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APPLICATION OF GIS IN THE NATIONAL SECURITY AND DEFENSE SYSTEM OF UKRAINE

ЗАСТОСУВАННЯ ГІС У СИСТЕМІ НАЦІОНАЛЬНОЇ БЕЗПЕКИ ТА ОБОРОНИ УКРАЇНИ

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Abstract. *The role of geographic information systems (GIS) in ensuring the national security and defense of Ukraine in the conditions of armed aggression and digitalization of state administration is studied. The main directions of using GIS in the military sphere and the activities of security agencies are highlighted. The analysis of the legislative framework, the prerequisites for the implementation of geographic information technologies, the advantages of using digital terrain models, satellite and unmanned data to increase the efficiency of decision-making is carried out. Key directions for the development of GIS in the sector of national security and defense capability are proposed, through the creation of a Unified Geographic Information System.*

Key words: *geographic information systems, national security, geospatial data, metadata, unmanned aerial vehicles.*

Анотація. *Досліджується роль геоінформаційних систем (ГІС) у забезпеченні національної безпеки та оборони України в умовах збройної агресії та цифровізації державного управління. Висвітлено основні напрямки використання ГІС у військовій сфері та діяльності органів безпеки. Здійснено аналіз законодавчої бази, передумови впровадження геоінформаційних технологій, переваги використанні цифрових моделей місцевості, супутникових і безпілотних даних для підвищення ефективності прийняття рішень. Запропоновано ключові напрями розвитку ГІС у секторі національної безпеки та обороноздатності, через створення Єдиної геоінформаційної системи.*

Ключові слова: *геоінформаційні системи, національна безпека, геопросторові дані, метадані, безпілотні літальні апарати.*

Introduction.

In the current conditions of armed aggression against Ukraine and the rapid development of information technologies, the introduction of geoinformation systems

(GIS) into the sphere of national security and defense of Ukraine is of particular importance. GIS technologies provide operational receipt, analysis, modeling and visualization of geospatial data, which are critically important for decision-making in military, intelligence and crisis situations of the state.

Today, geoinformation analytics is an integral component of modern defense management, planning operations, monitoring threats and assessing risks. The development of digital transformation of the security and defense sector, in particular within the framework of the implementation of the Military Security Strategy of Ukraine and the Law of Ukraine "On the National Infrastructure of Geospatial Data" creates the prerequisites for the integration of GIS into the public administration system.

Geoinformation technologies allow the formation of a single geospatial information space that ensures the interaction of security, defense, intelligence, civil protection and local self-government bodies.

This will contribute to increasing situational awareness, the effectiveness of planning and forecasting activities in the areas of defense and crisis response.

Main text.

The Law of Ukraine “On the National Geospatial Data Infrastructure” created the legal basis for the integration of GIS into public administration, including the security sector.

The development of state geoinformation resources, such as digital topographic maps, geodatabases, cadastral systems, provides a single platform for information exchange between defense, security and civilian structures.

According to Article 1 of the Law of Ukraine “On the National Geospatial Data Infrastructure”, a geoinformation system is an information system designed to carry out activities with geospatial data and metadata [2].

Geoinformation systems are the basis for the integration of spatial data from various sources - satellite images, unmanned aerial vehicles, radar surveillance data, topographic and cadastral materials.

GIS allows you to solve issues related to identifying potential threats on the

territory of the state, analyze the dynamics of hostilities and predict scenarios of events, provide decision support in the public administration system during crisis situations, create digital terrain models to assess the defense capability of regions, etc.

GIS acts as a platform for combining data from various sources - satellite images, aerial photography, unmanned aerial vehicles (UAVs), radar monitoring, mobile sensors, topographic and geodetic materials, state cadastres and registers. Thanks to this, multi-level maps of the operational situation are created, which allow state structures to obtain a complete picture of events in space and time.

The use of GIS in the field of security allows you to analyze spatial patterns of threats - both natural and man-made or military.

A vivid example is the mapping of areas at risk of terrorist acts or sabotage, the analysis of transport and energy infrastructure to identify “vulnerable nodes”, monitoring border areas to detect illegal movements, etc. Such models help state bodies to identify dangers in advance and localize threats before they become large-scale.

In military conditions, GIS serve as the basis for operational and tactical planning, allowing:

- to track changes in the front line and the movement of units;
- to visualize control zones, logistical routes and potential directions of strikes;
- to carry out spatial modeling – for example, to assess the consequences of using different types of weapons or to predict the spread of hostilities depending on the terrain, weather and infrastructure.

Geographic information systems are an effective tool for situational analytics and crisis management. In emergency situations, they provide for the creation of operational maps of crisis zones, calculation of optimal evacuation routes, modeling of affected or contaminated areas, assessment of potential material damage and human losses, etc.

One of the key areas of application of GIS is the creation of a high-precision digital terrain model (DTM), which makes it possible to assess the suitability of territories for the deployment of military infrastructure, analyze the vulnerability of

critical infrastructure facilities to strikes or natural disasters, determine optimal positions for defense structures taking into account relief, hydrography, vegetation and buildings, calculate the zones of observation and destruction for artillery, missile systems and air defense systems. Such digital models are an integral part of the geospatial support system for defense planning, which makes it possible to increase the accuracy and effectiveness of military operations.

Thus, GIS form the information and analytical foundation of national security, providing spatial visualization, risk analytics and decision support at all levels - from strategic to tactical. Their role in the current conditions of armed aggression is not only auxiliary, but also system-forming for managing security processes in Ukraine.

Also, geographic information systems are actively used in the State Emergency Service of Ukraine for:

- modeling areas of possible flooding, fires, radiation or chemical contamination;
- optimizing evacuation routes;
- managing rescue services resources;
- creating interactive maps of risks and crisis situations.

Synchronization of such data with the National Geospatial Data Infrastructure (NGDI) ensures increased efficiency in responding to emergency events and coordination between various departments.

In the coming years, the priority areas for the development of GIS in the field of national security of Ukraine are:

- ✓ creation of a Unified Geoinformation System for Security and Defense;
- ✓ integration with NATO systems;
- ✓ development of own GIS software products, taking into account the requirements of cyber defense and import substitution;
- ✓ expanding the use of UAVs and satellite technologies for data collection;
- ✓ training personnel in the field of military geoinformatics;
- ✓ implementing real-time technologies for monitoring the situation at the front and in the rear.

Summary and conclusions.

Geographic information systems are a strategic tool for improving the efficiency of management of the security and defense forces of Ukraine. The use of GIS allows for the formation of a single geospatial information space that integrates the activities of security, defense, intelligence, civil protection and local government agencies. This increases situational awareness, reduces decision-making time and improves interaction between agencies.

The development of a national geoinformation infrastructure should become one of the key elements of the digital transformation of the security and defense sector of Ukraine. Important tasks are the creation of a Single Geoinformation System for Security and Defense, integration with geoinformation platforms of NATO partner countries, the development of national software products that meet the requirements of cyber defense, as well as the training of qualified personnel in the field of military geoinformatics.

A promising direction for further research is the development of a methodology for using GIS to predict threats based on artificial intelligence, the creation of analytical risk models and the implementation of real monitoring to manage dynamic security processes.

Thus, geographic information systems form the information and analytical foundation of state security, contributing to increasing its defense capability, resilience to external threats, and the effectiveness of public administration in the field of security and defense.

References:

1. Карпінський Ю. О., Лященко А. А., Лазоренко Н. Ю., Кінь Д. О. Основи створення інтероперабельних геопросторових даних. Київ: КНУБА, 2023. 302 с.

2. Закон України про національну інфраструктуру геопросторових даних [Електронний ресурс] Режим доступу: https://zakon.rada.gov.ua/laws/show/554-20#Text.

3. Постанова Кабінету міністрів України про затвердження порядку

функціонування національної інфраструктури геопросторових даних від 26 травня 2021 р. № 532 [Електронний ресурс] Режим доступу: https://zakon.rada.gov.ua/laws/show/532-2021-%D0%BF#Text.

4. Стратегія воєнної безпеки України, затверджена Указом Президента України від 25 березня 2021 року № 121/2021 [Електронний ресурс] Режим доступу: https://zakon.rada.gov.ua/laws/show/121/2021#n15.

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