric and topocentric;

flat rectangles and spatial curves relative to coordinate lines (spherical, ellipsoidal);

by function - stellar and terrestrial coordinate systems.

Many applications of the above-mentioned coordinate systems are geocentric (geodetic) rectangular spatial coordinate systems (which are three-dimensional) and flat rectangular Gauss-Kruger coordinate systems, which consist of two-dimensional systems. In a geocentric coordinate system, the starting point is the common center of the earth's ellipsoid (the center of mass of the Earth), and its Z axis coincides with the axis of rotation of the Earth. This system is used to solve geodetic problems associated with large areas of the earth's surface or any shape of the Earth (for example, space exploration).

In a geographic coordinate system, the position of a point on the ground is determined by its geographic latitude and distance. The geographic coordinates of a point on the Earth, depending on the method of determination, are divided into astronomical and geodetic coordinates. In ArcGIS, a geodatabase is a collection of different geographic datasets stored in a Microsoft Access database stored in a shared file system folder or in a multiuser relational database (including IBM, Oracle, DBR, Informix, PostgreSQL, or Microsoft SQL Server). Depending on the level of user coverage, they range from a small single-user file-based database to large multiuser groups, networks (areas), and can be created up to the size of an enterprise geodatabase. Thus, direct human involvement plays an important role in GIS, and we have reason to believe that the following definition is complete. The main objectives of a geographic information system are to create a generalized computerized system consisting of collecting, storing, managing, analyzing, modeling, and visualizing spatial and geographic data under the direction of expert analysts.

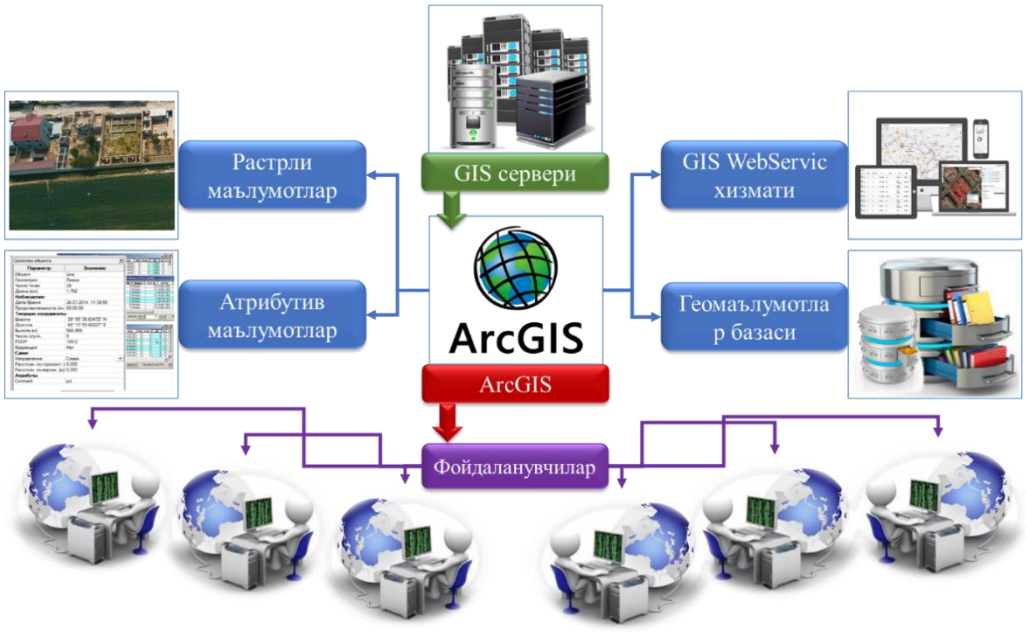


Figure 2. ArcGIS GAT Representation

In the definition above, the category of spatial and geographic data includes all data about a place, including coordinates, land boundaries, information about where you are, legal and economic data about a place, and many other important spatial data that you need to understand.

ArcGIS is a program designed to work with maps and geographic data created by ESRI, a U.S. geographic information systems (GIS) company. This software is used to create maps, use

them, collect geographic data, analyze and share geographic data, and manage databases. The ArcGIS system also provides access to maps and geographic information through an organizational, public, and web portal.

REFERENCES

1. "Strategy of Actions for Five Priority Areas of Development of the Republic of Uzbekistan for 2017-2021" of the President of the Republic of Uzbekistan Shavkat Mirziyoyev 2017
2. "New Development Strategy of Uzbekistan" of the President of the Republic of Uzbekistan Sh. Mirziyoyev Tashkent 2022.
3. Land Code of the Republic of Uzbekistan Tashkent. 1998
4. Fundamentals of Land and Real Estate Valuation Tashkent 2008
5. lex.uz website
6. 2024 Land Fund of the Republic of Uzbekistan Cadastre Agency
7. https://scholar.google.com/scholar?oi=bibs&cluster=17963125453949797 60&btnI=1&hl=ru
8. https://scholar.google.com/scholar?oi=bibs&cluster=17807867488782400220&btnI=1&hl=ru.
9. https://scholar.google.com/scholar?oi=bibs&cluster=3989786110421481766&btnI=1&hl=ru
10. Mukhtorov O'.B., Inamov A.N., Islamov O'.P. - Geographic information systems and technologies, Tashkent-2017.