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POSSIBILITIES OF USING GEOGRAPHIC INFORMATION SYSTEMS IN STUDYING THE TERRITORIAL LOCATION OF SETTLEMENTS

***Abstract:** This article presents some considerations about the possibilities and advantages of using new modern methods, in particular, geographic information systems, in the study of the geographical study of settlements, their expansion and location.*

***Keywords:** Geographic information systems (GIS), remote sensing, mapping, thematic maps, settlements, satellite images, expansion of settlements, territorial location of settlements, cities, urban planning, visualization of geographical data.*

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ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ ГЕОГРАФИЧЕСКИХ ИНФОРМАЦИОННЫХ СИСТЕМ ПРИ ИЗУЧЕНИИ

ТЕРРИТОРИАЛЬНОГО РАСПОЛОЖЕНИЯ НАСЕЛЕННЫХ ПУНКТОВ

Аннотация: В данной статье представлены некоторые соображения о возможностях и преимуществах использования новых современных методов, в частности, геоинформационных систем, при изучении географического изучения населенных пунктов, их расширения и расположения.

Ключевые слова: Географические информационные системы (ГИС), дистанционное зондирование, картографирование, тематические карты, населенные пункты, космические снимки, расширение населенных пунктов, территориальное расположение населенных пунктов, города, городское планирование, градостроительство, визуализация географических данных.

Introduction: Geographic information systems (GIS) are specialized software tools for collecting, storing, analyzing, and visualizing geographic data. They combine information about the location of objects on Earth with various attributes, allowing researchers, governments, businesses and ordinary users to make more informed decisions based on spatial data.

In the most general sense, geoinformation systems are tools for processing spatial information, usually explicitly linked to some part of the earth's surface, which are used to manage it. This working definition is neither complete nor accurate. As in the case of geography, the term is difficult to define and represents an amalgamation of many subject areas. As a result, there is no generally accepted definition of GIS. The term itself varies depending on intellectual, cultural, economic, and even political goals. This terminology has actually become very variable, leading to ever-new definitions that are constantly penetrating both scientific and popular literature.¹

¹ [Общее представление о ГИС. \(tstu.ru\)](http://tstu.ru)

The importance of GIS in the modern world cannot be overestimated. They are used in various fields such as geography, geology, ecology, urban planning, agriculture, transportation, healthcare, disaster planning and more. GIS helps to optimize decision-making processes, improve resource planning and management, provide analysis of spatial relationships and forecasting of events.

Using GIS, you can create maps, simulate various scenarios, identify trends and patterns, and discover hidden connections between data. Thanks to GIS, scientists can study changes in the environment, government agencies can manage territories more effectively, and businesses can optimize logistics and marketing strategies.

Thus, GIS play an important role in the modern world, providing access to spatial information, improving the quality of decisions made and contributing to the development of various sectors of the economy and science.

The study of the territorial location of settlements using geographic information systems (GIS) is of great importance due to a number of reasons:

1. Urban development planning: GIS allows you to analyze the territorial distribution of settlements, their infrastructure, and access to resources and services. This helps urban planners optimize urban development, build new residential areas, develop transport infrastructure and ensure sustainable development.

2. Environmental planning: The study of the territorial location of settlements using GIS allows you to assess the impact of human activity on the environment. This helps to identify vulnerable ecosystems, predict possible environmental problems and develop measures to prevent them.

3. Social and economic research: Analysis of the territorial location of settlements using GIS allows you to explore the socio-economic aspects of regional development. This includes studying the accessibility of education,

healthcare, trade, as well as assessing the unemployment rate, standard of living and other socio-economic indicators.

4. Catastrophic planning: GIS allows you to analyze the risks and vulnerability of settlements to various disasters, such as floods, earthquakes, fires and other emergencies. This helps to develop action plans for the prevention and management of emergencies.

Thus, the study of the territorial location of settlements using GIS is an important tool for planning sustainable development, assessing the impact of human activities on the environment, analyzing socio-economic processes and ensuring the safety of the population.

Methods: Geographic Information Systems (GIS) are a powerful tool for collecting, storing, analyzing and displaying geographic data. They have many features and functions that make them an indispensable tool for working with spatial information. Here are the main features and functions of GIS in the analysis and display of geographical data:

1. Data collection: GIS allows you to collect various types of geographical data, such as coordinates of points, lines and polygons, attribute data on the location of objects, high-resolution images and other geospatial data.

2. Data storage: GIS provides convenient storage and organization of geographical data in a database. This allows you to effectively manage a large amount of information and provides quick access to the necessary data.

3. Data analysis: GIS can be used to perform a variety of analyses of geographical data, such as spatial analysis, network analysis, location analysis, time series analysis, and others. This allows you to identify patterns, make predictions, and make informed decisions based on the data.

4. Data display: GIS provides the ability to visualize geographical data on maps, diagrams, graphs and other graphical elements. This makes the information more understandable and accessible for analysis and decision-making.

5. Creating reports and maps: Using GIS, you can create various reports, maps and graphs based on the analysis of geographical data. This allows you to visually present the results and share information with other users.

6. Integration with other systems: GIS can be integrated with other information systems, which allows data exchange, automate processes and improve the efficiency of the organization as a whole.

Thus, GIS has a wide range of capabilities and functions that make it an essential tool for working with geographic data in various fields such as urban planning, ecology, transportation, agriculture, geology and many others.

Results: Examples of specific GIS applications in the study of the location of settlements (for example, analysis of population density, dynamics of growth and development of settlements):

1. Population density analysis: GIS can be used to analyze population density in various localities. By spatial analysis of data on settlements and their boundaries, it is possible to determine where the most densely populated areas are located, as well as to identify trends in population density over time.

2. Modeling the growth of human settlements: Using GIS, it is possible to create models of the growth and development of human settlements based on various factors such as accessibility to infrastructure, economic conditions, natural resources and others. This makes it possible to predict the future development of settlements and make appropriate decisions.

3. Determining the optimal location of new settlements: With the help of GIS, an analysis of the territory can be carried out in order to determine the optimal location for new settlements. This includes taking into account various factors such as accessibility to transport routes, environmental conditions, social infrastructure, and others.

4. Studying the dynamics of growth and development of human settlements: GIS can be used to analyze changes in the size, structure and functions of settlements over time. This makes it possible to identify trends in

the growth and development of human settlements, identify the causes of changes and take measures to manage this process.

Such GIS applications enable researchers, urban planners, government agencies, and other stakeholders to better understand the dynamics of human settlements, make informed decisions, and develop effective urban and settlement development strategies.

The advantages of using GIS in this study. Geographic information systems (GIS) provide a number of unique advantages over traditional methods of studying the territorial location of human settlements. Below are some of them:

1. **Spatial Analysis:** GIS allows for spatial data analysis, which means the ability to analyze information in the context of its location on a map. This allows you to identify connections between various objects and phenomena, determine trends and patterns that may be invisible using traditional methods of analysis.

2. **Data Integration:** GIS allows the integration of various types of data such as geographic, social, economic and environmental data. This allows you to get a more complete picture of the territory and settlements, as well as conduct a more in-depth analysis taking into account various aspects.

3. **Visualization:** GIS provide the ability to visualize data on a map, making the information more understandable and accessible for analysis. Visual representation of data allows you to quickly identify patterns, trends and anomalies, which helps you make informed decisions.

4. **Modeling:** Using GIS, you can create spatial models that allow you to predict various scenarios for the development of human settlements and evaluate their consequences. This helps plan sustainable development of territories and make data-based decisions.

5. **Efficiency and time saving:** Using GIS allows you to automate the processes of data collection, analysis and visualization, which increases work

efficiency and saves time. Thanks to GIS, you can quickly get results and conduct deeper analysis of information.

These unique advantages of GIS make it a powerful tool for studying the territorial location of settlements and provide more accurate, complete and visual data for decision-making in various areas of activity.

The use of geographic information systems (GIS) in the context of studying the territorial location of settlements demonstrates high efficiency in the collection, analysis and visualization of geographic data. Let's take a closer look at the analysis of the effectiveness of using GIS in this topic:

1. Data collection: GIS allows you to collect a variety of geographical data about settlements, such as coordinates, area, population, infrastructure, environmental characteristics and others. This provides a comprehensive view of each locality and its surroundings.

2. Data analysis: Using GIS, various analytical studies can be carried out, for example, determining the optimal location for a new settlement, assessing the level of accessibility to various services and infrastructure facilities, analyzing the dynamics of population growth, and others. This allows you to identify trends and problems, as well as offer solutions based on data.

3. Data Visualization: GIS provide the ability to visualize geographic data using cartographic elements, charts, graphs and other tools. This makes the information more understandable and visual for researchers, administrators and other interested parties.

4. Decision making: GIS helps to make informed decisions based on data analysis and visualization of research results. For example, based on the analysis of accessibility to medical facilities, it is possible to optimize the allocation of medical resources or plan the construction of new facilities.

5. Efficiency and resource savings: Using GIS can reduce the time for collecting and processing data, reduce the likelihood of errors and improve the

quality of research. This helps to save resources and increase the efficiency of specialists.

Thus, GIS is a powerful tool for studying the territorial location of settlements, providing an integrated approach to the collection, analysis and visualization of geographical data, which contributes to informed decision-making and optimization of the planning and management of territories.

Practical examples of the use of geographic information systems (GIS) in the study of the territorial location of settlements:

1. Determining the optimal location of a new settlement: GIS can be used to analyze various factors such as accessibility to infrastructure, natural resources, demographic data and environmental conditions to determine the optimal location of a new settlement. This helps urban planners and architects make informed decisions when creating new settlements.

2. Study of migration flows: GIS allows you to analyze data on migration flows of the population and their impact on the territorial distribution of settlements. This helps management bodies and sociologists to understand the dynamics of population change and take measures to optimize the development of territories.

3. Assessment of the level of accessibility to social and commercial services: GIS allows you to analyze the accessibility of settlements to various social and commercial services, such as schools, hospitals, shops and transport infrastructure. This helps to optimize the placement of public facilities and improve the quality of life of residents.

4. Monitoring urbanization and changes in the urban environment: GIS allows you to track the dynamics of urbanization, changes in the urban environment and the distribution of population in cities. This helps city authorities and planners make decisions on infrastructure development, environmental protection and improving the living conditions of citizens.

These examples demonstrate the practical application of GIS in the study of the territorial location of settlements and allow making informed decisions on the development of territories and improving the living conditions of the population.

Discussion: The use of geographic information systems (GIS) in the study of the territorial location of settlements is of great importance for several reasons: spatial analysis, data visualization, planning and management, decision-making, research on urbanization and demography. Thus, the use of GIS in the study of the territorial location of settlements not only provides a deeper understanding of spatial processes, but is also an important tool for decision-making and planning the development of territories.

The prospects for the development and further application of geographic information systems (GIS) in the study of the territorial location of settlements remain very extensive and important. Several areas that may be key to the future development of GIS in this area include:

1. Integration of big data and artificial intelligence: The development of GIS will be associated with the wider use of big data and artificial intelligence (AI) technologies for more accurate analysis and forecasting of the territorial location of settlements.

2. Mobile GIS: The development of mobile GIS applications will allow researchers and government agencies to collect data on the ground, which will improve the accuracy of information and enable rapid response to changes in the territorial location of the population.

3. Spatial modeling: The continued development of spatial modeling methods will make it possible to more accurately predict changes in the territorial location of settlements and their impact on the environment.

4. Consideration of environmental and climatic factors: The development of GIS includes consideration of environmental and climatic factors in the

analysis of the territorial location of settlements, which is becoming increasingly important in the light of climate change.

5. Risk management and crisis planning: GIS will be used for more effective risk management and crisis planning, which will help improve emergency preparedness.

6. Social integration and public participation: The development of GIS will involve the wider use of methods of social integration and public participation, which will help to take into account the needs of the local population when planning the development of territories.

These areas indicate that GIS will continue to play a key role in the study of the territorial location of settlements, providing more accurate data analysis, informed decision-making and effective management of territorial development.

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