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MANAGING LAND RESOURCES USING ARTIFICIAL SATELLITES

Begaliyev Og'abek Mavlonjon ugli
student of "TIIAME" NRU
ogabekbegaliyev77@gmail.com
Amankeldiyev Tuychi Azim ugli
student of "TIIAME" NRU
amankeldiyevtoychi1977@gmail.com
Tuyokulov Mironshoh
student of "TIIAME" NRU
mironshoh.ihtiyorovich@gmail.com

Abstract: This article illuminates the theoretical and practical aspects of land resource management using satellite technologies. It analyzes the role of remote sensing technologies in the rational use of land resources, the monitoring of their condition, and their effective management. Furthermore, the potential applications of satellite imagery in the fields of agriculture, the cadastral system, and environmental monitoring are examined. The article also substantiates the importance of integration with modern technologies, including geographic information systems (GIS), global positioning systems (GPS), artificial intelligence, and big data. The research findings demonstrate the significance of satellite technologies for efficient land resource management and ensuring sustainable development.

Keywords: satellite, land resources, remote sensing, GIS, GPS, cadastre, monitoring, ecology, artificial intelligence

Introduction. Today, the rational use and effective management of land resources is one of the most pressing issues on a global scale. Population growth, the acceleration of urbanization processes, and the intensification of environmental problems are significantly increasing the pressure on land resources. As a result, problems such as land degradation, salinization, erosion processes, and the disruption of the natural balance are emerging. Therefore, there is a growing need for accurate accounting of land resources, regular monitoring of their condition, and scientific management.

Gathering information on land resources through traditional methods is time-consuming, labor-intensive, and costly. Moreover, such methods often fail to provide a sufficient level of accuracy. From this perspective, the use of modern information technologies is enabling the fundamental improvement of land resource management processes. In particular, satellite technologies and remote sensing methods stand out for their ability to cover large areas in a short time and obtain precise data.

Satellite imagery and geospatial data allow for near-real-time monitoring of changes occurring on the Earth's surface. Using this data, it is possible to assess the condition of agricultural lands, analyze sown areas, monitor water resources, and identify environmental problems. This serves to make scientifically grounded decisions on the effective use and protection of land resources.

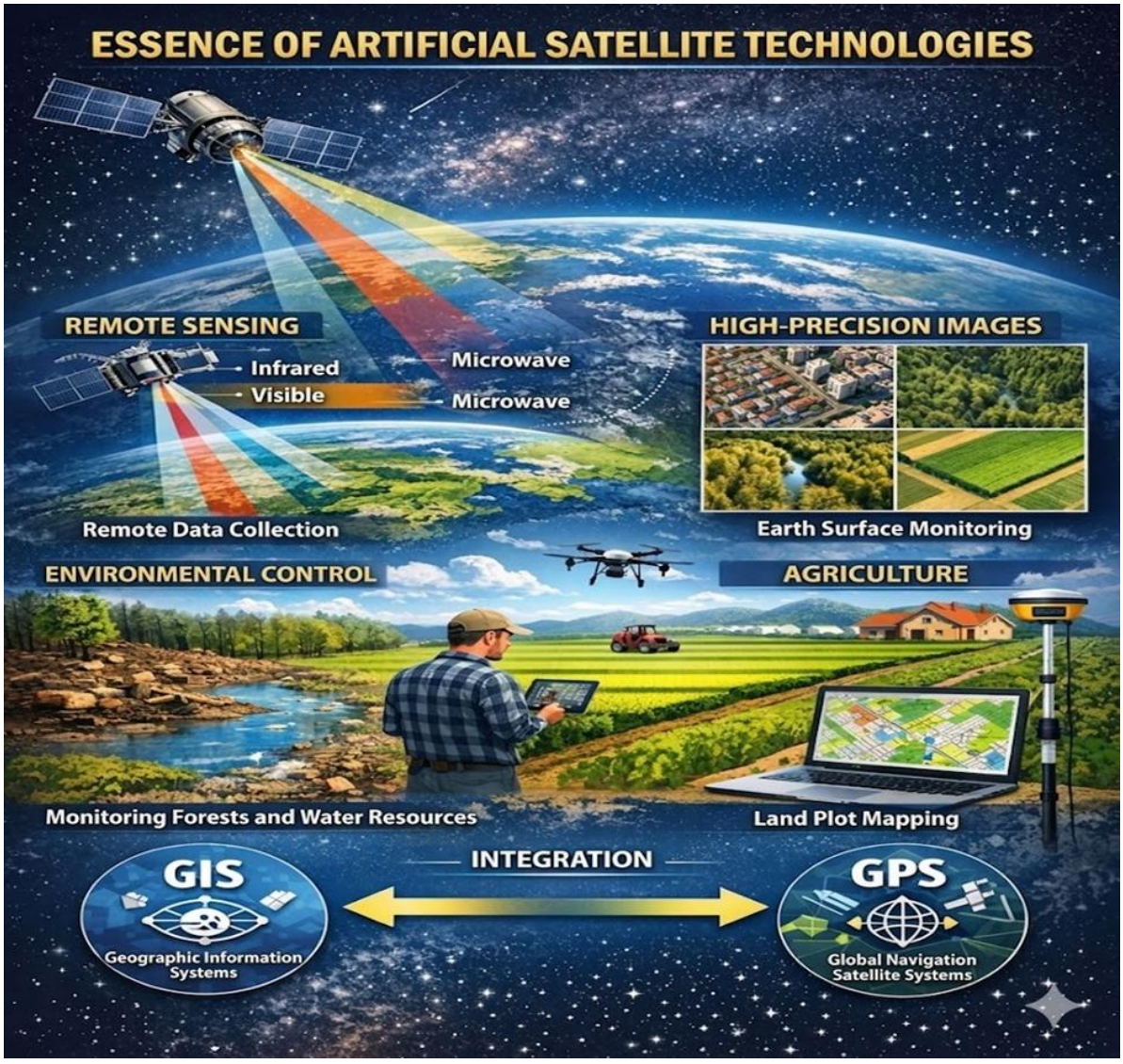
Satellite technologies are also achieving greater efficiency when integrated with geographic information systems (GIS) and global positioning systems (GPS). As a result of such integration, land resource management processes will be automated, the database will be enriched, and the accuracy and speed of management systems will increase. As a result, the processes of territorial planning, cadastral work and environmental monitoring will be improved at a high level. The use of satellite technologies is elevating the land resource management system to a new level. With the help of these technologies, it is possible to effectively manage land resources, constantly monitor their condition, and forecast future changes. Therefore, conducting scientific research in

this direction and the widespread implementation of modern technologies into practice is one of the important tasks of today.

The Essence of Satellite Technology. Satellite technology is a key component of modern geospatial information systems, enabling the remote collection of data about the Earth's surface through specialized technical instruments orbiting the planet. Satellites are equipped with various sensors and scanners that use electromagnetic waves to receive signals reflected from the Earth's surface, which are then transmitted as digital images and data. This information is subsequently processed, analyzed, and applied for practical purposes using specialized software.

Satellite imagery possesses high precision, allowing for the observation of natural and anthropogenic processes on the Earth's surface. For example, processes such as deforestation, changes in water bodies, the expansion of cities, or the condition of agricultural lands are determined through satellite imagery. This makes it possible to systematically monitor and analyze regional changes.

Remote sensing technology is considered one of the most critical areas of satellite systems. Thanks to this technology, it is possible to obtain information about large areas in a short time without going directly to the surface. Based on data obtained during remote sensing in various spectral ranges (e.g., infrared, visible, and microwave), the state of the earth, vegetation cover, soil moisture, water resources, and other indicators are determined. This allows for a comprehensive assessment of land resources.



Application in land resource management. Satellite technologies are currently being widely utilized in land resource management processes, significantly increasing the efficiency of this sector. With the help of these technologies, it is possible to observe large areas in a short time, identify changes and obtain accurate analytical data. As a result, the processes of rational use, protection and management of land resources are carried out on a scientific basis.

First of all, satellite technologies are an important tool in organizing ground monitoring. The dynamics of changes occurring in various regions are monitored through regularly taken images of the Earth's surface. In particular, it is possible to identify negative processes such as land degradation, erosion, salinization, desertification at an early stage and take the necessary measures to prevent them. This serves to protect land resources and ensure their stability. Satellite technologies are also of great importance in the field of agriculture. With the help of these technologies, the condition of sown areas, the growth process, the level of vegetation and yield indicators are analyzed. Based on remote sensing data, soil moisture, plant development levels, and irrigation requirements are determined. This will allow for the correct planning of agrotechnical measures, the economical use of water and fertilizer resources, and increased yields.

Furthermore, the use of satellite technologies in the cadastral system significantly improves land accounting processes. Satellite imagery plays an important role in defining the exact boundaries of land plots, creating digital maps, and updating existing cadastral data. Based on this information, the information base on land resources will be enriched, and its accuracy and reliability will increase. This will serve to protect property rights and reduce land-related disputes.

Satellite technologies also play an important role in environmental monitoring processes. With their help, ecological indicators such as the reduction of forest areas, the state of water bodies, and atmospheric and soil pollution are regularly monitored. This will allow for environmental protection, the rational use of natural resources, and the timely identification of environmental problems. The use of satellite technologies in land resource management serves to organize these processes more effectively, accurately, and systematically. Based on the information obtained through them, scientifically grounded decisions are made, and the sustainable use of land resources is ensured.

Development prospects. In the future, the development of satellite technologies will serve to further improve the land resource management system. As a result of modern scientific and technological progress, these technologies are deeply integrated with artificial intelligence, Big Data, and geoinformation systems (GIS), allowing for the automation of complex analytical processes. As a result, the capabilities of rapid processing of large volumes of geospatial data, their in-depth analysis and making accurate forecasts will expand.

The application of artificial intelligence algorithms significantly simplifies the processes of automatically analyzing satellite imagery, detecting surface changes, and classifying them. This reduces the human factor and increases the accuracy and reliability of the analysis results. Big data technologies, on the other hand, combine information from various sources into a single system and allow for comprehensive analysis. Furthermore, real-time monitoring capabilities are expanding. Next-generation satellites are providing high-resolution and frequently updated images, allowing for nearly continuous monitoring of surface changes. This will allow for the rapid detection of emergencies, effective management of agricultural processes, and timely response to environmental problems.

Moreover, the advancement of mobile technologies and cloud computing systems is making the use of satellite data more accessible. Users can now access and analyze geospatial data anywhere, anytime, and utilize it in their decision-making processes.

Conclusion. In conclusion, satellite technologies are considered one of the modern and effective tools for fundamentally improving the land resource management system. With their

help, it will be possible to accurately assess the state of land resources, regularly monitor changes in them, and make scientifically grounded management decisions. In particular, remote sensing technologies are distinguished by covering large areas in a short time and providing high-precision data.

The analysis presented in the article indicates that satellite technologies are being widely applied in fields such as agriculture, cadastral systems, environmental monitoring, and territorial planning, significantly increasing their efficiency. These technologies will allow for the timely detection and prevention of negative processes such as land degradation, salinization, and erosion. This is of great importance for the rational use and protection of land resources.

Furthermore, the integration of satellite technologies with geographic information systems (GIS), global positioning systems (GPS), artificial intelligence, and big data technologies further expands the development prospects of this field. As a result of such integration, land resource management processes will be automated, analytical capabilities will expand, and the accuracy of management decisions will increase. In the future, one of the important tasks will be the further development of the use of satellite technologies, their widespread implementation in practice, and the training of qualified specialists. This will ensure the efficient, sustainable, and environmentally safe use of land resources.

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