

INTRODUCTION OF AN INFORMATION AND ANALYTICAL SYSTEM FOR MONITORING ENVIRONMENTAL SAFETY IN UKRAINE

Ihor Didur¹, Svitlana Lutkovska², Hanna Pantsyreva³

Abstract. The article explores the theoretical, methodological, and applied aspects of implementing an information and analytical system for monitoring environmental safety in Ukraine, considering modern environmental challenges, the digital transformation of public administration, and European integration processes. The relevance of the topic is attributable to the growth of anthropogenic load on the environment, the consequences of military operations, the need for an operational response to environmental threats and the need to form a single information space for making management decisions in the field of environmental protection. The paper analyses the essence of environmental safety as a multidimensional category, which is considered within the framework of various scientific approaches: as the state of environmental and population protection, as a component of national security, as an object of public administration, as a risk-oriented system and as an element of the concept of sustainable development. It is substantiated that a systemic-risk-oriented approach is the most appropriate, as it allows for the complexity of environmental threats and the need to predict them to be taken into account. This paper analyses the current state of Ukraine's environmental safety monitoring system, which is characterised by a multi-level but fragmented structure, the distribution of functions between various state bodies, an insufficient level of digitalisation, and the absence of a single integrated information platform. The main problems with how the system functions have been identified. These include duplication of monitoring entity functions, an outdated material and technical base, limited automation of data collection and processing, insufficient interdepartmental coordination and a weak level of environmental risk forecasting. Particular attention is given to analysing international and European experience, especially the operation of the Eionet and Copernicus systems, and national environmental monitoring platforms in EU countries, the USA and Canada. The leading trend identified is the integration of data from various sources, the use of geoinformation technologies, satellite monitoring, big data and artificial intelligence, and ensuring open access to environmental information. A conceptual model of an information and analytical system for monitoring environmental safety has been developed. This model provides a multi-level structure, covering everything from primary data collection to analytical processing, forecasting, and management decision support. The proposed model focuses on integration with European standards, particularly INSPIRE and Copernicus, while taking into account the needs of state authorities at different levels. A SWOT analysis has been conducted to identify the strengths and weaknesses of the national monitoring system, as well as the opportunities and threats to its development. Proposals have been formulated to improve regulatory support. In particular, there is a need to adopt a special law on a unified information and analytical system for environmental safety, to unify data standards, and to implement the principles of openness of environmental information. The study proves that implementing a unified information and analytical system for monitoring environmental safety would increase the efficiency of public administration, enable environmental risks to be identified promptly, improve the quality of management

Received on: June 10, 2026 **Accepted on:** August 25, 2026 **Published on:** October 14, 2026

¹ Vinnytsia National Agrarian University, Ukraine (*corresponding author*)

E-mail: dim@vsau.vin.ua

ORCID: <https://orcid.org/0000-0002-6612-6592>

² Vinnytsia National Agrarian University, Ukraine

E-mail: svetvsau@gmail.com

ORCID: <https://orcid.org/0000-0002-8350-5519>

³ Vinnytsia National Agrarian University, Ukraine

E-mail: apantsyreva@ukr.net

ORCID: <https://orcid.org/0000-0002-0539-5211>



This is an Open Access article, distributed under the terms of the Creative Commons Attribution CC BY 4.0

decisions, make environmental policy more transparent and ensure Ukraine's sustainable development in accordance with European standards.

Keywords: ecological safety, state environmental monitoring, ecological risks, European integration, open ecological data, environmental policy of Ukraine.

JEL Classification: Q58, Q56, O38, H83, C88

1. Introduction

In the context of the modern environmental challenges posed by anthropogenic pressure on the environment, climate change and the consequences of military action, as well as the need to fulfil international environmental obligations, the implementation of effective monitoring and assessment mechanisms is becoming particularly urgent. The contemporary environmental monitoring system in Ukraine necessitates further modernisation, integration of diverse data sources, and automation of their processing processes to ensure prompt management decision-making (Hetman et al., 2024; Lohosha et al., 2025). The introduction of an information and analytical system for monitoring environmental safety enables the comprehensive collection, accumulation, analysis and forecasting of environmental indicators in real time using modern information technologies, geoinformation systems, Earth observation and intelligent data processing methods. These systems enhance the reliability of environmental information and enable the timely detection of environmental threats and effective responses to environmental emergencies (Hontaruk et al., 2026; Tomashuk et al., 2025; Bondarenko et al., 2023). This problem is particularly important in Ukraine due to the significant environmental risks posed by military action, the destruction of industrial facilities and the pollution of water, soil and air resources. In order to ensure the country's ecological security, it is necessary to create a unified information system that will consolidate data from various monitoring entities and enable state authorities, scientific institutions and the public to use it effectively.

In addition, the digitalisation of public administration and the adoption of modern information technologies are identified as key to enhancing the effectiveness of Ukraine's environmental policy and integrating it into the European ecological landscape. This is why developing and implementing an information and analytical system to monitor environmental safety is an important scientific and practical task. This will ensure the state's sustainable development and increase the population's environmental safety (Hontaruk et al., 2024; Kaletnik et al., 2019; Tkachuk et al., 2025; Palamarchuk et al., 2024).

The challenges associated with implementing an information and analytical system for environmental safety monitoring in Ukraine stem from a number of

regulatory, organisational, and informational gaps in environmental management. Despite the existence of a legislative framework for environmental protection and state environmental monitoring, mechanisms for the integrated collection, processing and exchange of environmental information remain insufficiently regulated (Koval et al., 2025; Petrychenko et al., 2024).

The legal basis is the Constitution of Ukraine, the Laws of Ukraine 'On Environmental Protection', 'On Information' and 'On National Geospatial Data Infrastructure', and a number of by-laws on the state environmental monitoring system. However, current legislation does not fully ensure the operation of a single digital environmental monitoring platform that would consolidate the information resources of various state bodies.

Thus, the research problem is the need to improve regulatory and legal support for environmental monitoring by creating a holistic legislative mechanism for an integrated information and analytical system that monitors environmental safety. This system must meet modern digital challenges and European standards for environmental information management.

2. Materials and Methods

The purpose of this study is threefold: to substantiate the theoretical foundations; to analyse the regulatory framework; and to develop practical recommendations for implementing an information and analytical system for monitoring environmental safety in Ukraine. This will increase the efficiency with which environmental information is collected, processed, analysed and used in management decision-making processes.

To achieve the goal, it is necessary to solve the following tasks:

1. Analyse the theoretical approaches to identifying the nature and scope of environmental safety as a subject of state management.
2. Investigate the current state of Ukraine's environmental safety monitoring system and identify its main functional problems.
3. Analyse Ukraine's regulatory framework for environmental monitoring, information support, and the digitalisation of state management.
4. Identify the main shortcomings of the legislative regulation of the creation and operation of information and analytical systems for environmental monitoring.

5. Investigate the use of information and analytical systems for monitoring the state of the environment in international and European contexts.

6. Justify the need to integrate modern digital technologies, geoinformation systems, remote sensing tools, and analytical platforms into Ukraine's environmental monitoring system.

7. Create a conceptual model of an information and analytical system for monitoring environmental safety that takes into account the needs of state authorities and European standards.

8. Formulate proposals to improve the regulatory and legal support for a unified information and analytical system for monitoring environmental safety in Ukraine.

9. Determine the expected results of implementing an information and analytical system to increase environmental safety and ensure the state's sustainable development.

The object of the research is social relations in the field of ensuring environmental safety and implementing state environmental monitoring in Ukraine.

The subject of the research is the organisational, legal, and information and technological mechanisms for implementing an information and analytical system for monitoring environmental safety in Ukraine.

The article's relevance is enhanced by the tasks of the applied project, 'Development of agrobiotechnological approaches to the production of crop products to restore soil fertility affected by hostilities'.

3. Results and Discussion

The legal basis for this regulation is the Constitution of Ukraine, the Laws of Ukraine 'On Environmental

Protection', 'On Information' and 'On National Geospatial Data Infrastructure', as well as a number of by-laws on the state environmental monitoring system. However, current legislation does not ensure the effective operation of a single digital platform for environmental monitoring that would consolidate the information resources of various state bodies.

Among the key legislative problems, it is advisable to highlight the following (Figure 1).

Thus, the research problem is the need to improve regulatory and legal support for environmental monitoring. This can be achieved by creating a holistic legislative mechanism for an integrated information and analytical system that monitors environmental safety. This system must meet modern digital challenges and European standards for environmental information management.

Environmental safety is a multifaceted scientific concept studied within the frameworks of environmental law, public administration, ecology, national security, and economics. Due to the complexity of the relationships between society, the state and the surrounding natural environment, there is no single approach to defining this concept in modern scientific literature.

According to Ukrainian legislation, environmental safety is defined as a state of the environment in which deterioration of the ecological situation and danger to human health are prevented. This definition emphasises the state's protective role and the need to minimise environmental risks.

The scientific literature has identified several key approaches to understanding the essence of environmental safety.

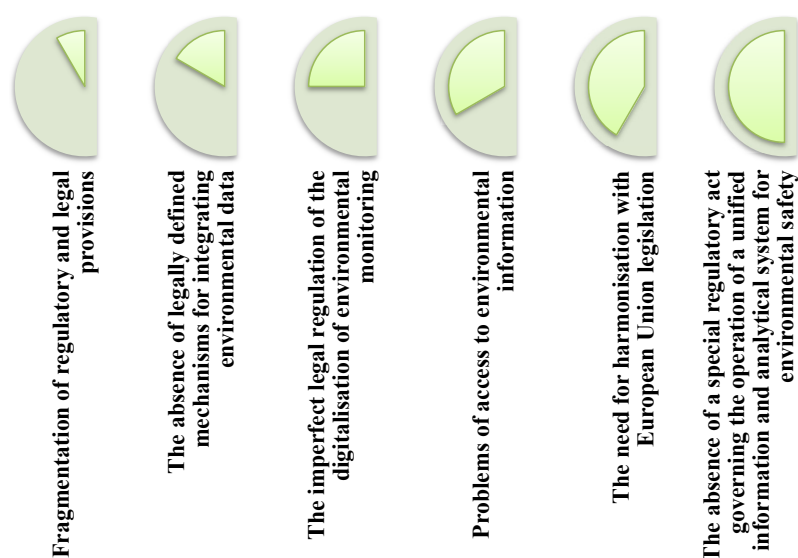


Figure 1. Issues of the legislative mechanism for the functioning of an integrated information and analytical system for monitoring environmental safety

Source: (Bondarenko et al., 2023; Petrychenko et al., 2024)

Adherents of this approach consider ecological security to be the protection of individuals, societies and states from the negative impact of natural and human-made factors.

This approach delineates ecological security as comprising the following elements: the absence of critical environmental threats; the preservation of natural resources; the assurance of safe living conditions for the population; and the maintenance of ecological balance.

The advantage of this approach is that it focuses on the final result: a safe environment. However, it does not adequately consider the mechanisms for achieving this state or the role of state authorities in ensuring it.

Ukraine's environmental safety monitoring system is part of the state environmental monitoring system. It is a set of organisational, legal, technical and informational measures aimed at observing, collecting, processing, storing and analysing information about the state of the environment. The system's primary objective is to furnish state authorities, local governments, businesses and the public with dependable information to inform management decisions regarding environmental safety.

Environmental monitoring is currently carried out by a number of state bodies, the leading ones being the Ministry of Environmental Protection and Natural Resources of Ukraine, the State Ecological Inspectorate of Ukraine, the State Agency of Water Resources of Ukraine, the State Agency of Forest Resources of Ukraine, the State Emergency Service of Ukraine, the Ukrainian Hydrometeorological Centre and institutions of the National Academy of Sciences of Ukraine, as well as other specialised organisations.

In recent years, Ukraine has gradually developed digital environmental monitoring tools. These include geoinformation technologies, Earth observation systems, automated air quality monitoring stations, open electronic registers and online environmental data platforms. At the same time, the process of aligning the national monitoring system with European environmental standards is ongoing.

After the start of a full-scale war, the monitoring system became particularly important, as there was a need to promptly identify and assess the environmental consequences of hostilities, such as the contamination of territories, damage to industrial facilities and water management infrastructure, and the destruction of nature reserves. Full-scale military aggression presented new challenges to the environmental security monitoring system (see Figure 3).

Analysis of Ukraine's current environmental safety monitoring system shows that it is undergoing a transformation from disparate departmental systems to an integrated digital model of environmental information management. The main issues with its operation are the fragmentation of information resources, insufficient digitisation, imperfect interdepartmental interaction, limited funding, and the absence of a unified information and analytical platform. These problems can be solved by creating a modern information and analytical system for environmental safety monitoring. This system would ensure the prompt collection, processing, analysis and forecasting of environmental risks, in accordance with European environmental management standards (Tkachuk et al., 2025).

The analysis shows that the world's leading countries and international organisations are actively implementing information and analytical systems for environmental monitoring based on digital technologies, geographic information systems, remote sensing, cloud computing, and artificial intelligence tools. Such systems typically feature centralised accumulation of environmental data, interdepartmental integration of information resources, open data and support for management decision-making. For Ukraine, the most promising approach is to use European experience to create a single information and analytical platform for environmental monitoring. This will make public administration more efficient in terms of environmental safety and promote adaptation to European Union standards (see Table 1).

Analysis of the data presented in Table 1 shows that international environmental monitoring practices

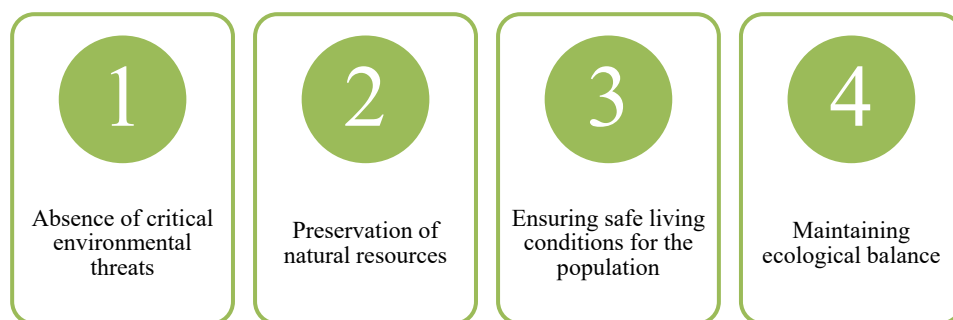


Figure 2. Theoretical foundations of the concept of environmental safety

Source: (Koval et al., 2025; Kaletnik et al., 2019)

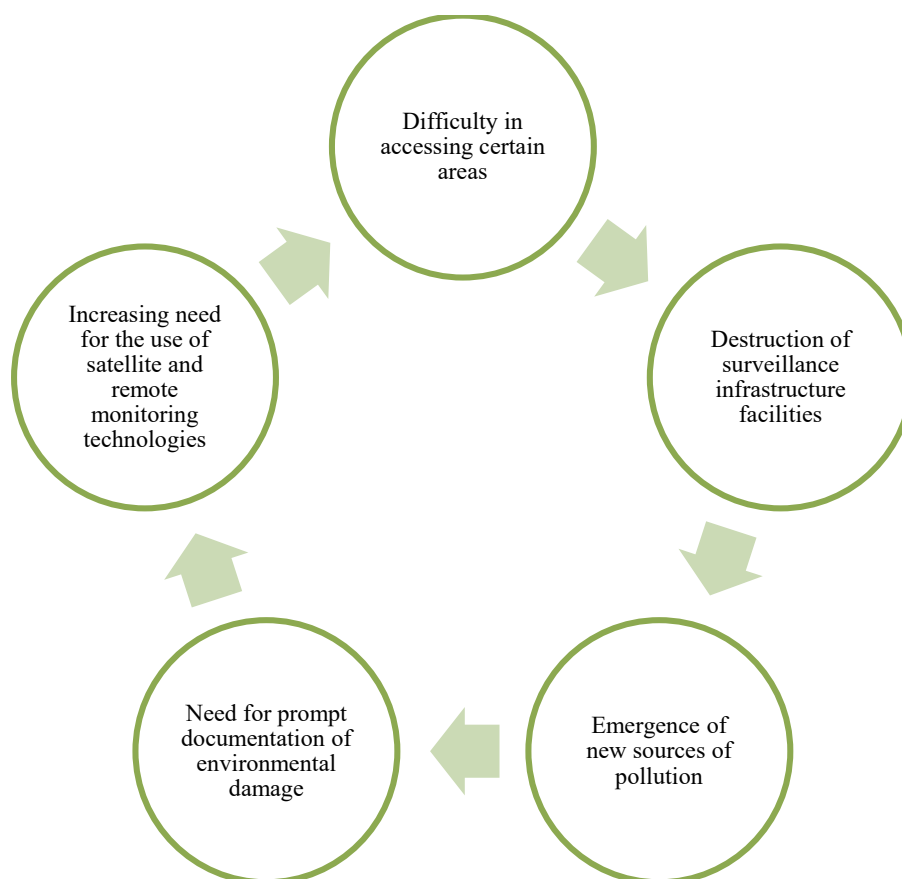


Figure 3. Consequences of full-scale military aggression, which caused challenges for the environmental security monitoring system

Source: (Chikov et al., 2022; Didur & Pantsyryeva, 2025; Palamarchuk et al., 2022)

are characterised by high levels of digitalisation and information resource integration, as well as the use of modern information and analytical technologies. Leading countries and international organisations consider environmental monitoring to be an important element of the system for supporting management decisions in the field of environmental safety, as well as a tool for monitoring the state of the environment. The European Union's experience with the Eionet network, which ensures the integration of environmental data between member states and contributes to the formation of a single information space, is worthy of special attention. This approach enables a thorough analysis of the state of the environment, the prompt identification of environmental threats, and the development of effective protection measures.

This experience is particularly valuable for Ukraine in the context of creating a single national information and analytical system for monitoring environmental safety. An important aspect of environmental monitoring development is the use of satellite technologies, as evidenced by the Copernicus programme. By using remote sensing technology, it is possible to constantly monitor changes in the state of the atmosphere, water

resources, land and natural ecosystems, regardless of territorial restrictions. This experience is particularly relevant to Ukraine under martial law, when access to certain areas is restricted or impossible. An analysis of Germany, France and the Netherlands' experiences shows that environmental monitoring systems are largely effective due to the automation of data collection processes, the use of geographic information systems, and the openness of environmental information to the public. In these countries, citizens have the opportunity to receive up-to-date data on the state of the environment through specialised digital platforms and geoportals. This contributes to increasing the transparency of government activities and the development of public environmental control.

The United States' experience demonstrates the importance of using big data technologies, artificial intelligence, and predictive analytics to assess environmental risks. Such tools not only allow us to record the current state of the environment, but also to predict possible negative changes and develop preventive measures in a timely manner. Meanwhile, Canada and the United Nations Environment Programme's practices demonstrate the importance of creating

Table 1

International and European experience in using information and analytical systems for monitoring the state of the environment

Country / Organisation	Information and analytical system	Main functions	Technologies used	Practical significance for Ukraine
European Environment Agency (EU)	Eionet	Collection and integration of environmental data from EU countries, assessment of the state of the environment, reporting	Geographic Information Systems (GIS), Big Data, Web Platforms	Model for creating a single information space for environmental data
European Commission	Copernicus	Satellite monitoring of atmospheric air, water resources, land and climate	Remote sensing of the Earth, satellite technologies, artificial intelligence	Using satellite data to assess environmental risks and consequences of military operations
Germany	Umweltbundesamt Monitoring System	Air, water and soil quality control, environmental forecasting	Automated monitoring stations, GIS technologies, digital registers	Example of integrated state environmental monitoring
France	Géorisques	Monitoring of natural and man-made risks, informing the population	Geoportals, digital risk maps, open data	An example of open access to environmental information
Netherlands	Atlas Leefomgeving	Displaying environmental quality data online	GIS platforms, interactive maps, cloud services	An example of environmental data integration for citizens and authorities
USA	Environmental Protection Agency – Envirofacts	Environmental monitoring, pollution analysis, management decision support	Big Data, artificial intelligence, cloud computing	An example of using analytical tools to predict environmental risks
Canada	Canadian Environmental Sustainability Indicators	Assessment of environmental performance and sustainable development indicators	Integrated databases, statistical models, web analytics	An example of building a system of environmental indicators
United Nations Environment Programme	UNEP Live	Global monitoring of environmental indicators, support for environmental policy	Cloud technologies, international databases, digital platforms	Source of international environmental data and standards

Source: (Kaletnik & Lutkovska, 2020; Tkachuk et al., 2025; Petrychenko et al., 2022)

systems of environmental indicators and international databases that provide an assessment of the level of environmental safety at national and global levels. This approach improves the quality of strategic planning and the implementation of state environmental policy. The results of the analysis indicate that key trends in the development of modern information and analytical systems for environmental monitoring include the integration of data from various sources, the automation of observation processes, the use of geoinformation and satellite technologies, artificial intelligence tools, the openness of environmental information, and a focus on predicting environmental risks. This experience can provide a valuable foundation for modernising Ukraine's environmental safety monitoring system and aligning it with European environmental management standards.

The proposed conceptual model reflects the multi-level architecture of the environmental security information and analytical system, combining the processes of collecting, integrating, analysing and using environmental data. A key feature is its orientation towards a single digital platform that facilitates interaction between various state authorities (see Table 2).

The model is based on European approaches, particularly the standards of the European Environment Agency and the Copernicus satellite monitoring system. These standards facilitate data integration and openness of information, as well as the use of modern analytical technologies.

The practical implementation of such a system will allow for an increase in the efficiency of public administration in the field of environmental security, ensure timely identification of risks and contribute to the harmonisation of Ukrainian environmental policy with the requirements of the European Union.

The practical implementation of such a system will increase the efficiency of public administration in the field of environmental safety, ensure timely identification of risks and contribute to the harmonisation of Ukrainian environmental policy with the requirements of the European Union.

The SWOT analysis shows that Ukraine has significant potential to implement a modern information and analytical system for monitoring environmental safety. This is due to its developed network of state institutions, availability of basic digital technologies, and strategic course towards European integration. However,

Table 2

Conceptual model of the information and analytical system for monitoring environmental safety

System component	Content / characteristics	Main functions	Users (authorities)	Compliance with European standards
Sources of environmental data	Stationary posts, satellite systems, laboratory measurements, departmental databases	Primary collection of information on the state of the environment (air, water, soils, biodiversity)	Ministry of Environmental Protection and Natural Resources of Ukraine, State Ecological Inspectorate of Ukraine, local authorities	INSPIRE Directive, Copernicus Data Standards
Level of data collection and integration	A single platform for collecting information from various sources	Format unification, data integration, cleansing and validation	Ministries, regional administrations	EEA Data Integration Model (Eionet)
Environmental information database	Centralised storage of structured and unstructured data	Storage, archiving, and access to historical data	Government agencies, scientific institutions	Open Data Directive (EU), ISO 19115
Analytical module	Big Data, AI, forecasting models, statistical analysis	Assessment of environmental risks, forecasting changes in the state of the environment	Cabinet of Ministers of Ukraine, think tanks	EU Environmental Assessment Framework
Geographic Information System (GIS)	Interactive maps, spatial analysis	Visualisation of pollution, risk areas, environmental events	State Emergency Service, local authorities	INSPIRE Spatial Data Infrastructure
Real-time monitoring system	Online sensors, automated stations	Continuous monitoring of critical indicators	State Emergency Service, Ministry of Environment	Copernicus Near Real-Time Monitoring
Management support subsystem	Dashboards, indicators, reporting	Preparation of solutions for public administration	Cabinet of Ministers of Ukraine, National Security and Defense Council	EU Environmental Governance Standards
Open access to data	Public portals, APIs, open datasets	Ensuring transparency and public access	Citizens, NGOs, journalists	EU Open Data Policy
Environmental Threat Response System	Notifications, risk triggers, crisis modules	Rapid response to accidents and disasters	State Emergency Service, local authorities	EU Civil Protection Mechanism

Source: (Petrychenko et al., 2024; Pronko, et al., 2020)

fragmentation of information resources, insufficient digitalisation and weak interdepartmental coordination remain key internal issues (see Table 3).

The implementation of European standards, the use of modern technologies (AI, big data and GIS) and international support present external opportunities that create favourable conditions for system modernisation.

However, the project's implementation is accompanied by significant threats, including military risks, cyber threats, and financing instability.

Therefore, Ukraine's environmental safety monitoring system should be developed strategically, based on strengths and opportunities, while minimising the impact of weaknesses and threats.

Table 3

SWOT analysis of the implementation of an information and analytical system for monitoring environmental safety in Ukraine

S – Strengths	W – Weaknesses
Availability of a basic regulatory framework in the field of environmental monitoring	Fragmentation and dispersion of environmental data between different agencies
A developed network of state monitoring entities (hydrometeorological services, water, forest resources, etc.)	Lack of a single integrated information platform
Gradual digitalisation of public administration	Outdated material and technical base of observations
Experience in using GIS and open data	Insufficient level of automation of data collection and processing
Support for the European integration course and harmonisation of EU standards	Weak interdepartmental coordination and duplication of functions
Development of remote monitoring (satellite data)	Limited funding for environmental programmes

Source: authors' conclusions

4. Conclusions

Improving the regulatory and legal support for a unified information and analytical system for monitoring environmental safety in Ukraine is essential for improving the efficiency of public administration in environmental protection. Despite the presence of basic regulatory acts, the current legislative framework remains fragmented and does not comprehensively regulate the integration of environmental data, interdepartmental interaction, or the digital transformation of the monitoring system. The absence of a regulatory and legal act determining the legal status, structure and functioning mechanisms of a unified information and analytical platform, as well as regulating data standardisation and the use of modern information processing technologies, requires special attention. In this context, it would be advisable to adopt a separate law to regulate the operation of a unified information and analytical system for monitoring environmental safety. This law should clearly define the powers of monitoring entities, the procedure for data exchange, and the principles of openness of environmental information. A significant area for enhancement is the harmonisation of national legislation with European standards, particularly in relation to spatial data, environmental monitoring and open data. This will

ensure the compatibility of the Ukrainian system with EU infrastructures. Concurrently, there is a necessity to normatively consolidate the utilisation of contemporary digital technologies, including geographic information systems, remote sensing of the Earth, big data and artificial intelligence, which form the foundation of modern approaches to environmental management.

It is anticipated that the implementation of a unified information and analytical system will markedly enhance the efficiency of public administration in the domain of environmental safety by ensuring expeditious access to reliable and contemporary information. This will contribute to the formation of a single information space, increasing the transparency of management decisions and strengthening public control over the state of the environment. Furthermore, the system will facilitate the early identification of environmental risks, the forecasting of negative changes, and the prompt response to both natural and man-made emergencies.

In the long term, implementing the proposed measures will contribute to Ukraine's integration into the European environmental monitoring system. This will increase the level of environmental safety for the population and ensure the state's sustainable development based on a balanced combination of economic, social and environmental interests.

References:

- Bondarenko, V., Pokyncherda, V., Pidvalna, O., Kolesnyk, T., & Sokoliuk, S. (2023). Green Economy as a Prerequisite for Sustainable Development: Analysis of International and Ukrainian Experience. *European Journal of Sustainable Development*, 12(1), 221. <https://doi.org/10.14207/ejsd.2023.v12n1p221>
- Chikov, I., Radko, V., Marshalok, M., Tepluk, M., Petrenko, O., Sharko, I., & Sitkovska, A. (2022). Economic development of agricultural food enterprises on an innovative basis. *Financial and credit activity-problems of theory and practice*, 1(42), 98–106. <https://doi.org/10.55643/fcaptop.1.42.2022.367>
- Didur, I., & Pansyryeva, H. (2025). Peculiarities of soybean growth and development on gray forest soils. *Agronomy Research*, 23(1), 352–364. <https://doi.org/10.15159/AR.25.015>
- Hetman, N., Veklenko, Y., Petrychenko, V., Korniiichuk, O., & Buhaiov, V. (2024). Agrobiological substantiation of growing Hungarian vetch in mixed crops. *Scientific Horizons*, 27(4), 61–75.
- Hontaruk, Y., Furman, I., Bondarenko, V., Riabchyk, A., & Nepochatenko, O. (2024). Production of biogas and digestate at sugar factories as a way of ensuring the energy and food security of Ukraine. *Polityka Energetyczna*, 27(2), 195–210. <https://doi.org/10.33223/epj/185210>
- Hontaruk, Ya., Bondarenko, V., Sokoliuk, K., Basyuk, D., & Amirov, R. (2026). Analysis of the state, potential and marketing support of bioenergy development in Ukraine in the context of European and world experience. *Polityka Energetyczna – Energy Policy Journal*, 29, 69–88. <https://doi.org/10.33223/epj/210086>
- Kaletnik, G., & Lutkovska, S. (2020). Modern Organizational and Economic Mechanism For Environmental Safety. *Journal of Environmental Management and Tourism*, 3(43), 607–613.
- Kaletnik, G., & Lutkovska, S. (2020). Innovative Environmental Strategy for Sustainable Development. *European Journal of Sustainable Development*, 9(2), 89–98.
- Kaletnik, H., Lutsiak, V., Melnichuk, O., Dovhan, Y., & Malicki, M. (2019). Organizational basis of the development of innovative functional food products by the Ukrainian enterprises of deep walnut processing. *Ukrainian Food Journal*, 8(1), 169–180.
- Koval, V., Perović, N., Rasovic, I., Božović, D., & Gontaruk, Y. (2025). Biofuel Production Assessment of Crop Rotation Systems and Organic Residues in Agricultural Management. *Agriculture*, 15, 2316. <https://doi.org/10.3390/agriculture1522316>
- Lohosha, R., Lutkovska, S., Pidvalna, O., Pronko, L., & Kolesnyk, T. (2025). Ecological optimisation of vegetable production as a factor of the industry capitalisation. *Agricultural and Resource Economics: International Scientific E-Journal*, 11(1), 74–101.

- Palamarchuk, V., Lohosha, R., & Krychkovskyi, V. (2024). Energy and Economic Efficiency of Bioethanol Production Depending on the Quality of Corn Grain. *Baltic Journal of Economic Studies*, 10(5), 293–304. <https://doi.org/10.30525/2256-0742/2024-10-5-293-304>
- Petrychenko, V., Korniyshuk, O., Lykhochvor, V., Kobak, S. & Pansyrev, O. (2024). Study of Sowing Quality of Soybean Seeds Depending on Pre-Sowing Treatment of Seed. *Journal of Ecological Engineering*, 25(7), 332–339. <https://doi.org/10.12911/22998993/188932>
- Petrychenko, V., Lykhochvor, V., Didur, I., & Pansyreva, H. (2024). Scientific aspects of organic soy production in Ukraine. *Chemistry-Didactics-Ecology-Metrology*, 29(1-2), 111–121. <https://doi.org/10.2478/cdem-2024-0008>
- Petrychenko, V., Petrychenko, O., Fedoryshyna, L., Kravchuk, O., Korniyshuk, O., & Nitsenko, V. (2022). Agricultural production in Ukraine: ecological challenges and impact on the quality of life. *Financial and Credit Activity-problems of Theory and Practice*, 4(45), 374–384. <https://doi.org/10.55643/fcaptp.4.45.2022.3782>
- Pronko, L., Furman, I., Kucher, A., & Gontaruk, Y. (2020). Formation of a State Support Program for Agricultural Producers in Ukraine Considering World Experience. *European Journal of Sustainable Development*, 9(1), 364–379. <https://doi.org/10.14207/ejsd.2020.v9n1p364>
- Tkachuk, O., Pansyreva, H., Mazur, K., Chabanuk, Ya., Zabarna, T., Pelekh, L., Bronnicova, L., Kozak, Yu., & Viter, N. (2025). Ecological problems of the functioning of field protective forest belts of Ukrainian Forest Steppe. *Ecological Engineering & Environmental Technology*, 26(1), 149–161. <https://doi.org/10.12912/27197050/195735>
- Tkachuk, O., Pansyreva, H., Zelenchuk, N., Bondaruk, N., & Mostovenko, V. (2025). Resistance of sunflower crops to harmful objects when using growth-stimulating bioproducts in their crops. *Journal of Ecological Engineering*, 26(4), 98–110. <https://doi.org/10.12911/22998993/199816>
- Tomashuk, I. V. (2025). Formation of the scientific paradigm of innovative support for sustainable development of the agricultural sector. *Economic Space*, 208, 354–365. <https://doi.org/10.30838/EP.208.354-365>