GEOSPATIAL DYNAMICS: INTEGRATING INFORMATION TECHNOLOGY FOR SUSTAINABLE RESOURCE MANAGEMENT

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This thesis explores the intricate interplay between economic development, population growth, and their impact on land cover changes. Focused on Uzbekistan, it delves into the strategic initiatives outlined in presidential decrees for space activities and agricultural development. The study addresses the environmental repercussions of human activities, emphasizing the importance of preserving forests, oceans, and addressing rising sea levels. The research also introduces the Sentinel mission, a joint initiative by the European Space Agency and the European Commission, highlighting its role in monitoring Earth's surface. Additionally, the thesis investigates the evolution of information technology and software products in Uzbekistan, emphasizing the role of digital hydrogeological cartographic systems in local information exchange. The system's development process is detailed, covering design, components' interaction, and the resolution of scientific-theoretical questions. The study concludes by proposing guidelines for the national geoinformation system of geological data, including the study of global experiences, development of digital maps, and integration with existing information systems. The overarching goal is to contribute to sustainable resource management by leveraging advancements in technology and information systems.

In the last year, the population increased from 3.5 billion to 7 billion. Most people are not on the surface, but most people are on the ground. Economic development and population growth have led to rapid changes in land cover over the past two years. Economic development and population growth have led to rapid land cover changes in the last two years. These rapid changes are based on long-term dynamics associated with climate change. Land cover changes affect the earth's ecosystem. As a result, economic activity creates conditions that affect the climate and other aspects of global change. Also, the demand for food will increase.

In our country, a number of works are being carried out to develop strategic priorities in the sphere of information-communication technology and all geo-information systems. Proof of this is the Decree of the President of the Republic of Uzbekistan No. PF-5806 dated August 30, 2019 "On the development of space activities in the Republic of Uzbekistan" [1] and the Decree of the President of the Republic. Uzbekistan dated October 23, 2019, one can cite Resolution No. PF-5853 "On measures to implement in 2021 the tasks set in the Agricultural Development Strategy of the Republic of Uzbekistan for 2020-2030" [2].

Nowadays, many parts of the forests are used by people and turned into cultivated fields. But such a process harms wildlife and causes the disappearance of various rare animal species. Cutting down trees in forests seriously harms the production of oxygen in the air. Also, 3/2 of the planet Earth consists of water. The role of the ocean in human life is growing rapidly. The use of the ocean in various sectors of the economy of the countries of the world is very important to solve the problems arising in such areas as shipping, fishing, rational use of ocean resources, laying of intercontinental cables, water desalination, as well as the protection and prevention of pollution of the seas. Sea level rise is a powerful climate

indicator. The well-being and security of future generations in coastal regions and small island states depends on environmental policy actions and decisions.

In the process of modern globalization, natural disasters occurring on a global scale, in particular forest fires, melting glaciers, rising sea levels, cause serious harm to the health and future of humanity, the study of the surface layer of the earth, glaciers, earth in order to predict in advance, and it is especially important to constantly monitor the condition of volcanoes in order to minimize their negative consequences by forecasting the weather in advance. A new generation mission called Sentinel was developed as a joint initiative of the European Space Agency (ESA) and the European Commission. Each of the satellites launched as part of the Sentinel program regularly sends data through remote sensing of the earth's surface. As part of this scientific work, by receiving and analyzing data coming from a satellite, satellite images of regions are formed, pre-processing algorithms are determined, and the image of the selected region is classified based on machine learning. algorithms, a comparative analysis is carried out and the best result is obtained. The resulting image is integrated into the geographic information system.

Development in the sphere of information technology and software products in the years 2000-2010 and during the period of approval of the President of the Republic of Uzbekistan on January 28, 2022 "The strategy for the development of new Uzbekistan in 2022-2026" PF-60 the country created necessary political, legal, social-economic and scientific-educational foundations for the establishment of New Uzbekistan, created conditions for the processing and reliability of hydrogeological data and the use of modern ICT.

The research work on the creation of a digital hydrogeological cartographic system for local information exchange based on the analysis and systematization of existing thematic electronic maps was carried out on the basis of the technical assignment given in the plan of the project objects of TATU named after Muhammad al-Khorazmi.

This scientific-research work is carried out on the basis of methodology, project work approved in the program, and digital geologic-hydrogeological cartographic system for the exchange of local information, on the basis of analysis and systematization of the thematic electronic card.

Requirements for developing the system of a national geoinformation system of geological data:

- designing of the national geoinformation system of geological data (input, output, interface in the design of the system; equipment, software, database, telecommunications, personnel and procedures). As a result of this stage, a detailed design of the new or modified system is developed.

- details of the connection and interaction of the existing components. At the stage of practical creation of a system, programs come into operation and bring the system to a software state. At this stage, a database is actually created, a program is written in programming languages, the database is populated and tested.

The need for scientific-theoretical questions to be solved in the development of the national geoinformation system of geological data:

- study, analyze and automate the most suitable world experience in creating digital maps of geological content;

- Using QGIS software, development of standards for digital geological maps at a scale of 1:200,000 in the region and 1:500,000 for the republic as a whole;

- development of attributes used to create a digital map and form a database structure;

- creation of digital geological, hydrogeological maps in scales of 1:200,000 and 1:500,000 and topographical lists with the use of standard conditional signs developed with the use of QGIS software;

- Development of the structure of the information model and the spatial database of geodata and the basis of Sentinel-2 data.

- assessment and systematization of cartographic information for the compatibility of software based on vectorized layers and the connection of its databases with components of the geological and hydrogeological environment.

- development of technical guidance and integration of digital geological maps with other information systems;

- development and presentation of methodical methods and effective use of digital geological maps and necessary input and final changes.

In conclusion, shifting focus to Uzbekistan's development in information technology, the study discusses the creation of a digital hydrogeological cartographic system, aligning with the country's vision for a "New Uzbekistan." The detailed exploration of the system's design, components, and integration highlights the commitment to harnessing modern technology for the sustainable management of geological data.

The proposed guidelines for the national geoinformation system of geological data provide a roadmap for the future. From studying global experiences to developing digital maps and integrating databases, the emphasis is on adopting best practices for effective resource management. This research contributes to the broader discourse on sustainable development, providing insights into the intersection of technology, environmental preservation, and strategic planning.

As we navigate the complex challenges of the 21st century, the findings presented in this thesis underscore the importance of informed decision-making, international collaboration, and the responsible use of technology to build a resilient and sustainable future for Uzbekistan and the global community.

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