

## РОЛЬ ГЕОИНФОРМАЦИОННЫХ СИСТЕМ В СТРУКТУРЕ СОВРЕМЕННОГО ОБЩЕСТВА КЫРГЫЗСТАНА

### THE ROLE OF THE GEOGRAPHIC INFORMATION SYSTEMS IN THE STRUCTURE OF THE MODERN SOCIETY OF KYRGYZSTAN

*Макалада Кыргызстандын учурдагы коому үчүн маанилүү болгон көптөгөн конкреттүү милдеттерди чечүүдө геоинформациялык системалардын ролу жана аларды пайдалануу каралат. Ал системалар транспорт, курулуш, навигация тармагында, илимде, геология менен географияда, аскер иштеринде, топографияда, экономикада, аба ырайын болжолдоо иликтөөдө, демографиялык, статистикалык, жер, муниципалдык, даректик жана бишка маалыматтарда колдонулат.*

***Ачкыч сөздөр:** географиялык информациялык системалар, топография, айлана-чөйрө, маалыматтар базасы, геофизикалык программалык камсыздоо.*

*В статье рассматривается роль и применение геоинформационных систем в решении множество конкретных задач, важных для современного общества Кыргызстана. Они применяются в транспорте и строительстве, навигации, науке, геологии и географии, военном деле, топографии, экономике, изучении прогнозе погоды, бизнесе, демографической, статистической, земельной, муниципальной, адресной и другой информации.*

***Ключевые слова:** географические информационные системы, топография, окружающая среда, база данных, геофизическое программное обеспечение.*

*This paper presents a role and the use of GIS (the geographic information systems) applications in solving a set of the specific tasks that are important for the modern society of Kyrgyzstan. They are used in transportation and construction, navigation, science, geology and geography, military science, topography, economy, the study of weather forecast, business, demographic, statistical, land, municipal, address and other information.*

***Keywords:** geographic information systems, topography, environment, database, geophysical software.*

Since its inception, a geographic information system (hereinafter referred to as GIS) is to help solve various challenges facing the society. It is clear that first of all the governmental agencies are involved in solving of these tasks, the greater the share of which among the GIS users only emphasizes the role of this technology in solving of the socially significant tasks.

Geographic information systems represent is a versatile analysis tools of the tabular, textual and cartographic data of a business, of demographics, statistics, land, municipal, address, and other data put together.

The main advantage of GIS over other information technologies is that it is a set of tools for creating and combining databases with possibilities of their geographical analysis and clear visualization in the form of various maps, graphs, diagrams, direct binding to each other of all the attribute and graphic data.

In terms of spheres of applications GIS are not to be equaled. They are used in transportation, construction, navigation, science, geology, geography, military science, topography, economy, research, weather forecast, etc. Automated methods of creating maps

using GIS have several advantages:

- improved accuracy of cartographic information;
- reduced labor costs for the manufacture of products;
- increased productivity due to automation of certain operations or their exclusion.

The methodological basis for information processing in GIS is the digital modeling of the terrain, combining the processes of collection of primary data, its modeling and updating, processing and generation of documents. Today maps of the cities and localities go out of date quickly because of the new constructions and designed roads. GIS allow us to track these changes and add them to the database almost immediately. Launched in a virtual network, such a map will allow you to always have at hand the relevant data.

Scientists estimate that 85% of the information, which a person faces in his life, has a territorial binding. Therefore, it is simply impossible to enumerate all the fields of applications of

GIS. These systems can be found in virtually any spheres of work activities.

GIS in Kyrgyzstan are effective in all the areas where the accounting and management of territory and objects on it exist. It's almost all the activities of management and administrative bodies: land resources and real estate, transport, utilities, business development, insurance of law and order, emergency management, demography, ecology, health, etc.

GIS are used for the graphic development of maps and information just as about individual objects, so spatial data about the areas, for example, about the location of natural gas reserves, density of transport communications or distribution of income per capita in the state. In many cases the area marked on the map much better reflects the required information than dozens of pages of reports with tables. It is important to know for any resident where in its vicinity are the socially important facilities of public services like health care institutions, post offices, etc. The most effective way to provide this information is on an interactive map on the Internet published using the GIS server. As mentioned above, each service can provide information about their facilities and their service areas as a separate web service, not even agreeing on the integration of information with other organizations, and information integration can be performed by a software of the GIS server or of a client. The content of the general service may also involve data about the development planning of the terrain, public transport routes, timely information on changes in traffic management and much more. The functionality of such a service is "typical for GIS": displaying information about a user-specified object on the map, search service object on the specified criteria, the search for a way for the movement of private transport given current restrictions or to travel on public transport on the existing routes. The emergence and spread of web

mapping, of individual means of positioning and mobile access has created the preconditions for the emergence of a new, GIS environment [1].

Popular map services like Google Maps, Yandex Maps, Bing Maps, etc. allow citizens not just "view map", but also to find the right services close to where they are or plan to be, to get directions to travel to them, etc. But more importantly for the society is that on the basis of these services are independent services with information contents not controlled either by the state or by the providers of basic web cartography. The emergence of these independent projects is, in fact, in line with the development of democratic institutions. The Open Street Map (OSM) and Wikimapia projects can be called among the most famous ones. The OSM, translated as "open street map" is a global project for the creation of a public roadmap, i.e. one that is fully free from any restrictions on the distribution of (privacy and copyright) and is created on the basis of voluntary entry of information by citizens on a Pro Bono basis. Wikimapia is a service imposed on a Google Maps that allows anyone to picture and sign objects which can be seen on satellite images, and, of course, to see what is already signed by other users of the project [2]. Nowadays the geographic information systems are

effectively used in the demographic processes. Demographic researches starting with a census of the population need these systems, as data are of a spatial nature. After all, it is important to know not only how many people of a particular age, of a particular nationality, or of affluence are in the country, but also how they are distributed geographically. It is also important to know how to distribute economic activities, transport infrastructure and many other factors. Without this it is impossible to build a forecast for the country's development and to find optimal solutions in the field of regional, social, economic, and migration policy. The same factors are important for the private sector, because complete market researches and strategic business planning are impossible without them.

GIS technology makes it possible to investigate social processes separately; it allows also simulating their interaction. For example, monitoring of natural foci of dangerous infections is required to plan anti-epidemic measures among the people. But along with such use as the saying goes "head-on", GIS allows to identify and estimate less noticeable correlation, for example, between the changes of natural conditions and volumes of insurance payments for certain types of insurance. This can be valuable for public insurance systems as well as for a private insurance business.

The principal directions of GIS applications in mining are: geology and geophysics, exploration, design and installation of pipelines, resolving network communication problems, the property and territories management, monitoring the condition of equipment and pipelines, ecology, control of oil spills, damage assessment, modeling, management tasks.

When developing the deposit, producing and transporting minerals the oil or gas companies first of all are faced with the problem of collection, accumulation and processing of large volumes of spatial geological and physical information. Earlier this problem was solved by the use of paper topographic maps and plans, and by maintaining reference files. But working with papers has several shortcomings that significantly slow down and sometimes make it impossible to analyze the vast array of data. Geographic information systems allow solving this problem quickly and efficiently.

The military GISs are designed for use in automated systems of control of troops and weapons, for the support of decision-making command, for planning of combat actions of troops and types of combat support. Firstly ever the scientific research and experimental works on the conversion of conventional maps to digital forms were in Canada, in the USA, in the USSR and in other countries. Intensive involvement of the ministries of defense of several countries to solve the problem of conversion into the digital form of the traditional topographic maps was a significant impulse in the development of the theory and practice of digital cartographic geoinformatics.

The basis for all data used in military GIS is digital data refinement for the area or terrain

Digital Terrain Model). The DTM is used to reference various types of information needed when planning operations and the use of various weapons. This information should include intelligence data acquired by space, air, ground and human intelligence, meteorological information

acquired by geophysical software, and specialized information about phono-target environment for precision weapons as well as the necessary data about the troops. At the same time different types of DTM are needed for a variety of command and control tasks. For what are the military geographic information systems? The military GIS provide users with tools to collect, to accumulate and visualize the digital terrain model (DTM), as well as to bind and use in conjunction with the DTM thematic variety of user information, to create and issue topographical maps and special plans, to develop and implement the GIS applications that solve a wide range of tasks with the analysis and evaluation of the terrain to the modeling of the troops actions at various levels: from the divisions to the Armed Forces in general, to use in automated command and control systems.

The GIS technology can facilitate another useful thing that is support of the

interaction between the state and society. Network services developed within the paradigm of e-government allow most fully inform citizens about the plans and actions of state authorities and organizations. This fullness is achieved by the fact that information from different agencies can be easily integrated on the basis of geographic location without the need to somehow to link its elements. In English even appeared a special term "loose coupling", which means "soft" linking data and systems that do not require any modification for the purpose of sharing.

Thanks to it, the owner of content can publish the web service only with the own information, and its integration with other sources of related information and basic cartography will perform the software user or the integration server. Governmental agencies especially like about this approach are that it is not necessary to specifically deal with the linkage of data or to give the data to someone else. The technology of web mapping allows going without it. The network geographic services allow not only transmitting information from authorities to citizens, but also in the opposite direction.

This could be done via the service desk that collects signals from residents and integrates them into the geodatabase in the overall picture of the problems, and through an interactive map service, where the residents themselves can indicate the problem areas on a map and describe what is wrong. In the same way public discussions of plans for a new construction and territory development can be conducted. All of these allows you to improve the quality of life of people by reducing their costs for obtaining and transmitting information when interacting with the government as well as due to more adequate actions of the administrations, whose decisions are based on the proposals and reports of the citizens.

The use of GIS in public organizations and private companies of Kyrgyzstan is growing rapidly. As a consequence of it is a growing need for qualified trained professionals, well versed in the problems and methods of spatial analysis. As a result, students in related disciplines have the opportunity to choose interesting prestigious jobs requiring complete knowledge in the field of GIS. Due to the growing popularity of GIS one of the most pressing tasks is to enhance the number of training and practical courses offered to students including specialized ones. In recent years, in addition to general courses on the basics of GIS technology and its use in traditional application areas as ecology, forestry, natural resources study, there are, for example, specialized courses such as "Introduction to Soil Science", "Field methods in archaeology", "Landscape architecture and urbanism", "Sociological and political analysis", where GIS plays a role of a universal tool to facilitate the development of basic scientific disciplines. GIS allows the university students of Kyrgyzstan to develop new approaches to reviewing data and modern methods of working with data using computers. In addition, GIS introduces students to a team working, since the activity usually requires a high level of cooperation. In addition to the educational process as such, GIS is widely used in the activities of the university research centers and laboratories in carrying out research and applied projects, including interdisciplinary and international ones, where tools for dissemination and mutual exchange of data via local and global networks are actively used. With the use of geographic information systems the relationships between different parameters (e.g., soil, climate and crop yields) are defined, ruptures of electrical grids are identified. Selection and storage of information about the earth, the study of long-term dynamics of the forest

ecosystems, inventory of green plantings, forest biogeocenosis and the analysis of their changes, a warning of problems associated and not associated with human factors, prevention of natural disasters by monitoring natural areas, by monitoring of the habitat of various species of animals and plants are not all the problems that are solved using the GIS. GIS allows an accurate account of the coordinates of the objects and land area. Due to the possibility of complex (taking into account a set of geographic, social and other factors) analysis of data about the quality and value of the territory and objects on it, these systems allow objectively to estimate the areas and construction sites. GIS helps, for example, in tasks

such as providing a variety of information upon request of the planning authority, the resolution of the territorial conflicts, the choice of the optimal (from different points of view and by different criteria) locations for placing facilities and so on. The information required for decision-making can be presented in a simple cartographic form with additional textual explanations, graphs and diagrams.

In the field of transportation the GIS has already proven its effectiveness due to the possibility of constructing optimal routes both for individual shipments and for the entire transport systems, on a scale of a certain city or an entire country. The ability to use the most up to date information on the status of the road network and bandwidth allows you to build truly optimal routes [3]. Based on the foregoing, it should be noted that the use of GIS in the public interest should be widely used. Modern society of Kyrgyzstan without the GIS technology cannot get by. It is impossible to build the economy and run a modern economy without them. Besides the fact that this technology allows people to get to know the environment in which they exist, geographic information systems help to solve many specific tasks important for the whole society.

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