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Assessing the Quality of Healthcare Services: A Theoretical Aspect

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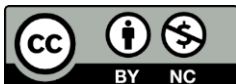
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ABSTRACT

In the XXI century, in the field of healthcare, the emphasis has shifted to innovation, technological development, and active involvement of patients in assessing the quality of medical services. This process requires an in-depth analysis of the factors that affect the provision of quality services and effective management of the health care system, which complicates the unification of standards. The purpose of the study is to analyze the main components of the quality of medical services in modern conditions. The features of the criteria for assessing the quality of medical services are defined and given: *technical competence* (competence of employees who provide medical services); *material and living conditions*; *access to services* (determined by the availability of services to different segments of the population in different territories of residence); *interpersonal relationships* in the process of providing services (information and consulting work, quality of medical service and communication with patients); *continuity* (continuity of service provision, speed and completeness and timeliness of services provided to patients); *efficiency* (measured both by economy and low cost, as well as by the optimality of using all types of resources in the provision of services); *safety* (safety for patients, the environment, medical personnel, compliance with waste disposal measures and non-contamination of employees, compliance with sanitary and hygienic conditions). It has been proven that comprehensive compliance with the defined criteria will ensure high efficiency of medical services, their accessibility for the population and generally improve the quality of life of the population. It has been proven that comprehensive compliance with and monitoring of certain criteria allows for ensuring high-performance medical services, their accessibility for the population and generally improves the quality of life. The quality criteria used for monitoring must be meaningful, specific, sensitive and reliable in order to ensure the effectiveness of management decisions.

KEYWORDS

public management, medical services, health care system, treatment, quality, health care institutions.



Оцінювання якості медичних послуг: теоретичний аспект

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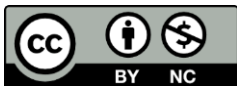
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У XXI столітті у сфері охорони здоров'я акцент змістився на інновації, технологічний розвиток та активне залучення пацієнтів до оцінки якості медичних послуг. Цей процес вимагає глибокого аналізу факторів, які впливають на надання якісних послуг та ефективне управління системою охорони здоров'я. Актуальність дослідження посилюється тим, що на якість медичної допомоги впливають культурні та економічні особливості різних країн, що ускладнює уніфікацію стандартів. Метою дослідження є аналіз основних складових якості медичних послуг у сучасних умовах. Визначено та наведено особливості критеріїв оцінки якостей медичних послуг: *технічна компетентність* (компетентність працівників, які надають медичні послуги); *матеріально-побутові умови*; *доступ до послуг* (визначається доступністю послуг різними верствами населення на різних територіях проживання); *міжособистісні стосунки* в процесі надання послуг (інформаційно-консультаційна робота, якість медичного сервісу та комунікації з пацієнтами); *безперервність* (безперебійність надання послуг, швидкість та повнота і своєчасність наданих послуг пацієнтам); *ефективність* (вимірюється як економічністю і низькою затратністю так і оптимальністю використання усіх типів ресурсів при наданні послуги); *безпека* (безпека для пацієнтів, середовища, медичного персоналу, дотримання заходів з утилізації відходів та незараження працівників, дотримання санітарно-гігієнічних умов). Доведено, що комплексне дотримання визначених критеріїв дозволить забезпечити високу результативність медичних послуг, їх доступність для населення та загалом підвищити якість життя населення. Доведено, що комплексне дотримання та моніторинг визначених критеріїв дозволяє забезпечити високу результативність медичних послуг, їх доступність для населення та загалом підвищити якість життя. Критерії якості, що використовуються для моніторингу, повинні бути значущими, специфічними, чутливими та надійними, щоб забезпечити ефективність управлінських рішень.



КЛЮЧОВІ СЛОВА

публічне управління, медичні послуги, система охорони здоров'я, лікування, якість, заклади охорони здоров'я.

1. Introduction

In the XXI century, the global healthcare system is going through a period of profound transformations due to technological innovations, changes in the structure of morbidity and growing public demand for quality, affordable and patient-centered services. Under these conditions, the assessment of the quality of medical care ceases to be an exclusively clinical issue and turns into a key element of public administration and administration. The quality of services directly affects the level of public confidence, the efficiency of the use of state resources, as well as the overall socio-economic development. The relevance of the study is also enhanced by the need to adapt the health system to the challenges associated with global uncertainty and economic reforms, which requires the unification of assessment standards that can be applied in different cultural and institutional contexts.

2. Literature Review

The issue of the quality of medical services has been studied by many Ukrainian and foreign scientists. Thus, O. Bernaz-Lukavetska and R. Podsiadlo consider the legal aspects of medical services and care in Ukraine. The authors conduct a comparative analysis of the legal norms that determine the rights of patients and the obligations of medical institutions. The need to improve national legislation to ensure quality medical care is emphasized [2].

S. Vovk conducts a study of changes in the health care system in Ukraine that are taking place in the context of European reforms and studies the main challenges and problems faced by the Ukrainian medical system, as well as proposes ways to modernize it. The paper highlights aspects of management and financing of medical services in the new conditions [17].

Also, in their scientific work, S. Vovk et al. analyze the processes of transformation of quality management of medical services in Ukraine, in particular, the introduction of new approaches to quality control and assessment. The authors focus on the importance of adapting standards and assessment mechanisms to meet modern requirements. The need for effective integration of international practices into the national system is emphasized [18].

G. Akhade et al. consider various aspects of the quality of medical services in different countries, including the measurement and evaluation of this indicator. The authors analyze how cultural and economic characteristics of different countries affect the quality of medical services. An important emphasis is the comparison of the results of assessing the quality of medical services in different health care systems [1].

The work of L. DiPrete Brown et al. discusses the issue of quality assurance of medical care in developing countries, with a special emphasis on methods for controlling and improving this quality. The authors offer recommendations for improving the effectiveness of medical services in resource-constrained settings. The problems of integrating international standards into local health care systems are also considered [5].

B. Debata et al. investigate the relationship between the quality of medical services and patient loyalty in the context of medical tourism. The authors analyze the factors influencing the choice of patients when choosing medical institutions abroad. The main characteristics of medical services that contribute to a high level of patient satisfaction and loyalty are determined [4].

Fundamental approaches to assessing the quality of medical care are considered in the classic work of A. Donabedian [6]. The author laid the theoretical foundation for understanding quality through the prism of a three-dimensional model: structure, process, and result. B. Endeshaw [7] conducts a thorough review of modern models for measuring the quality of medical services, focusing on a comparative analysis of various methods used to quantify this indicator in healthcare practice.

D. Ferreira et al. [9] carry out a systematic review of studies on patient satisfaction with medical services, analyzing a variety of techniques and methods that are used to objectively assess the perception of the quality of services by consumers. I. Göttgens and S. Oertelt-Prigione [9] explore the application of human-centered (Human-Centered Design) approaches in the field of medical innovation, emphasizing the importance of incorporating patient and user experience into the development of new medical services and technologies.

R. Kaplan and R. Hays [10] focus on measuring health-related quality of life as a key indicator in public health, discussing the methodology for integrating this indicator to assess the overall effect of

medical interventions. L. Kleinman and D. Dougherty [11] offer a theoretical framework for the practical evaluation of processes to improve the quality of care, which is an important contribution to understanding how theoretical models can be turned into tools for measuring real changes in healthcare settings.

G. Larsson and B. Wilde-Larsson [12] have developed a new theoretical and methodological approach to assessing quality of care and patient satisfaction, which contributes to a deeper understanding of the relationship between these two key dimensions. M. Lederle et al. [13] analyze the application of the Andersen behavioral model for qualitative research in the field of health services, which is relevant for understanding the social and behavioral factors that determine patients' access to medical care.

N. Nguyen et al. [14] conducted a study using mixed methods to assess the impact of quality of medical services on patient satisfaction, perceived value, and loyalty. H. Sixma et al. [16] looked at the quality of care from the perspective of patients, developing a new measuring tool that was key to the transition to patient-centric quality assessment.

Despite a significant number of thorough works devoted to both general theoretical models of quality and applied aspects of its assessment, legal regulation, and transformation of health care systems, the issue of comprehensive systematization and theoretical substantiation of key criteria for the quality of medical services in the context necessary for effective public administration and administration remains insufficiently resolved in the scientific field. There is also a lack of a single, structured theoretical approach that would clearly differentiate and describe a set of necessary criteria (technical competence, safety, accessibility, continuity, efficiency) as a holistic, interconnected system for further implementation in the national practice of assessment and management decisions. It is to eliminate this theoretical gap and unify the criterion base that this article is aimed at.

3. Problem Statement

Despite significant theoretical developments in the field of quality of medical care, including classical models (such as "structure-process-result") and numerous studies of patient satisfaction, the critical problem of the lack of a single, comprehensively systematized and theoretically grounded criterion base for monitoring the quality of medical services remains in the field of public administration. Existing approaches are often fragmented, focusing only on narrow dimensions (e.g., clinical skills or behavioral factors), making it difficult to make effective management decisions, oversee the implementation of reforms, and unify standards, especially in the face of cultural and economic differences between countries. This creates a theoretical gap that must be filled by systematizing and clearly differentiating key quality criteria (such as technical competence, safety, accessibility, continuity, efficiency) into a holistic model suitable for the purposes of public administration and strategic planning in the field of healthcare.

4. Methods and Materials

A combination of general scientific and specialized methods is typically used in research on the quality of medical services. Analysis and synthesis. Scientific literature, regulatory documents, and statistical data were reviewed to identify key approaches to assessing the quality of medical care. Synthesis allowed us to generalize the information obtained and form a comprehensive view of the problem. Comparative method. This was used to compare the quality indicators of medical services in different healthcare institutions, regions, or healthcare system models. This made it possible to identify differences and determine the most effective practices.

5. Results and Discussion

The quality of medical services depends on the interaction of direct and indirect factors. The high level of qualification of medical personnel and modern technical support can be ineffective without proper funding and support at the state level. On the other hand, favorable socio-economic conditions and education of the population significantly increase the efficiency of medical services even in the presence of certain resource constraints [2].

Factors depend on the type of service sector, needs, type of respondent, socio-demographic background of stakeholders, culture and beliefs [17].

Service quality can be defined as the difference between reality and consumer expectations for the services they receive or the services they receive or should receive [5].

The quality of services is usually evaluated in terms of technical and functional quality. In the world of healthcare, technical quality is determined on the basis of the technical accuracy of medical diagnoses and procedures or compliance with professional specifications, and the competence of personnel in the performance of their duties. In addition, the perception of individual health also depends on psychological well-being, which is certainly not directly related to physical condition [3].

It is important to carry out proper monitoring and evaluation at every stage of the provision of medical services. The criteria can be: positive (the higher the indicator, the better the quality) or negative (the higher the indicator, the worse the quality).

The development of quality criteria requires the collection of data and their proper processing so that they provide useful information for those who carry out monitoring. Therefore, an important element in defining the criteria is to ensure that they characterize: significance – must be effective and provide specific information necessary for management; specificity – the ability to assign them a grade; sensitivity – must clearly communicate changes; accessibility – be available for achievement subject to reasonable efforts; reliability – must be identical with similar measurements.

Quality criteria used in healthcare can be divided into two types: universal (quality measures) – external indicators developed by organizations dealing with quality issues in healthcare and suitable for use in every medical institution; individual – internal quality indicators developed by a medical institution [1], see Fig. 1.

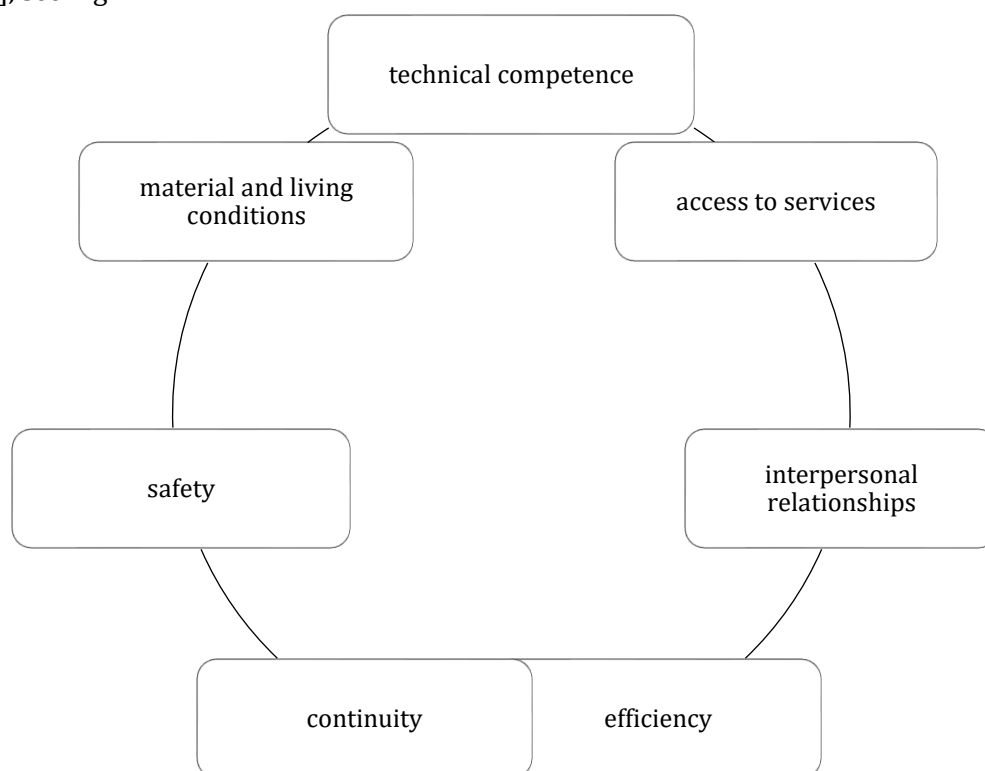


Figure 1. Criteria for assessing the quality of medical services

Source: Author's development.

Let's consider the main criteria for assessing the quality of medical services:

1. Technical competence refers to the skills, capabilities and actual work of healthcare professionals, managers and support staff. For example, in order to provide technically literate services, a healthcare worker must have the skills and knowledge (ability) to perform specific tasks and do it consistently and accurately (actual effectiveness) [15].

Technical competence is related to how well healthcare professionals follow practical guidelines and standards in terms of reliability, accuracy, and consistency. This dimension applies to both clinical

and non-clinical services. For healthcare professionals, it includes clinical skills related to prevention, diagnosis, treatment, and health counseling.

Competence in healthcare management requires supervision, training, and problem-solving skills. The required skills of support staff depend on individual job descriptions. For example, a technically competent secretary must be able to respond to information requests, while a pharmacist must know logistics and inventory management.

Technical competence can also refer to material resources: for example, an X-ray machine must produce radiation that consistently meets accepted standards. Lack of technical competence can range from minor deviations from standard procedures to serious errors that reduce efficiency or compromise patient safety.

2. Access to services. Access means that health services are not limited by geographical, economic, social, cultural, organizational, or linguistic barriers.

Geographic access can be measured using metrics such as transportation availability, distance, travel time, and any other physical barriers that may prevent a client from receiving medical care. Economic access refers to the availability of products and services to customers. Social or cultural access refers to the acceptability of services in the context of the client's cultural values, beliefs and attitudes. For example, family planning services may not be accepted if they are offered in a way that is not appropriate for the local culture.

Organizational access refers to how conveniently services are organized for potential clients and covers issues such as clinic hours and appointment scheduling systems, waiting times, and how services are delivered. For example, the lack of evening clinics can reduce organizational access for employees who work during the day. Where transportation issues, lack of home visits, or lack of home or village services can create an access problem.

Language accessibility means that the services are provided in the local language or dialect that the customer is fluent in.

3. Interpersonal relationships. The dimension of interpersonal relationships refers to the interactions between service providers and clients, managers and health care providers, as well as between the medical team and the community. High-level interpersonal relationships establish trust and authority through the demonstration of respect, confidentiality, courtesy, sensitivity, and empathy. Effective listening and communication are also important.

Proper interpersonal relationships contribute to effective health counseling and the establishment of positive contact with patients. Inadequate interpersonal relationships can reduce the effectiveness of a technically competent health service. Patients who are treated poorly may be less likely to follow a healthcare professional's advice or avoid seeking medical help.

4. The effectiveness of health services is an important measure of quality, because it affects the availability of products and services, and because the resources of the health system are usually limited. Effective services provide optimal, not maximum, care to the patient and the community. They provide the greatest benefit within the limits of available resources. Effectiveness requires the provision of necessary or appropriate medical care. Poor quality care resulting from ineffective standards or improper provision must be minimized or eliminated.

In this way, quality can be improved while reducing costs. Poor quality care, in addition to causing undue risk and discomfort to the patient, is often expensive and takes a long time to fix. However, it would be wrong to assume that quality improvement never requires additional resources. But by analyzing effectiveness, health program managers can choose the most cost-effective intervention.

5. Continuity means that the client receives the full range of medical services he or she needs, without interruption, discontinuation, or unnecessary repetition of diagnosis or treatment. Services must be provided on an ongoing basis. The client must have access to routine and preventive care provided by a healthcare professional who knows his or her medical history. The client must also have access to timely referrals for specialized services and full follow-up care. Sometimes continuity is achieved by ensuring that the client always sees the same primary care physician; In other cases, this is achieved by maintaining accurate medical records so that the new doctor knows the patient's history and can build on and complement the diagnosis and treatment of previous doctors. Lack of continuity can compromise efficiency, reduce the effectiveness and quality of interpersonal relationships.

6. Security. As a measure of quality, safety means minimizing the risks of injury, infection, harmful side effects, or other hazards associated with the provision of services. Safety applies to both the provider and the patient. For example, safety is an important measurement of the quality of blood

transfusions, especially with the advent of AIDS. Patients must be protected from infection, and medical workers who work with blood and needles. Additional safety issues associated with blood transfusions include maintaining aseptic conditions and using proper blood transfusion techniques.

While safety may seem paramount in the delivery of complex clinical services, safety issues exist and there are also safety concerns in the provision of basic health services. For example, waiting rooms in medical centers can put clients at risk of infection from other patients if measures are not taken to reduce the risk.

7. Material and living conditions. Amenities include characteristics of medical services that are not directly related to clinical efficacy, but can increase client satisfaction and their desire to return to the facility for subsequent medical services. Conveniences are also important because they can affect the customer's expectations for other aspects of the service or product, and their trust in them.

6. Conclusions

The study achieved its goal by carrying out a theoretical analysis and systematization of the key components of the quality of medical services, which is crucial for improving the mechanisms of public administration and administration in the field of healthcare. First of all, the essence of the quality of medical services was defined as the degree of compliance of the actually provided service with the expectations of its consumer, emphasizing that the assessment is two-dimensional: it covers technical quality (clinical competence and accuracy of procedures) and functional quality (interaction process and service support). Such a dualistic approach allows the heads of medical institutions and public administration bodies to focus not only on medical results, but also on the patient-centricity of the process.

As a result of the analysis, seven key criteria were systematized and substantiated, which form a holistic picture of the quality of medical services. These include Technical Competence (level of knowledge, skills and qualifications of personnel), Safety (minimization of the risks of injury, infections and compliance with sanitary and hygienic standards) and Efficiency (achievement of the required medical result with optimal use of resources and minimization of costs). Ensuring these three criteria is the basis for the clinical reliability of the system.

Along with clinical criteria, social and organizational components were singled out. These are Access to Services (elimination of all barriers: geographical, financial and organizational), Continuity (ensuring a complete, timely and coordinated range of services without failures), Interpersonal relationships (quality of communication, respect, empathy and building trust between staff and patient) and Material and living conditions (comfort, convenience and aesthetics of the premises). The systematization of these criteria creates a theoretical basis for the formation of indicators sensitive to the quality of management and patient satisfaction.

Thus, the comprehensive implementation of monitoring according to the identified seven criteria is a prerequisite for increasing the effectiveness of medical care and its accessibility for the population. The practical significance of the work lies in providing managers with clear theoretical tools that can be transformed into measuring indicators. This allows for effective evaluation of the effectiveness of government programs, allocation of funding and adjustment of reform policies, ensuring that quality criteria are meaningful, specific, sensitive and reliable. Further research should be aimed at developing practical methods for quantifying these criteria in the conditions of the Ukrainian health care system.

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The International Experience in the Formation of Mechanisms for Public Personnel Management in the Healthcare Sector

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ABSTRACT

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The article analyzes foreign experiences in shaping mechanisms of public personnel management in the healthcare sector, based on a comparative study of practices in Japan, the USA, Germany, and Canada. It is shown that the effectiveness of human resource management in the medical field largely depends on a combination of state regulation, stable financing, professional development of personnel and incentive systems. The theoretical part of the study substantiates the importance of personnel development as a strategic factor for improving the quality of medical services, managerial efficiency and public trust in state institutions. Comparative analysis demonstrates that in countries with well-developed health systems (Canada, Germany, Japan), public personnel management is implemented through the integration of state policy, professional development mechanisms and social guarantees. In particular, Japan is characterized by a multi-level system of workforce planning and centralized quality control; Germany combines public and private insurance with a high degree of social responsibility among health professionals; Canada features effective coordination between federal and provincial authorities and stable tax-based funding. By contrast, the US experience highlights the limitations of a private insurance model, which creates financial barriers for citizens and complicates the maintenance of a sustainable workforce. The results allow us to conclude that successful foreign practices for forming mechanisms of public personnel management rest on combining strategic state oversight, institutional support for continuous professional development, transparent financing systems and effective motivational tools. The proposed approach may be used to improve the Ukrainian health care system by aligning personnel management with European standards, ensuring workforce stability and enhancing the quality of public services.

KEYWORDS

international experience, public management, public management in healthcare, healthcare sector, mechanisms of public management, management processes, global trends in healthcare, staff development, staff motivation, career growth, human capital.



Зарубіжний досвід формування механізмів публічного управління персоналом у сфері охорони здоров'я

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У статті проаналізовано зарубіжний досвід формування механізмів публічного управління персоналом у сфері охорони здоров'я, що ґрунтується на порівняльному вивченні практик Японії, США, Німеччини та Канади. Визначено, що ефективність управління людськими ресурсами у медичній галузі значною мірою залежить від поєднання державного регулювання, стабільного фінансування, професійного розвитку персоналу та систем мотивації. Теоретична частина дослідження обґрунтовує значення розвитку персоналу як стратегічного чинника підвищення якості надання медичних послуг, управлінської ефективності та довіри населення до державних інституцій. Порівняльний аналіз показує, що в країнах із розвиненими системами охорони здоров'я (Канада, Німеччина, Японія) публічне управління персоналом реалізується через інтеграцію державної політики, механізмів професійного розвитку й соціальних гарантій. Зокрема, Японія характеризується багаторівневою системою кадрового планування та централізованим контролем якості праці; Німеччина – поєднанням державного та приватного страхування з високим рівнем соціальної відповідальності медичних працівників; Канада – ефективною взаємодією федерального й провінційного рівнів влади та стабільним фінансуванням через податкову систему. На противагу цьому, досвід США демонструє обмеження приватної моделі страхування, яка створює фінансові бар'єри для громадян і ускладнює забезпечення сталого кадрового потенціалу системи. Отримані результати дозволяють узагальнити, що успішні зарубіжні практики формування механізмів публічного управління персоналом базуються на поєднанні державного стратегічного контролю, інституційної підтримки професійного розвитку, прозорих систем фінансування та ефективних мотиваційних інструментів. Запропонований підхід може бути використаний для вдосконалення української системи охорони здоров'я з урахуванням європейських стандартів управління персоналом, забезпечення кадрової стабільності та підвищення якості публічних послуг.

КЛЮЧОВІ СЛОВА

зарубіжний досвід, публічне управління, публічне управління у сфері охорони здоров'я, сфера охорони здоров'я, механізми публічного управління, управлінські процеси, світові тенденції в галузі охорони здоров'я, розвиток персоналу, мотивація персоналу, кар'єрне зростання, кадровий потенціал.

1. Introduction

In the current conditions of transformation of the health care system, one of the key determinants of its effectiveness is the quality of public personnel management. The formation of effective mechanisms for human resources management in the medical sector determines the ability of the state to ensure the sustainability of the health care system, its adaptability to the challenges of the socio-economic environment and compliance with the standards of good governance. Human capital, intellectual potential and professional competence of medical workers are the basic factors in ensuring the competitiveness of health care institutions in the context of global medical integration and market changes [18, p. 163].

The issue of effective personnel management in medical institutions is of particular importance in view of the reform of the industry on the principle of “money follows the patient”, which requires not only the rational use of financial resources but also a rethinking of approaches to labor management. In this context, the mechanisms of public personnel management should include strategic planning of human resources, optimization of the processes of selection, evaluation and motivation of medical workers, as well as increasing the level of professional culture and managerial responsibility.

The development of the system of public personnel management in the medical field is closely related to the implementation of strategic and psychological management mechanisms, which provide for the formation of a favorable organizational climate, the development of leadership competencies of heads of medical institutions, and the provision of conditions for continuous professional development of employees. Effective management of human resources also requires the improvement of the system of advanced training, the introduction of professional mentoring programs, as well as the creation of tools for internal motivation of personnel for quality work and innovative activities.

At the same time, a significant challenge for the modern health care system, according to N. Hoi and M. Pylypiv, remains the personnel shortage caused by both emigration processes and insufficient motivation of young specialists to stay in the domestic system. Low level of remuneration, limited career opportunities and lack of proper conditions for professional realization significantly reduce the attractiveness of the medical profession [4, p. 72]. Therefore, an important task of public management is to create a holistic system of personnel development that would combine state support, social guarantees, professional incentives and mechanisms for recognizing the merits of medical workers.

Special attention should be paid to the formation of an appropriate level of organizational culture of health care institutions, which directly affects the quality of medical services, patient satisfaction and the overall efficiency of management processes. Respect for ethical standards, the quality of communication between medical staff and patients, as well as the creation of a comfortable working environment, contribute to strengthening the positive image of the institution and increasing the motivation of employees.

Therefore, the effectiveness of medical institutions directly depends on the level of managerial competencies, the effectiveness of personnel planning and the ability of management to provide an optimal combination of material and non-material incentives. In this context, the formation of modern mechanisms of public personnel management in the field of health care is a necessary prerequisite for the successful implementation of reforms, strengthening human resources and increasing the competitiveness of the national health care system.

2. Literature Review

The issue of public management of personnel in the field of health care belongs to complex interdisciplinary problems that integrate administrative, legal, organizational and socio-economic aspects. Modern scientific opinion testifies to the growing role of human resources as a determining factor in the effectiveness of public management of the health care system, which necessitates the study of foreign practices and the development of adapted management mechanisms based on them.

In the works of I. Boryshkevych, N. Hoi and O. Zhuk [1], the conceptual foundations of personnel development management as a systemic process aimed at ensuring the strategic stability of the organization and increasing its competitiveness are theoretically substantiated. The authors argue that effective personnel management should be based on a competency-based approach, the formation of internal motivational mechanisms and the introduction of modern tools for assessing the effectiveness

of employees. Such an approach, in their opinion, is a necessary prerequisite for creating an innovation-oriented organizational culture in the field of healthcare.

The study by N. Hoi and M. Pylypiv [4] is devoted to the problems of building an effective system of public personnel management in medical institutions operating in a dynamic legal and social environment. The authors' academic duumvirate focuses on the fact that the effectiveness of personnel administration is determined by a combination of innovative management approaches with proper regulatory and legal support. In particular, among the key areas of modernization, they single out the digitalization of personnel processes, optimization of management structures, as well as the development of a culture of leadership and responsibility in medical teams.

A significant contribution to the study of the legal foundations of the functioning of the industry was made in the dissertation of D. Gaumont [5], which revealed the administrative and legal mechanisms of the organization of health care. The scientist outlines the institutional foundations of state management of the industry, emphasizing the need to improve the legal regulation of the activities of medical institutions. In a joint publication by D. Gaumont and A. Denisova [6], the foreign experience of organizing the health care system, in particular in the countries of the European Union, Canada and the United States, is systematized, which allows us to identify universal principles of effective management – subsidiarity, autonomy and responsibility for the quality of services.

The monographic study edited by Y. Radysh [17] highlights the evolution of public health care management in Ukraine and summarizes the prospects for its transformation in accordance with European standards. The authors' team emphasizes that increasing the efficiency of personnel processes is possible only if the unification of professional standards, the formation of a system of managerial competencies and the creation of a favorable social and legal environment for the activities of medical personnel are combined.

In the scientific works of O. Dmytruk and O. Svintsytska [2], the processes of adaptation of employees of medical institutions to new economic conditions are studied. The authors convincingly prove that effective personnel management requires the development of a mentoring system, the formation of a corporate culture and the introduction of flexible forms of professional support for personnel in the face of constant changes.

Foreign experience in the formation of mechanisms of public management in the field of health care is thoroughly analyzed in the work of M. Dolgikh [3], where a comparative analysis of management models in Great Britain, Germany, Canada and Poland is carried out. The scientist emphasizes that the key factors of efficiency are the autonomy of medical institutions, the availability of clearly defined standards of professional activity and a developed system for evaluating the effectiveness of personnel.

In the study of V. Zverych [27], the specifics of personnel management in the countries of Central and Eastern Europe, characterized by a combination of state control with the expansion of the independence of medical organizations, are considered. The author substantiates the expediency of borrowing European practices of continuous professional development of medical workers and improving the mechanisms of their stimulation based on the competence approach.

V. Karlash [7] focuses on the relationship between the quality of personnel management and the effectiveness of the health care system. The scientist argues that state regulation of the industry should ensure a balance between centralized management decisions and autonomy of personnel processes at the level of health care institutions.

Scientists N. Kostenko and V. Martsynkovskiy [9] focus on the social aspects of providing health care, analyzing European mechanisms for stimulating medical personnel and supporting social partnership in the industry.

In the work of G. Kuzmenko [11], the foreign experience of public management in the field of health care is systematized, and the state, insurance and mixed models of industry organization are allocated. The author substantiates that the effective functioning of the system is possible only if the autonomy of medical institutions is balanced with state responsibility for the results of activities, which is a characteristic feature of European countries.

A comparative analysis of the health care systems of Canada, the USA, Japan and the European Union was carried out by I. Palamarchuk [15], A. Parshikova [16], O. Terzi [22], M. Shevchenko [19] and other researchers. Their works allow us to single out the universal characteristics of effective management – a high level of professional autonomy of medical personnel, transparent personnel selection procedures, orientation to competence development and the formation of a motivation system based on the effectiveness of activities.

Important is the contribution of Y. Shipov [20], who analyzes the possibilities of implementing foreign practices of public management of medical and social services in the Ukrainian context. The author emphasizes that successful adaptation of such models is possible only under the conditions of integration of digital technologies, compliance with ethical standards of professional activity and ensuring effective state control over the quality of services.

Thus, the generalization of scientific sources shows that foreign experience in the formation of mechanisms of public personnel management in the field of health care is based on a combination of administrative, legal and socio-economic factors. The key development trends are the decentralization of management, increasing the role of human resources, digitalization of processes, as well as the development of partnerships between state institutions, medical institutions and civil society. It is this integrative model that allows for ensuring the sustainability, efficiency and social orientation of the public management system in healthcare.

3. Problem Statement

The purpose of this study is to analyze foreign experience in the formation of mechanisms of public personnel management in the field of healthcare, to identify effective practices of management processes that ensure the development of human resources, motivation and career growth of employees, as well as the formation of criteria for assessing the effectiveness of these mechanisms. The article provides for the study of modern approaches to the organization of public management in health care abroad, analysis of personnel management mechanisms, development strategies and motivational systems that contribute to increasing the efficiency of health care institutions and sustainable development of human resources.

4. Methods and Materials

In the process of studying foreign experience in the formation of mechanisms of public personnel management in the field of healthcare, a set of qualitative methods was applied, which made it possible to comprehensively analyze theoretical approaches, regulatory and legal foundations and practical models of personnel management in the medical field of different countries. The methodological basis is a systematic approach, which made it possible to consider personnel management as an integral social and management system that combines strategic planning, professional development, motivational mechanisms and control of labor efficiency.

The paper uses the analysis and synthesis of scientific sources that provided the identification of key concepts for the development of human resources in the public sector, in particular in the field of healthcare. This made it possible to clarify the content of the concepts of “public personnel management”, “personnel policy in healthcare” and “mechanisms of human capital development” in the domestic and foreign scientific tradition, as well as to systematize approaches to assessing the effectiveness of management models in different countries.

The use of the comparative method made it possible to analyze the experience of Japan, the USA, Germany and Canada, determining the structural differences in their personnel management systems in the medical field. The comparison was based on the analysis of official statistics, government reports, international documents of the World Health Organization (WHO), OECD, as well as the results of scientific research and practices published in open sources.

Structural and functional analysis is also used, which made it possible to reveal the relationship between the functions of state health care management bodies and practical forms of organization of work of medical personnel. This method made it possible to determine the role of institutional, economic and social factors in the formation of effective mechanisms of personnel management.

In addition, the method of analysis of documents and management practices is used, which includes the study of official reports of ministries of health, statistical collections, materials of international conferences and the experience of professional associations of medical professionals. This made it possible to generalize real models of personnel policy and identify successful tools for motivating, training and retaining personnel in the medical systems of developed countries.

To summarize the results, a logical generalizing method was used, which contributed to the formulation of analytical conclusions on the effectiveness of existing mechanisms of public personnel management in foreign health care systems. Thanks to this, key elements relevant for adaptation in the

Ukrainian context have been identified, in particular in the field of professional development of personnel, financing, state control and motivation of employees.

Thus, the selected methodological toolkit provided a comprehensive study of the problem, allowing for to combination of theoretical analysis, normative evaluation and practical comparison of international models of personnel management in health care systems. This creates the basis for the development of effective management decisions in the context of reforming the domestic medical industry.

5. Results and Discussion

In the current conditions of transformation of the economy and social processes, personnel development is a key factor in the effective functioning of both private companies and public sector institutions, in particular healthcare. The changes taking place in the socio-economic space require constant updating of knowledge, skills and competencies of employees, since it is human capital that is the basis for ensuring the quality of management decisions, professional service and sustainable development of the organization.

As noted by I. Boryshkevych, N. Hoi and O. Zhuk, personnel development is a strategic tool for increasing the competitiveness of the organization, which allows to ensure its flexibility and ability to adapt to market challenges [1, p. 33]. This thesis is also quite relevant for the system of public management in the field of healthcare, where human resources determine the effectiveness of the implementation of reforms, the quality of medical services and the trust of citizens in state institutions.

Personnel development in the medical field should be considered not only as a process of advanced training, but as a comprehensive system that covers the formation of competence potential, improvement of organizational culture, stimulation of professional growth and increase of motivation of employees. According to modern scientific approaches, personnel development is a strategically oriented process that combines training, mentoring, performance evaluation, personnel planning and the introduction of innovative forms of professional improvement [1, p. 36].

In modern research on the problems of human resource management in the field of healthcare, it is important to distinguish and specify the content of the basic concepts that form the conceptual field of research. The analysis of scientific approaches of domestic and foreign authors allows us to determine the essence of the categories of “public personnel management”, “personnel policy in health care” and “mechanisms of human capital development”, taking into account modern trends in reforming the health care system. The summarized results of this analysis are presented in Table 1.

The formation of mechanisms of public management of personnel in the field of health care in foreign practice is implemented through the integration of strategic directions of state policy and specific management procedures that ensure the effective work of medical workers. The main elements of such mechanisms are personnel planning, professional development, motivational stimulation and quality control of personnel, which together determine the effectiveness of the health care system.

The example of Japan shows that personnel management is carried out at four levels: national, regional, medical centers and local. The Ministry of Health and Social Security establishes standards of qualifications, functional responsibilities and criteria for evaluating the work of medical personnel, which is practically implemented through annual planning of the number and structure of personnel of health care institutions, identification of needs for specialists and allocation of resources for training and advanced training [19].

In prefectures and large cities, there are medical centers that provide staffing services to approximately 100,000 residents of each region. In practice, this means the formation of local personnel development programs: organization of advanced training courses, seminars on new medical technologies, assessment of employee competence and rotation system for optimal use of human resources. Municipalities carry out motivational measures, including bonuses for achieving quality of service indicators, supporting staff participation in scientific projects and providing social guarantees, which contribute to the retention of highly qualified personnel.

A feature of the Japanese system is the strong state regulation of the financing of health care and health insurance, which directly affects personnel management. Almost all tariffs for medical services are approved by the government, and the activities of insurance companies and medical service providers are subsidized by the state, which creates stable conditions for the work of medical personnel and allows the implementation of incentive mechanisms: competitive wages, premium systems, long-

term insurance and social guarantees. Regulated share participation of patients within 10–30% of the cost of medical services, a ban on the profits of insurance companies and restrictions on payment for the work of doctors in case of serious errors raise the standards of professional responsibility and discipline among personnel.

Table 1. The Content of Basic Concepts in the Context of Public Personnel Management in the Field of Health Care

Concepts	The content and essence of the concept
Public Personnel Management	It is interpreted as a purposeful, normatively regulated activity of state bodies and local self-government bodies aimed at the formation, development, motivation and effective use of the human resources of the health care system. Scientists emphasize that in the field of medicine, public personnel management should take into account the specifics of the social purpose of the industry, the need for ethical leadership and managerial flexibility, as noted by N. Hoi and M. Pylypiv [4, p. 72]; G. Kuzmenko [11, p. 21]. Foreign practice shows that in countries with developed health care systems (Canada, USA, Japan), public personnel management is focused on the service model and state-public partnership, which is emphasized by O. Terzi [22, p. 169]; Y. Shipov [20, p. 119].
Personnel policy in healthcare	It is understood as a comprehensive system of goals, principles and measures aimed at providing the industry with qualified personnel, their professional development, adaptation and motivation for effective work. Domestic researchers emphasize the need to form a personnel policy based on a competency-based approach, innovation and strategic planning. This opinion is supported by I. Boryshkevych, N. Hoi, O. Zhuk [1, p. 33]; O. Dmytruk, O. Svintsytska [2, p. 183]; I. Trunina [23, p. 52]. In the foreign context, personnel policy is considered as a tool for the autonomy of medical institutions and stimulation of professional growth of personnel, as noted by I. Palamarchuk [15, p. 182]; A. Parshikova [16, p. 5].
Mechanisms of human capital development	They are defined as a set of institutional, organizational, legal and economic tools aimed at creating conditions for continuous professional growth, the formation of competencies, digital literacy and improving the quality of work of medical workers. Scientists consider human capital as a strategic resource of the health care system, which requires investments in training, social protection and corporate culture. This position is expressed by I. Boryshkevych [1, p. 37]; V. Yankovska [25, p. 117]. Foreign experience demonstrates the effectiveness of innovative approaches to the development of human capital through digitalization, telemedicine and intersectoral cooperation, as M. Dolgikh writes [3, p. 110]; V. Zvirych [27, p. 24].

Outpatient care in Japan is provided by therapists and family doctors, which relieves doctors of clinics and hospitals. A practical tool for personnel management is the activities of professional public organizations, such as the Academy of Family Medicine, the Society of General Medicine and the Society for Primary Care, which coordinate professional development, standardization of practices and training programs.

In addition, the government has implemented the National Program “Healthy People – 21”, aimed at active participation of the public in maintaining their own health and interaction with medical institutions, which provides for staff participation in educational programs, monitoring of public health indicators and the implementation of disease prevention measures.

The formation of mechanisms of public management of personnel in the field of health care in the United States of America has specific features related to the private model of financing medical services [21]. The main characteristic of the system is that about 90% of citizens use the services of private insurance companies, while spending more than 10% of their family income on insurance. The vast majority of the population receives health insurance through employers or professional associations, as well as through organizations such as Blue Cross and Blue Shield, which are obliged to insure everyone [12].

The high level of private financing and significant healthcare expenditures – 16.4% of GDP, which is one of the highest rates in the world, does not guarantee equal and full access to health services for citizens. In the fourth quarter of 2023, about 7.7% of the US population remained uninsured due to the high cost of insurance, job loss, or inability to receive a government subsidy. The lack of insurance limits access to medical services: non-profit medical centers and emergency departments can only stabilize the patient’s condition, but do not provide complete treatment. In addition, even the presence of insurance does not guarantee coverage of all the necessary medicines [13].

The American healthcare system implements the principle of “managed care”, where patients are referred through a network of intermediaries to doctors, pharmacies, laboratories and other medical institutions. Part of the population uses the state programs “Medicaid” and “Medicaid”, financed by taxpayers. Medicaid provides insurance for people over 65 years of age and socially disadvantaged

groups, while Medicaid covers a wider range of categories, but its provision depends on the legislation of individual states [3, pp. 108–109].

Primary health care is provided by family doctors who work individually or in small group practices. Most private clinics provide services with a staff of less than five people, which requires high autonomy and responsibility for employees. Patients choose doctors through electronic networks of registered providers, which stimulates staff to maintain a professional level and quality of service [2, p. 75].

Practical analysis shows that the existing system of mechanisms of public health care management in the United States has significant shortcomings. Citizens' dissatisfaction with high costs and limited access to services is confirmed by a 2017 survey by the Commonwealth Fund, according to which 82% of Americans consider the system to need fundamental reform [10]. Per capita expenditure in the United States – 7,290 USD per year – is more than twice as high as the average among industrialized countries, which indicates the inefficiency of private financing as the main source of resources for the health care system [6, p. 125].

Thus, the experience of the United States demonstrates that the private model of financing medical services creates significant financial barriers, complicates the availability of medical care, and affects the mechanisms of public personnel management.

The formation of mechanisms of public personnel management in the field of health care in Germany is based on a comprehensive system of public and private health insurance, which ensures the stability of financing and management of human resources. State insurance covers about 89% of the population, while private insurance funds cover about 9%, and the rest of the population uses special state programs that provide medical care for military personnel, police officers and other categories. The actual contribution of state health insurance to total health care expenditures exceeds 60%, with additional resources coming from pension insurance funds, occupational injury insurance and the state budget [16].

At the federal level, the health care system is coordinated by the Ministry of Health and Welfare, which determines public health insurance policies, sets standards for equality, completeness and quality of service delivery, and regulates the financing of medical institutions. State legal regulation is based on the Social Code, the fifth book of which directly regulates the procedure for the functioning of state insurance and the organizational principles of medical institutions [16].

The practical implementation of public personnel management mechanisms takes place at the level of the federal states, each of which is responsible for planning the activities of the health care system, ensuring the financing of hospitals and meeting the needs of the population for medical services. This means that regional authorities form local personnel development programs, determine the need for specialists and organize training programs for advanced training. Such regional diversity allows adapting personnel mechanisms to the social and economic characteristics of a particular territory, but at the same time creates a difference in the methods of planning and management of medical personnel [5, pp. 158–160].

The main source of funding for health care is the self-governing regional and federal hospital funds (*gesetzliche Krankenkassen*), which collect contributions and keep health facilities running at the social security level. Hospitals function as non-profit organizations, which guarantee financial stability and social responsibility of medical personnel. Practical personnel management in such conditions includes the formation of staffing, planning the number and structure of personnel, the organization of training and advanced training, as well as the introduction of motivation systems that support the efficiency and professional competence of employees [5, pp. 158–160].

The insurance system provides a wide range of services that affect personnel management: medical workers provide outpatient and inpatient treatment, provide prescription drugs, work with medical equipment and organize patient logistics. Practical interaction between state bodies, hospital funds and professional associations ensures a high level of personnel qualification, standardization of medical practices and equal access of the population to medical services. Stable funding and clear regulation of personnel roles and functions allow the implementation of comprehensive personnel development programs, including advanced training courses, competency assessments and motivational measures that guarantee the retention of highly qualified specialists in the health care system.

The formation of mechanisms for public management of personnel in the field of health care in Canada is carried out within the framework of a federal system with two constitutionally defined levels

of power. The central government is responsible for formulating national policies, manufacturing pharmaceuticals, financing and managing health services for certain populations, such as veterans, military personnel, and federal prisoners. The level of local self-government includes ten provincial and territorial bodies that implement a wide range of social medical programs and directly manage most medical institutions [17, p. 121].

Approximately 70% of health care costs are financed from federal, provincial, and territorial taxes, allowing for stability and predictability in funding. The federal government sets national standards for the health care system in accordance with the Canada Health Act and monitors their implementation by transferring funds to the provinces to cover the cost of medical care. At the same time, provinces manage local health care institutions, determine the need for medical personnel, organize training and extension programs, and ensure continuous quality control of service provision [24].

In a practical dimension, HR management mechanisms in Canada focus on primary care provided by therapists, who make up about 51% of medical practitioners. They act as coordinators, referring patients to specialists, laboratories, pharmacies and hospital facilities. This approach allows you to optimize the load on the system and increase the efficiency of the use of human resources. Doctors have a high level of professional autonomy: most work in private practices, hospitals, or outpatient clinics, receiving payment depending on the volume of services provided or a fixed salary. The state provides direct payment for their activities through the budgets of provinces and territories, which guarantees the timeliness of funding and stimulates high-quality performance of official duties [14].

Practical mechanisms of personnel management include a clear definition of the functions and powers of medical workers, the organization of continuous professional development, the establishment of standards for the provision of medical care and the provision of social guarantees, which contribute to the retention of highly qualified personnel in the health care system. An important element is also the patient's ability to freely choose a primary care doctor, which forms competition between medical professionals and stimulates the maintenance of a high level of competence [24].

Canada demonstrates that the integration of federal and provincial governments, stable funding through the tax system, effective organization of primary health care, and standardization of professional activities of personnel are key elements of practical mechanisms for public personnel management in the field of healthcare. This approach ensures high quality of medical services, accessibility for the population and effective use of human resources, which is the world standard of the modern health care system [24].

Table 2 provides a comparative description of the main mechanisms of public personnel management in the field of health care in the leading countries of the world, demonstrating different approaches to financing, control, professional development and motivation of employees.

Table 2. The Main Mechanisms of Public Personnel Management in the Field of Health Care in Foreign Practice

Country	Funding	Level of state control	Professional development	Motivational mechanisms	Features of the organization
Japan	Integrated State Insurance	High	Courses, seminars, staff rotation	Bonuses, social guarantees	Multi-level control system
USA	Private insurance	Medium	Professional standards through associations	Payment for the volume of services	"Managed" assistance, supplier network
Germany	Public and private insurance	High	Regular training, standards	Fund contributions, social guarantees	Federal-Länder system of government
Canada	State insurance	High	Coordination through therapists	Payment for the volume of services	Federated system, primary health care

Source: Compiled by the authors based on [16].

Thus, a systematic analysis of foreign experience demonstrates that effective public management of personnel in the field of healthcare requires a combination of strategic planning, adequate funding, professional development of personnel and integration of national systems with international practices. The use of this approach in Ukraine will contribute to improving the quality of medical services, stabilizing human resources and forming sustainable development of the health care system as a whole.

6. Conclusions

The analysis of foreign experience has shown that the effectiveness of public personnel management in the field of health care is determined by the complexity of approaches that combine state regulation, professional development of personnel and a system of motivational incentives. In most countries with a developed medical system, personnel management is based on strategic planning, advanced training, standardization of activities and support for social guarantees of employees.

Management models implemented in countries with different types of public management have a common goal – to ensure high-quality of medical services through the development of human capital. In countries with a state-type of management (Germany, Canada, Japan), the emphasis is on professional stability and continuous learning, while in countries with a market model (the USA), the main role is played by the autonomy of institutions and competition of specialists.

Thus, the generalization of foreign experience gives grounds to assert that in order to increase the efficiency of public personnel management in the health care system of Ukraine, it is necessary to implement a holistic personnel development policy focused on a combination of strategic planning, professional training, social support and ethical leadership.

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Analysis of International Practices of Water Resources Protection in Conflict Regions: Lessons for Ukraine

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ABSTRACT

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It is determined that the norms of international humanitarian law, in particular Articles 54 of Additional Protocol I and 14 of Additional Protocol II to the Geneva Conventions of 1949, form a comprehensive regime for the protection of water infrastructure, prohibiting its destruction or use as a means of pressure on the civilian population. It has been found that modern conflicts are characterized by high vulnerability of water bodies to asymmetric attacks, cyberattacks and manipulation of water levels, which requires the integration of effective monitoring and early response mechanisms. The importance of harmonization of the national legislation of Ukraine with international standards to ensure the legal protection of water infrastructure and responsibility for violations was emphasized. The role of international initiatives, in particular the Global Alliance for the Protection of Water Resources, in the formation of a systematic approach to coordinating the actions of states and humanitarian organizations in conflict regions was emphasized. It was stated that digital technologies, including satellite monitoring and unmanned platforms, significantly increase the accuracy of risk assessment and the efficiency of response to damage to water infrastructure. It has been established that the involvement of local communities and increasing their capacity is a necessary prerequisite for the sustainability of water supply and recovery of systems after conflicts. It is noted that international UN resolutions, the Geneva Principles and national guidelines outline legal guidelines for the protection of water resources and minimization of humanitarian and environmental risks. It has been established that a comprehensive combination of legal, technological, humanitarian and institutional instruments forms the basis for stable and safe water resources management. It was emphasized that the implementation of these measures during the post-war recovery period creates preconditions for the protection of civilians and ensuring the sustainability of Ukraine's water systems in the long term.



KEYWORDS

protection of water resources, water infrastructure, international humanitarian law, conflict regions, civilian population, cyberattacks, post-war reconstruction.



Аналіз міжнародних практик захисту водних ресурсів у конфліктних регіонах: уроки для України

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СТАТТЯ	АНОТАЦІЯ
Дослідницька DOI: 10.70651/3041-2498/2025.11.03 Отримана: 24.09.2025 р. Прийнята: 02.11.2025 р. Опублікована: 13.11.2025 р. Авторське право © 2025 авторів Цей твір ліцензовано на умовах Ліцензії Creative Commons «Із Зазначенням Авторства – Некомерційна 4.0 Міжнародна» (CC BY-NC 4.0).	У статті досліджено питання захисту водних ресурсів у конфліктних регіонах. Визначено, що норми міжнародного гуманітарного права, зокрема статті 54 Додаткового протоколу I та 14 Додаткового протоколу II до Женевських конвенцій 1949 року, формують комплексний режим охорони водної інфраструктури, забороняючи її руйнування або використання як засобу тиску на цивільне населення. З'ясовано, що сучасні конфлікти характеризуються високою вразливістю водних об'єктів до асиметричних атак, кібератак та маніпуляцій рівнями води, що потребує інтеграції ефективних механізмів моніторингу та раннього реагування. Наголошено на важливості гармонізації національного законодавства України з міжнародними стандартами для забезпечення правової захищеності водної інфраструктури та відповідальності за порушення. Підкреслено роль міжнародних ініціатив, зокрема Глобального альянсу із захисту водних ресурсів, у формуванні системного підходу до координації дій держав та гуманітарних організацій у конфліктних регіонах. Констатовано, що цифрові технології, включно з супутниковим моніторингом і безпілотними платформами, значно підвищують точність оцінки ризиків та оперативність реагування на пошкодження водної інфраструктури. Встановлено, що залучення місцевих громад і підвищення їх потенціалу є необхідною передумовою стійкості водопостачання та відновлення систем після конфліктів. Зауважено, що міжнародні резолюції ООН, Женевські принципи та національні інструкції окреслюють правові орієнтири для захисту водних ресурсів та мінімізації гуманітарних і екологічних ризиків. Встановлено, що комплексне поєднання правових, технологічних, гуманітарних та інституційних інструментів формує основу для стабільного і безпечного управління водними ресурсами. Підкреслено, що реалізація зазначених заходів у період повоєнного відновлення створює передумови для захисту цивільного населення та забезпечення стійкості водних систем України у довгостроковій перспективі.



КЛЮЧОВІ СЛОВА

захист водних ресурсів, водна інфраструктура, міжнародне гуманітарне право, конфліктні регіони, цивільне населення, кібератаки, повоєнне відновлення.

1. Introduction

The issue of ensuring adequate protection of water resources in conflict regions occupies an important place in modern aspects of international security, because water is a strategic element of civilian infrastructure, the vulnerability of which increases in the context of armed confrontations. Given the increasing frequency of attacks on water supply facilities and the use of water infrastructure as a means of pressure on the civilian population, there is a need for a systematic analysis of current trends and international legal norms governing the protection of water systems, which, remarkably, determines the relevance and subject of this study.

2. Literature Review

The analysis of recent studies and publications shows that the problem of the relationship between armed conflicts and water degradation has acquired a systematic scientific understanding within the framework of modern interdisciplinary approaches. In particular, J. Schillinger, G. Özerol, Ş. Güven-Griemert and M. Heldeweg prove that armed conflicts significantly disrupt water resources management [1]. At the same time, O. Shumilova, K. Tockner, A. Sukhodolov, V. Khilchevskiy, L. De Meester, S. Stepanenko, G. Trokhymenko and P. Gleick, based on empirical data, demonstrate the large-scale impact of the Russian-Ukrainian armed conflict on the state of aquatic ecosystems and critical infrastructure of Ukraine [2]. G. Özerol and Schillinger J. summarize important patterns of the impact of hostilities on water management systems [3]. S. Döring focuses on the need to integrate water governance with policies for overcoming conflicts and responding to climate risks [4]. Z. Nouri, W. B. Salah and N. M. AlOmran substantiate the importance of strengthening international legal mechanisms for the protection of water resources in armed conflicts as a basic prerequisite for ensuring the security of the civilian population [5].

3. Problem Statement

The article is aimed at analyzing international practices of water resources protection in conflict regions and outlining relevant lessons for Ukraine.

4. Methods and Materials

In the process of the study, a set of methods was used that provided a comprehensive analysis of international practices for the protection of water resources in conflict regions and the formation of recommendations for Ukraine.

1. Theoretical and legal analysis. It was used to study the norms of international humanitarian law, in particular the Geneva Conventions of 1949, Additional Protocols I and II, UN resolutions, and the Geneva Principles for the Protection of Civilian Infrastructure. This made it possible to systematize legal mechanisms for the protection of water resources during armed conflicts.

2. Comparative legal method. It was used to compare the normative approaches of different countries included in the analysis (Syria, Iraq, Afghanistan, Israel-Palestine, Ethiopia, Yemen), as well as to compare the national legislation of Ukraine with international standards. This made it possible to identify gaps and opportunities for improving legal regulation.

3. System analysis of international cases. Based on the reports of international organizations (UN-Water, ICRC, UNICEF, UNESCO, Global Water Security Alliance), the structures of water resources management models in conflict conditions, approaches to responding to infrastructure destruction, countering cyberattacks and asymmetric threats have been carried out.

4. Content analysis of analytical and expert materials. More than 60 international reports, studies, analytical reviews, and official recommendations have been processed, including on satellite monitoring, the use of unmanned systems, and digital platforms for early response.

5. Method of institutional analysis. Used to assess the role of key international actors – the UN, ICRC, international humanitarian missions, water partnerships – in coordinating the protection of water systems in conflict regions.

6. Elements of predictive modeling. Possible scenarios for the development of risks for the water infrastructure of Ukraine are analyzed, taking into account modern challenges (cyberattacks, targeted destruction, water blockade), as well as the potential of digital technologies to minimize them.

The materials of the study included: international treaties, conventions and protocols on international humanitarian law; official reports of the UN, ICRC, WHO, UNICEF, UNESCO, UNDP; analytical documents of international water partnerships and research centers; satellite data, open maps and technical reports on the state of water infrastructure in conflict regions; Ukrainian legislation and government strategies in the field of water security and restoration. The application of these methods ensured comprehensiveness of the study, a combination of legal, technological, humanitarian and institutional aspects of water resources protection.

5. Results and Discussion

Article 54 of Additional Protocol I to the Geneva Conventions of 1949 [6], which regulates the protection of victims of international armed conflicts, expressly prohibits any impact on objects that ensure the life of the civilian population. In particular, the normative provision contains a requirement not to attack, destroy, decommission or render unusable water supply infrastructure and related water supplies. Also, irrigation systems, if their deliberate failure could make it impossible for civilians to access the resources necessary for subsistence. It is noteworthy that this provision applies regardless of the motives of the parties to the conflict, including cases when the destruction of infrastructure is carried out to create conditions of famine, forced displacement or other forms of pressure on the civilian population.

In turn, Article 14 of Additional Protocol II to the Geneva Conventions of 1949 [7] duplicates and specifies the prohibition on attacks, destruction and rendering unusable objects critical for the survival of the civilian population, including infrastructure for the supply of drinking water, water resources and irrigation facilities. The content of this article emphasizes the universality of the approach of international humanitarian law to the protection of water resources; after all, it fixes a separate group of objects that have a special humanitarian status in any conflict environment.

It should be noted that the consistency of Articles 54 and 14 forms a comprehensive regulatory regime that protects water resources as an element of life support and, at the same time, emphasizes the prohibition of the use of water infrastructure as an instrument of military or political pressure. In view of this, international humanitarian law actually establishes a complex standard for the protection of water bodies, which covers the physical inviolability of infrastructure and the inadmissibility of its transformation into a means of influencing the behavior of the civilian population or the opposing party. In the context of the study of water protection practices in conflict regions, the relevance of these provisions lies in the fact that they set clear international legal guidelines for states and non-state actors regarding the inadmissibility of harmful actions against water infrastructure. At the same time, their implementation in modern conditions demonstrates significant challenges, in particular those related to asymmetric conflicts, the use of unconventional tactics, and the high vulnerability of water systems. Under these conditions, the formation of appropriate mechanisms of control and responsibility is of particular importance for minimizing humanitarian risks.

Instead, the Instruction on the Procedure for the Implementation of International Humanitarian Law in the Armed Forces of Ukraine, approved by the Order of the Ministry of Defense of Ukraine dated 23.03.2017 No. 164 [8], determines that the category of serious violations of international humanitarian law directed against the civilian population includes the restriction of people's access to water resources. The document directly emphasizes the prohibition of destruction, removal, or deliberate disabling of objects, necessary to ensure the livelihood of the civilian population, in particular facilities for the supply of drinking water, its storage and irrigation systems. The Regulation clarifies that such objects can be hit only if they are used to ensure the activities of enemy military units or direct support of its hostilities. It is noteworthy that the regulation applies to the protection of material objects of water infrastructure and to guarantee stable access of the population to critical resources.

In turn, modern international initiatives also focus on the criticality of water infrastructure in conflict situations. Thus, during the Civilian Protection Week 2024, Slovenia, Switzerland and the Geneva Water Hub initiated the creation of the Global Alliance for the Protection of Water Resources from Armed Conflict. armed conflicts on freshwater resources and related infrastructure. The new initiative received support from Costa Rica, Jordan, Indonesia, Mozambique, Panama, Senegal, Vietnam,

as well as UNICEF, PAX and the Geneva Call [9]. At the same time, the materials of these discussions emphasize that the consequences of the armed conflict for water supply facilities and other vital services are characterized by duration, scale and significant humanitarian, environmental and socio-economic risks. At the same time, children, women and the elderly are especially vulnerable in such conditions.

It should be emphasized that the formation of the Global Alliance reflects the systematic transition of the international community to the creation of institutionalized mechanisms for coordinating actions to protect water resources in conflict regions. The initiative actually integrates different approaches to overcoming the consequences of the destruction of water infrastructure, combining humanitarian, legal and environmental instruments. At the same time, the coordination of efforts of states and international organizations forms the basis for the introduction of long-term response models that minimize humanitarian losses and ensure the sustainability of water systems in the future. In this context, it is especially important to take into account that most modern conflicts are accompanied by targeted attacks on water infrastructure, which are increasingly used as an element of pressure or a tool of destabilization. Accordingly, the formation of international alliances aimed at protecting water resources creates an opportunity to rethink the safety standards of water systems and adapt them to new types of threats. This aspect opens up prospects for the development of new practices of monitoring, prevention and responsibility within the international community.

The Global Alliance for the Protection of Water from Armed Conflict directs its activities to consolidate international efforts in the field of ensuring the human dignity of the population suffering from hostilities. Within the framework of this format, it is envisaged to disseminate legal and technical instruments aimed at protecting freshwater resources and related infrastructure from the negative impact of armed conflicts [10]. It is noteworthy that this initiative covers responding to the consequences of attacks, as well as the formation of strategic methods for the prevention of risks associated with the destruction of water systems. In turn, important areas of current and potential cooperation between states, international organizations and technical partners include the development of analytical tools to raise awareness of the long-term consequences of attacks or military use of water bodies. These consequences include social divides, degradation of ecosystems and deterioration of general life support conditions in conflict regions. At the same time, an important task is to form a list of practical actions that parties to armed conflicts can take to strengthen the level of protection provided for by international humanitarian law, in particular through its wider dissemination, involvement of non-state armed groups, implementation of lessons learned and best practices [10].

It should be noted that the rethinking of the methods of international humanitarian law is considered as a necessary prerequisite for improving the norms governing the protection of water infrastructure in armed conflicts. In this context, it is particularly important to ensure consistency in the interpretation of the relevant provisions with their basic objects and objectives, which are to guarantee the safety of the civilian population and the inviolability of civilian objects [11]. It is noteworthy that modern challenges are primarily associated with the indirect, long-term and cumulative consequences of hostilities, which significantly complicate the practical application of the principles of proportionality and precautionary measures. In addition, the dissemination and enforcement of international humanitarian law is a shared responsibility of all states, regardless of their direct involvement in the conflict. According to the established doctrine, third states should avoid actions that may contribute to violations, in particular the supply of weapons, and at the same time actively promote compliance with humanitarian standards [11]. Incidentally, it should be noted that national and universal jurisdiction play an important role in bringing to justice serious violations of international humanitarian law, in particular those related to water resources. States are obliged to investigate the facts of possible war crimes within the framework of international and non-international armed conflicts, if such actions were committed by their citizens or on their territory. Of particular importance is the issue of responsibility for the deliberate creation of famine conditions or disproportionate attacks on water infrastructure, which may qualify as a war crime under the Rome Statute.

At the same time, the use of modern digital technologies opens up significant opportunities for improving the accuracy of risk assessment, monitoring the state of water infrastructure and ensuring a prompt response to cases of its damage. Satellite imagery, unmanned platforms, and remote sensing systems allow obtaining near-real-time data on the extent of destruction [11]. At the same time, analytical forecasting models can optimize humanitarian planning and reduce potential risks to civilians. However, digitalization is accompanied by limitations associated with the risks of technical

errors, cyberattacks, information manipulation and the spread of disinformation, which necessitate the development of high-quality data verification protocols and increasing the digital resilience of institutions. At the same time, it is worth emphasizing that the effective use of technology can significantly increase the transparency of the actions of the parties to the conflict, in particular by independently documenting attacks on water infrastructure.

Moreover, taking into account the role of local communities in the preservation and restoration of water systems is a necessary prerequisite for the effective protection of water infrastructure during conflicts. Local organizations have unique knowledge about the characteristics of water resources, the structure of water supply systems and the vulnerability of individual facilities [11]. Thanks to this, they can provide a rapid response to primary threats and contribute to maintaining a basic level of services even in conditions of limited access to humanitarian structures. Therefore, empowering local actors through skills development, providing technical resources and implementing risk management standards strengthens their capacity to rebuild systems after conflicts. An important role is also played by international support aimed at integrating the efforts of different states and organizations in the system of a single strategy for the sustainability of water systems.

Since 2020, according to the platform [12], 105 incidents have been recorded in which water or water infrastructure facilities have become a direct target of armed influence. These dynamics demonstrate the systematic expansion of practices in the use of water resources and water systems as a tool for warfare. Along the way, it is worth emphasizing that the geographical structure of these incidents covers a wide range of regions: from North Africa and the Middle East to North America, which confirms the growing vulnerability of important water bodies in modern conflicts. At the same time, the content of Table 1 allows us to state that the nature of threats is complicated by the transition from traditional destruction of hydraulic structures to targeted cyberattacks on automated control systems. In particular, cases in the United States, Israel and Ethiopia demonstrate a new format of risks, when harmful digital interventions can disrupt the chemical balance of water or stop critical facilities, creating potentially large-scale humanitarian consequences. It is noteworthy that these forms of influence actually neutralize the territorial boundaries of conflicts, because virtual attacks can be carried out at a considerable distance from the place of physical confrontation.

Table 1. The Largest Water Conflicts of an Armed Nature

Year	Event	Country	Description
2020	Attack on a water pumping station in Libya, which cut off the water supply to 2 million people	Libya	An armed group seized a control station in Schwerif, causing a temporary water cutoff for the population of the capital, Tripoli, demonstrating the high level of vulnerability of civilian water infrastructure in armed conflicts.
2020	Cyber attack on Israel's water supply systems	Israel, Iran	Iran's attempt to interfere with Israel's water supply systems through a cyber attack underscores the urgency of cyber threats to water infrastructure.
2020	Plan for water poisoning by neo-Nazi groups in the United States	USA	Neo-Nazi organizations planned a terrorist attack by polluting water; Law enforcement agencies made seven arrests, indicating the risks of using water as a means of terror.
2021	Manipulation of Water Treatment Chemical Parameters in Florida	USA	Unauthorized access to the software led to an increase in the alkalinity of drinking water; the incident was localized in time, demonstrating the need for monitoring and control of water supply systems.
2021	Damage to a wastewater plant by malware in Nevada	USA	The attack on the SCADA system of the wastewater treatment plant highlighted the vulnerability of the infrastructure to cyber threats and the need to increase the cyber resilience of water bodies.
2021	Ransomware attack on a drainage system in Maine	USA	The ransomware disabled the automated system, forcing the switch to manual control, demonstrating the critical importance of the continuous functioning of the water infrastructure.
2022	Destruction of the dam that blocked water to Crimea	Ukraine, Russia	The destruction of a concrete dam built by Ukraine in 2014 to block the North Crimean Canal has caused significant disruptions to water supplies, underscoring the strategic role of water bodies in conflicts.
2022	Cyberattack on the Great Ethiopian Renaissance Dam	Egypt, Ethiopia	An attempt to cause flooding downstream and disrupt energy supply, illustrating the use of water infrastructure as an instrument of political pressure.

Year	Event	Country	Description
2022	Damage to the Pechenega dam on the Seversky Donets	Ukraine, Russia	The blowing up of two locks and a road to complicate the offensive emphasizes the tactical use of water infrastructure in combat conditions.
2022	Flooding of territories north of Kyiv to deter Russian armored vehicles	Ukraine, Russia	The destruction of a hydraulic structure near Kozarovychi in order to flood the floodplain of Irpin demonstrates the strategic use of water resources in defensive operations.
2023	Manipulation of the water level in the reservoir behind the Kakhovka dam	Ukraine, Russia	Russian troops have changed the volume of water discharge, posing a threat to the water supply of Enerhodar, Melitopol, Berdyansk and the cooling systems of the ZNPP, highlighting the complexity of water management in wartime.
2023	Destruction of the Kakhovka dam on the Dnieper	Ukraine, Russia	Large-scale floods, more than 50 deaths, environmental and infrastructure losses, and interruption of water supply to several settlements which demonstrate the catastrophic consequences of the destruction of key water bodies.
2023	Destruction of the dam on the Mokri Yali River	Ukraine, Russia	The explosion of the dam caused flooding and was intended to slow down the Ukrainian counteroffensive, illustrating the tactical use of water resources in military operations.
2023	Capture of water sources in the West Bank	Palestine, Israel	Israeli settlers have established control over water bodies, causing damage to Palestinian rural areas, which highlights the socio-political dimension of water conflicts.
2023	Complete Water Shutdown Gaza	Palestine, Israel	The shutdown of the water supply under the blockade demonstrates the use of water as an instrument of humanitarian pressure.
2023	Attacks on school water systems in Iran	Iran	A series of poisonings of more than 100 people in Qom reflects the threat to the safety of water systems in civilian institutions.
2023	Water pump explosion in Oi	Burkina Faso	The IED caused the death of 21 civilians and damage to water infrastructure, demonstrating the direct impact of conflicts on civilian objects.
2023	Water poisoning at Farah religious school	Afghanistan	The hospitalization of about 40 schoolgirls after consuming contaminated water illustrates the need to protect educational institutions.
2023	Blowing up Al Shabaab water wells	Somalia	The destruction of infrastructure and damage to homes in the villages of Ceel Qoxle and Ceel Garas demonstrates the strategic use of water in unstable regions.
2023	Protests against the increase in water prices	Ecuador	The seizure of the El Ceibal water treatment plant, which led to the cessation of water supply for about 400 thousand people, emphasizes the socio-economic aspects of water conflicts.
2024	Attempted poisoning of water tanks in Homs	Syria	The execution of a QDW member after a failed water poisoning attempt demonstrates the critical importance of water system security in high-risk areas of violence.
2024	Pro-Russian hacktivists gain control of water supply in Texas	USA	Unauthorized access to water body control systems caused flooding, highlighting the current cyber risks to critical infrastructure.
2024	Killing civilians and destroying a water tower in Mali	Mali	FAMA and Wagner forces killed five civilians and blew up a water tower, illustrating the direct impact of armed groups on water infrastructure.
2024	Destruction of more than 30 water wells in Gaza	Palestine / Israel	Hostilities have led to massive losses of water resources, highlighting the humanitarian aspect of water conflicts.
2024	Cyberattack on Tipton Treatment Plant	USA	The Tipton Wastewater Plant's system was hacked, forcing the switch to manual control mode, demonstrating the importance of cyber defense.
2024	Two-day cyberattacks on wastewater systems	USA	A pro-Russian group manipulated HMI systems by posting videos of attacks, highlighting the threat to public safety due to cyber incidents.
2024	Shutdown of RSF water supply in Northern Darfur	Sudan	The seizure of the reservoir and the closure of pipelines at Hazan Golo demonstrate the impact of armed conflicts on the population's access to water.
2024	Explosion of the central reservoir of Rafah	Palestine / Israel	The destruction of a tank with a volume of 3 million liters of water had a critical impact on the region's water supply.
2024	Protest at the Ancipa dam (Sicily)	Italy	The blockade of distribution facilities has caused the suspension of water supply to several municipalities, demonstrating the social consequences of water scarcity.
2024	Attack on Texas water utilities by a group linked to Russia	USA / Russia	Equipment manipulation caused tanks to overflow, highlighting the global risks of water infrastructure in the context of cyber conflicts.

Source: Compiled based on [12].

It is also worth paying attention to the cases of deliberate flooding of territories and destruction of dams observed in the context of the Russian-Ukrainian war. In particular, the events of 2022-2023, namely the explosion of dams, manipulation of reservoir levels, and the destruction of facilities in the area of the Kakhovka hydroelectric power plant, reflect the tendency to use water as a factor of operational and tactical deterrence, which at the same time forms long-term environmental and social risks for the civilian population. It is synonymous that such actions violate international legal norms for the protection of life-supporting infrastructure.

Special emphasis should be placed on incidents related to water poisoning in educational institutions and religious communities (Iran, Afghanistan), which demonstrate the ambivalence of water threats. Therefore, such cases reflect significant gaps in the monitoring and safety systems of public water use in certain regions. It is also significant that in 2024 there will be an increase in the frequency of hybrid attacks, which combine physical strikes, cyber interference and social destabilization due to blocking or intercepting control over water supply. These incidents, primarily in the United States, Palestine, Mali, and Sudan, indicate increased competition for access to water resources and conflict-induced degradation of water infrastructure management systems. The summary shows that since 2020, there has been an increase in the number of armed incidents targeting water infrastructure, with cyberattacks, blowing up of hydraulic structures and deliberate manipulation of water resources dominating.

At the same time, UN Security Council Resolution 2573 (2021) [13] emphasizes the importance of preventing damage or destruction to civilian infrastructure, particularly facilities that meet the basic needs of the population in conflict conditions. The document focuses on the systemic interconnectedness of critical services and condemns unlawful attacks or misuse of such facilities. It is noteworthy that the resolution expands the scope of protection, directly including "facilities critical for the provision of essential services", which forms the basis for the modern interpretation of water infrastructure as an important element of life support.

Consistent with these provisions is Resolution 2417 (2018) [14], which emphasizes the crucial role of water resources and water management systems in ensuring food security in conflict situations. This document certifies that damage to water bodies makes it impossible for agricultural systems to function normally and thereby increases humanitarian risks. At the same time, the document emphasizes the need for strict compliance with international humanitarian law, including the ceasefire and restrictions on the supply of weapons. Incidentally, it should be noted that the systematic violation of these norms in modern conflicts reinforces the relevance of the assessment of international mechanisms for the protection of water infrastructure.

It is appropriate to note that the totality of these resolutions forms the conceptual basis for the further development of international standards for water safety. They fix the legal obligations of states and form practical guidelines for minimizing risks to the civilian population. In this context, the norms aimed at preventing attacks on water bodies as an important component of life support are of particular importance, because it is water infrastructure that most often becomes an instrument of pressure in modern conflicts.

In addition, the Geneva List of Principles for the Protection of Water Infrastructure [15] summarizes the provisions of international law regulating the protection of water systems in armed conflicts. Although most of the included principles reproduce current legal obligations, the document complements them with recommendations that go beyond the direction of formally enshrined norms. In particular, it provides for the possibility of establishing special protected zones around water bodies and negotiating the inclusion of provisions on water infrastructure security guarantees in ceasefire agreements.

Significantly, such recommendations are largely based on the practice of functioning of international missions and humanitarian organizations in conflict regions. The above allows us to adapt the regulatory framework to the conditions of a particular conflict and ensure its effective application in situations where legal mechanisms are insufficient. In this aspect, it is especially important to take into account the experience of states that have already integrated these principles into national strategies for managing water resources in conditions of danger. Thus, international experience demonstrates the need for an integrated approach to the protection of water infrastructure in conflict conditions. With this in mind, Ukraine can identify the following important steps to strengthen water security and ensure the livelihood of the civilian population:

1) harmonization of national legislation with international standards (it is recommended to strengthen the compliance of Ukrainian legislation with the norms of international humanitarian law; it is important to ensure a clear regulation of the procedure for the protection of water bodies, including determining the conditions for their possible destruction only if they are used to support enemy hostilities);

2) development of monitoring and early response mechanisms (it is necessary to introduce systems for monitoring and monitoring the state of water bodies using modern digital technologies for prompt detection of physical and cyber attacks);

3) increasing cyber resilience and physical protection of water infrastructure (Ukraine should create comprehensive measures for cyber protection of water body management systems, as well as strengthening physical structures: dams, pumping stations, reservoirs and treatment facilities);

4) institutional and international cooperation (it is necessary to intensify Ukraine's participation in international initiatives);

5) developing the capacity of local communities and humanitarian preparedness (to actively involve local organizations and communities in the conservation and restoration of water systems, improve their skills, provide technical resources and risk management standards);

6) legal regulation and responsibility for violations (Ukraine should strengthen mechanisms of legal responsibility for intentional damage to water infrastructure and restriction of access to water, including the investigation of war crimes). However, these steps should be implemented already in the post-war recovery period in order to lay the foundation for sustainable and safe water resources management in the future.

6. Conclusions

Summarizing the results of the study, it should be stated that the international experience in the protection of water resources in conflict regions demonstrates the need for an integrated approach that combines legal, humanitarian, technological and institutional tools aimed at ensuring the life support of the civilian population and the inviolability of water infrastructure. The analysis showed that the harmonization of national legislation with international standards, the development of monitoring and early response mechanisms, increasing cyber resilience and physical protection of water bodies, intensifying international and local cooperation, developing the capacity of communities and ensuring legal responsibility for violations form a systemic basis for water security. At the same time, the relevance of these measures is due to modern challenges, including asymmetric conflicts, cyberattacks and manipulation of water systems, as well as the need to integrate the lessons of international initiatives and practices of humanitarian organizations. Therefore, the implementation of the experience of other states, the use of digital technologies to monitor and engage local communities, increases the resilience of water supply systems, and international alliances provide a platform for agreeing on response strategies and minimizing humanitarian risks. The recommended implementation of these measures, already in the period of post-war recovery, will create the basis for stable and safe management of water resources in Ukraine in the future.

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Economic Losses from the Destruction of Water Supply Systems: An Assessment for Households, the Agricultural Sector, and Industry in Ukraine

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The article examines the economic losses resulting from the destruction of water supply infrastructure in Ukraine, taking into account the impact on households as well as the agricultural and industrial sectors. It is established that the war has caused significant damage to the natural environment, including ecosystems and water resources, which has led to increasing economic and social risks. It is emphasized that the scale of water infrastructure destruction directly affects the livelihood of the population and the functioning of production processes, underscoring the importance of restoring water supply systems in the context of sustainable development. It is noted that as of September 2025, only 68% of Ukraine's population had access to centralized water supply, while in rural areas this figure amounted to just 26%, resulting in critical inequality in access to water. The study identifies that the low level of access to safe water increases household expenditures on alternative water sources and limits the production capacities of the agricultural and industrial sectors. It is highlighted that military actions have substantially intensified the degradation of water pipelines and engineering facilities, affecting approximately 39.7 thousand km of water supply systems with total economic losses estimated at USD 4.6 billion. The article presents regional disparities in losses that correlate with the intensity of hostilities: the largest damages occurred in Luhansk, Kharkiv, and Zaporizhzhia regions, confirming the need for territorially differentiated investment. It is determined that the modernization of irrigation and drainage systems is a priority of state policy to ensure agricultural productivity and reduce pressure on ecosystems. It is stressed that the combined impact of destruction has caused significant economic losses in households and in the agricultural and industrial sectors, while further exacerbating disparities in access to water resources. The study concludes that an integrated approach to modernizing water supply systems, including infrastructure restoration and the use of modern technologies, is a crucial factor for ensuring socio-economic stability in the post-war recovery period.

KEYWORDS

economic losses, water supply, water management infrastructure, destruction, recovery, agricultural sector, industry, households, modernization.



Економічні втрати від руйнування систем водопостачання: оцінка для домогосподарств, аграрного сектору та промисловості України

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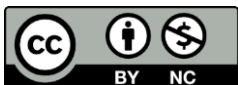
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У статті розглянуто економічні втрати від руйнування водопостачальної інфраструктури в Україні з урахуванням впливу на домогосподарства, аграрний та промисловий сектори. Встановлено, що воєнні події спричинили значні руйнування природного середовища, включно з екосистемами та водними ресурсами, що обумовлює зростання економічних і соціальних ризиків. Наголошено, що обсяг руйнувань водної інфраструктури безпосередньо впливає на життєдіяльність населення та функціонування виробничих процесів, підкреслюючи значення відновлення водопостачання у контексті сталого розвитку. Підкреслено, що станом на вересень 2025 року лише 68% населення України мали доступ до централізованого водопостачання, водночас у сільській місцевості цей показник становив лише 26%, що зумовлює критичну нерівність у доступі до води. Визначено, що низький рівень доступу до безпечної води спричиняє зростання витрат домогосподарств на альтернативні джерела води та обмежує виробничі потужності аграрного та промислового секторів. Зауважено, що військові дії значно інтенсифікували деградацію водопровідних мереж та інженерних споруд, охопивши близько 39,7 тис. км водопровідних систем із сумарними економічними втратами у 4,6 млрд дол. США. Висвітлено регіональну диференціацію втрат, що корелює з інтенсивністю бойових дій: найбільші збитки припадають на Луганську, Харківську та Запорізьку області, що підтверджує необхідність територіально диференційованого інвестування. Встановлено, що модернізація зрошувальних і дренажних систем є пріоритетом державної політики для забезпечення продуктивності аграрного виробництва та зниження навантаження на екосистеми. Підкреслено, що комплексний вплив руйнувань спричинив значні економічні втрати у домогосподарствах, аграрному та промислового секторах, водночас загостривши диспропорції у доступі до водних ресурсів. Констатовано, що інтегрований підхід до модернізації систем водопостачання, включно з відновленням інфраструктури та застосуванням сучасних технологій, є визначальним фактором забезпечення соціально-економічної стабільності в умовах поствоєнного відновлення.



КЛЮЧОВІ СЛОВА

економічні втрати, водопостачання, водогосподарська інфраструктура, руйнування, відновлення, аграрний сектор, промисловість, домогосподарства, модернізація.

1. Introduction

The destruction of water infrastructure in Ukraine as a result of prolonged hostilities poses serious threats to the livelihood of the population and the stability of the agricultural and industrial sectors. At the same time, it negatively affects the environmental sustainability of regions, emphasizing the need for an integrated approach to loss assessment. In this context, a comprehensive analysis of economic losses and the identification of structural weaknesses of water supply systems is important, because the lack of such studies complicates the development of effective recovery strategies. Therefore, the relevance of the topic is due to the need to determine the scale of destruction and restoration priorities to ensure socio-economic stability and sustainable water management.

2. Literature Review

The analysis of recent studies and publications shows the relevance of the problem of destruction of water infrastructure and the consequences of hostilities for water resources of Ukraine. In particular, O. Shumilova, K. Tokner, A. Sukhodolova, V. Khilchevsky, L. De Mester, S. Stepanenko, G. Trokhymenko, J. A. Hernandez-Aggero and P. Gleick emphasize the direct impact of the war on water resources and infrastructure [6]. In turn, A. Blakhopolukhna, O. Joa, V. Parakhnenko and N. Lyakhovska focus on the deterioration of the state of drinking water and environmental risks for water supply as a result of hostilities [2]. At the same time, V. Stelmakh, M. Melnychuk and O. Melnyk, I. Tokarchuk reveal significant changes in the hydroecological state of water bodies of Ukraine [18]. I. Hopchak and V. Zhuk analyze the impact of the war on water resources from the point of view of the circular economy [4]. At the same time, G. Khapych, R. Novytskyi, D. Onoprienko, D. Dent and H. Rubik focus on the consequences for water security [7]. In addition, G. Hapich, R. Novytskyi, D. Onoprienko and T. Dubov estimate the losses of ecosystem services from water resources [6].

3. Problem Statement

The article is aimed at estimating economic losses from the destruction of water supply systems in Ukraine, taking into account the impact on households, the agricultural sector and industry.

4. Methods and Materials

The methodological basis of the study is based on an integrated approach to assessing economic losses caused by the destruction of water supply systems in Ukraine during hostilities. In order to obtain objective and representative results, a set of general scientific, economic, statistical and special methods of analysis was used.

First of all, the structural and logical method was used, which made it possible to systematize information on the state of water infrastructure, to identify the key factors of the impact of armed aggression on water supply networks and to determine the relationship between the level of destruction and changes in the functioning of households, agricultural and industrial sectors.

To quantify losses, economic and statistical methods were used, in particular analysis of dynamics, comparative analysis, interval estimation and extrapolation. The statistical base was formed on the basis of data from the State Statistics Service of Ukraine, the Ministry of Communities and Territories Development, the State Agency for Water Resources, sectoral reports, as well as information from international organizations, including UNICEF, the World Bank and UNECE (physical destruction, cost of restoration) and indirect losses (additional household costs, reduced production productivity, interruptions in logistics processes).

A separate place is occupied by the method of estimating economic losses according to the sectoral approach. For households, the calculation was based on the assessment of the costs of alternative water sources, the increase in the cost of utilities, the increase in morbidity due to the consumption of poor-quality water and the decline in the quality of life. In industry, the calculations were carried out taking into account the suspension of production cycles, a decrease in capacity, additional costs for water treatment and restrictions on the functioning of critical enterprises.

The regulatory analysis included the study of current EU standards, recommendations of international organizations on water resources management during conflicts, as well as Ukrainian legislation in the field of water supply. This provided an opportunity to assess the compliance of the national system with the principles of sustainable governance and identify areas for modernization.

Thus, the application of a multi-level methodology combining quantitative and qualitative approaches provided a comprehensive study of the economic consequences of the destruction of water supply systems. Comprehensiveness, interdisciplinarity and the use of various sources made it possible to obtain scientifically based results relevant for the further development of strategies for the restoration and modernization of water infrastructure in Ukraine.

5. Results and Discussion

Russian aggression on the territory of Ukraine has caused unprecedented destruction of the natural environment, which manifests itself in significant destruction of ecosystems and large-scale pollution of air, soil, and water resources. According to the State Environmental Inspectorate of Ukraine [10], since the beginning of the full-scale invasion, the amount of damage caused to the environment is UAH 6.01 trillion, in particular, significant losses were caused due to pollution and littering of water resources in the amount of UAH 117.8 billion.

It should be noted that the volume of destruction of water infrastructure directly affects the economic stability of households and enterprises, because water supply is a critical component of the life of the population and production processes. Therefore, the assessment of economic losses in the context of water resources restoration is an important aspect of management decisions in the field of sustainable development and reconstruction of the country.

As of September 2025, only 68% of Ukraine's population had access to centralized water supply, leaving an estimated 1.7 million children without safe access to drinking water. In rural areas, the disproportion is even more critical – only 26% of settlements are provided with centralized water supply compared to 97% of cities [11]. These data confirm the systemic inequality in access to water resources and demonstrate the need for priority intervention in infrastructure restoration.

It is noteworthy that a third of all drinking water samples in Ukraine do not meet national standards. In comparison, EU countries such as Germany report only 0.1% non-compliance, while Austria retains 1.0% [11]. Therefore, the presented indicators allow us to assess the scale of the problem and emphasize the urgent need to modernize water supply systems to achieve compliance with international water safety standards.

It is worth noting that the low level of access to safe water creates preconditions for socio-economic risks, including increased household spending on alternative water sources and limited production capacity of the agricultural and industrial sectors. At the same time, the analysis of the current situation indicates the need for comprehensive investments in the restoration and modernization of water infrastructure, which is of strategic importance for the economic security of the state and for reducing the negative impact on ecosystems.

Hostilities significantly intensified the process of degradation of infrastructure systems that were already in critical condition. According to available data [11], the scale of destruction covers about 39.7 thousand km. km of water supply networks, while the total economic losses of the sector are estimated at USD 4.6 billion. USA. In view of this, the situation in Ukraine demonstrates an unprecedented level of damage, which necessitates a comprehensive analytical rethinking of the mechanisms for the restoration of engineering systems.

It is noteworthy that the regional structure of losses correlates with the spatial dynamics of hostilities. Thus, the Luhansk region suffered potential losses in the amount of about USD 1.6 billion. USA, Kharkiv region – USD 831 million. USA, Zaporizhzhia region – USD 546 million. The Donetsk and Kherson regions are also characterized by critically high rates of infrastructure destruction. In this context, there is a clear relationship between the intensity of military operations and the level of degradation of water supply systems, which confirms the territorial unevenness of economic consequences [11].

It is also significant that the restoration of water infrastructure is a prerequisite for the stabilization of the socio-economic development of the regions. In this case, it is important to take into account the risks of future resource vulnerability, in particular possible water shortages in industrial agglomerations and agricultural clusters. Therefore, the generalization of these provisions shows that

the assessment of resource vulnerability risks requires a detailed analysis of the actual structure of water use in different sectors of the economy. It is the quantitative characteristics of water consumption and waste generation that make it possible to identify the industries with the greatest dependence on the stable functioning of water supply systems and to outline the potential scale of economic losses in case of their destruction. In view of this, it is advisable to refer to the generalized statistical data presented in Table 1.

Table 1. Water use and waste by type of activity (million cubic meters)

Name	Number of reports/submissions	Total use of natural resources	Use of water for drinking and sanitation	Use for Manufacturing/ Industry	Use for irrigation	General waste
[A] Agriculture, forestry and fisheries	4326	439.019	5.033	207.3	189.99	205.503
[B] Mining and quarrying	380	65.341	4.831	49.758	0.003	148.952
[T] Household activities	2	0.008	0.008	–	–	–
[98] Activities of households as producers of goods and services for their own consumption	2	0.008	0.008	–	–	–
[98.1] Activities of households as producers of goods for their own consumption	1	0.008	0.008	–	–	–
[98.10] Activities of households as producers of goods for their own consumption	1	0.008	0.008	–	–	–
[98.2] Activities of households as producers of services for their own consumption	1	–	–	–	–	–
[98.20] Activities of households as producers of services for their own consumption	1	–	–	–	–	–

Source: Compiled based on [17].

The presented statistical data reflect the volume of water resources use and waste generation in the context of the main types of economic activity of Ukraine. In the reporting structure, the largest number of submissions is provided by the sector of agriculture, forestry and fisheries (4326 reports), which determines its dominance in the general system of accounting for nature management. In view of this, this sector is distinguished by the largest total volumes of natural resources – 439.019 million m³, which indicates a high level of dependence of agricultural production on the availability of water resources.

It is significant that within this sector, the volume of water use for production needs reaches 207.3 million m³, while irrigation accounts for 189.99 million m³, which indicates a significant water intensity of the agricultural sector. At the same time, the need for drinking and sanitary water remains relatively low (5.033 million m³), which is logical given the specialized nature of water use in agriculture. Along the way, it is worth focusing on the fact that significant volumes of waste are generated in this sector – 205.503 million m³, which creates an additional burden on ecosystems and increases the risks of degradation of soil and water resources.

The mining industry, despite a relatively small number of reporting submissions (380), demonstrates a tangible scale of water use, in particular 49.758 million m³ for production needs and 4.831 million m³ for sanitary consumption. The total volume of natural resources used by the industry is 65.341 million m³, while the total waste reaches 148.952 million m³.

In the segment of household activities, represented by separate statistical codes [T], [98], [98.1], [98.10], the minimum use of water is recorded - only 0.008 million m³, and exclusively for drinking and sanitary needs. These indicators are expectedly low given the nature of self-consumption activities. It is noteworthy that in the context of the study of economic losses from the destruction of water supply systems, these categories of households constitute an important benchmark for assessing the minimal but socially significant level of water dependence of the population.

In a broader analytical context, the comparison of the industrial and agricultural sectors demonstrates a significant difference like water use: the agricultural sector is characterized mainly by the consumption of natural water in an unchanged state, while industry causes significantly higher volumes of contaminated waste. The recorded discrepancies in the water use profiles of industries, in particular the different levels of load on natural resources and the volume of formation of polluted effluents, create an important analytical basis for further consideration of infrastructure constraints in the water supply sector. In this sense, it is appropriate to focus on the fact that the vulnerability of water systems is exacerbated by multidirectional sectoral needs, as well as by the critical condition of basic water infrastructure facilities, which determines the ability of the economy to ensure stable and uninterrupted water supply. It is in this context that the analysis of the technical deterioration of drinking water supply systems and its consequences for the functioning of the municipal and industrial sectors is important.

Therefore, the unsatisfactory technical condition of drinking water supply systems leads to a significant increase in operating costs, which in turn leads to an increase in the cost of relevant services. Under such conditions, the activities of water supply and sewerage enterprises become unprofitable, which causes a shortage of working capital and, accordingly, makes it impossible to update fixed assets. It is noteworthy that over the past three decades, the construction and commissioning of new water supply facilities has been practically stopped, while the reconstruction and modernization of existing structures and networks is carried out at an extremely slow pace.

In this context, it is significant that military aggression has significantly exacerbated existing problems, causing large-scale destruction of water infrastructure facilities critical for the functioning of the agricultural sector. Among the most affected elements are irrigation canals, pumping equipment and tank systems, the total damage of which is estimated at USD 740.2 million. The need for recovery over the next decade reaches USD 10.7 billion. USA. Incidentally, it should be noted that within two years, the intensity of destruction in the irrigation and water sectors increased by 95%, which is directly related to the explosion of the Kakhovka hydraulic structure on June 6, 2023 [3].

In the light of these trends, the modernization of drainage and irrigation systems should be considered as a priority area of state policy, because their functioning determines the productivity of agricultural production, as well as the degree of anthropogenic load on natural ecosystems. It is pertinent to note that modernization measures can reduce the volume of pesticides entering water bodies, as well as increase the resilience of Ukrainian landscapes to hydrometeorological risks, in particular floods and droughts, in the context of progressive climate change. At the same time, the continuation of hostilities forms additional barriers to the restoration of infrastructure, increasing uncertainty about the timing and scope of reconstruction. Significantly, the prolonged nature of destruction causes cumulative economic losses that cover household, agricultural and industrial segments, which complicates the formation of long-term water management strategies.

Summarizing the above provisions, it is worth emphasizing that the complex impact of war destruction on important sectors of the economy leads to a significant increase in the need for the restoration of critical infrastructure, particularly in the field of water resources and irrigation. That is why it is appropriate to present the generalized parameters of the necessary investments in Table 2.

According to Table 2, the total financial needs for the reconstruction and restoration of irrigation and water management systems in 2025–2035 will amount to USD 10936.0 million. USA. The given value of the indicator reflects the scale of accumulated losses and the need for comprehensive restoration of infrastructure elements. It is noteworthy that the aggregate needs are structured in two main directions: reconstruction of existing facilities and resumption of service provision, which allows assessing the technical and functional dimension of future investments.

First of all, the reconstruction amounts to USD 4161.0 million. This emphasizes the critical state of the state irrigation infrastructure and related hydraulic structures. The largest share in this category is the modernization and expansion of four important systems: Kakhovka, Severo-Rogachin, Syrohozh and Prinzovskaya, the total need of which reaches USD 1278.3 million. USA. Taking into account the territorial specifics of these massifs, they are characterized by the highest concentration of environmental and economic risks and determine the potential of agricultural production in the southern regions of Ukraine. At the same time, the reconstruction of the state irrigation infrastructure worth USD 2804.3 million. The United States indicates structural aging of systems, a long-term investment deficit and a high level of physical deterioration, which makes it impossible to have a stable water supply during the war and post-war period.

It should be emphasized that in the structure of the same category, the reconstruction of hydraulic structures of the Dnieper reservoirs with a need of USD 78.4 million is separately distinguished. USA. Given the strategic role of the Dnipro cascade in maintaining the country's water balance, these investments ensure the technical sustainability of structures and minimize the risks of systemic accidents that can potentially cause transboundary environmental consequences. Along the way, it should be noted that the restoration of hydrotechnical stability will contribute to the gradual equalization of regional differences in the provision of water resources, which has a significant economic effect for industrial centers and water-dependent agricultural enterprises.

Table 2. Irrigation and Water Resources: Total Recovery and Reconstruction Needs as of Time (USD million)

Category	Activities/investments	Total needs (2025–2035)
Reconstruction needs	Reconstruction, overhaul and modernization of state irrigation infrastructure	2804.3
	Reconstruction of hydraulic structures of the protective massifs of the Dnieper reservoirs	78.4
	Modernization and expansion of irrigation systems in four priority systems: Kakhovka, North Rohachin, Syrohoh and Prinzovska	1278.3
The needs of resumption of service provision	Restoration and modernization of water infrastructure	1439.8
	Restoration of the functionality of the state water resources monitoring system	1.5
	Restoration and construction of centralized water supply to rural settlements using imported water	93.4
	Restoration of drainage systems	1100.3
	Flood risk management measures	642.3
	Water Accumulation Projects	1500.0
	River revitalization measures	1562.0
	Technological support / equipment for on-farm irrigation for water user organizations	327.1
	Solar Energy Alternatives for Pumping Stations	108.5
Total	–	10936.0

Source: Compiled according to data [20, p. 125]. Note: The losses cover 34 months from February 24, 2022 to December 31, 2024; the losses cover a total of 52 months, which includes 34 months from February 24, 2022 to December 31, 2024 and an additional 18 months until June 30, 2026; The needs cover 10 years between 2025 and 2035.

The needs for resumption of the provision of services, which amount to USD 6775.0 million. The United States demonstrates an even wider range of problems related to the degradation of the country's water management potential. The costliest are water accumulation projects (USD 1500.0 million) and river revitalization measures (USD 1562.0 million). The presented directions are systemic in nature, as they provide for the restoration of natural hydrological dynamics, increasing the availability of water and increasing the ecosystem stability of river basins in the context of climate change. The volume of financial needs related to the restoration and modernization of water infrastructure (USD 1439.8 million) and drainage systems (USD 1100.3 million) is also significant. Given the importance of these elements for the efficient operation of irrigation systems, their degradation creates dominant risks of secondary flooding, increased soil mineralization and loss of fertility in the agricultural sector. It is appropriate to emphasize that these investments are decisive for the long-term reconstruction of agricultural potential, especially in regions with an arid climate, where alternatives to artificial moisture are extremely limited.

A notable element is the financing of flood risk management measures, which amounts to USD 642.3 million. USA. In the context of climate change, intensification of extreme hydrometeorological phenomena and destruction of water infrastructure, these measures protect households and industrial enterprises from potential economic losses. It is worth emphasizing that the integration of flood management with other areas of water policy allows for the formation of a more sustainable system of territorial planning, coordinated with the needs of post-war recovery.

In addition, a separate group is made up of investments in technological support for on-farm irrigation (USD 327.1 million) and alternative energy sources for pumping stations (USD 108.5 million). Given the high energy intensity of water lifting processes, the diversification of energy supply helps to reduce the cost of irrigation services and increase the autonomy of systems in critical conditions. In this context, it is advisable to emphasize that the technological re-equipment of the water sector is the basis of its long-term competitiveness. Special attention needs to be paid to the indicator of the restoration of the functionality of the state water resources monitoring system, which is estimated at only USD 1.5

million. USA. Despite its insignificant specific weight, this direction is important, as it provides verification of hydrological data, the formation of accurate forecasts and management decisions based on evidence-based information. Summing up, we note that taking into account the above generalized indicators allow us to move on to a broader analysis of the prerequisites of current imbalances, because it was the basic level of availability of water services that determined the system's resistance to exogenous shocks.

Therefore, the access of the population of Ukraine to wastewater supply and treatment services remained insufficient even before the outbreak of hostilities: the corresponding coverage rates were 70% and 50% of the population, which indicates a significant inequality between urban and rural areas [3]. In this context, the level of water supply and sanitation generally did not meet what was expected for the state, which focuses on harmonizing industry standards with the requirements of the European Union in the field of water policy. At the same time, structural imbalances in access to water services created additional prerequisites for the accumulation of infrastructure risks in the event of any crisis disturbances.

Hostilities have significantly exacerbated these problems, causing interruption or significant degradation of the quality of water supply for millions of citizens [3]. Large-scale destruction of networks, damage to water facilities and prolonged power outages have complicated the functioning of systems for the provision of relevant services throughout the country. It is noteworthy that according to UNICEF-sponsored WASH cluster estimates, in 2024 alone, up to 9.6 million people needed urgent provision of basic water supply and sanitation services, and about 1 million citizens lost access to drinking water as a result of the destruction of the Kakhovka hydroelectric structure [3]. The above data indicate the depth of systemic violations in ensuring water security and confirm the scale of socio-economic losses caused by the destruction of critical infrastructure.

Further analysis confirms that the total losses to the water supply and sanitation sector are estimated at almost USD 4 billion. The total need for reconstruction and recovery for 2024-2033 is USD 11.1 billion. USA [3]. The above data, in turn, demonstrate a high level of capital intensity of the industry and indicate a significant number of deferred investments that needed to be implemented even before the start of the full-scale war. Along the way, it is worth emphasizing that under the condition of the infrastructure is unsatisfactory, even local destruction leads to cumulative economic losses, covering the household, agricultural and industrial segments. Taking into account the outlined systemic risks, further analysis should be supported by quantitative data reflecting the territorial differentiation of economic consequences in the water supply and sanitation sector (Table 3).

Table 3. Water supply and sanitation: losses, losses and needs by regions (USD million)

Area	Damages	Losses	Needs
Nationwide (no specific region)	–	12150.8	2756.3
Zaporizhzhia	545.8	58.6	1000.1
Sumy	19.6	0.9	34.7
Rivne region	0.0	0.0	0.1
Poltava	14.8	0.2	25.7
Odesa	31.3	0.4	54.4
Mykolaiv	80.5	5.5	144.4
Luhansk	1590.5	247.0	2990.6
Kyiv	171.7	16.1	312.4
Kherson region	368.7	41.7	677.6
Kharkiv	831.2	91.7	1525.6
Donetsk region	514.6	42.8	930.4
Dnipropetrovsk	104.2	2.1	181.9
Chernihiv region	328.8	50.8	618.0
Cherkasy	0.6	0.1	1.1
Total	4602.4	12708.7	11253.3

Source: compiled according to data [20, p. 157]. *Note:* The losses cover 34 months from February 24, 2022 to December 31, 2024; the losses cover a total of 52 months, which includes 34 months from February 24, 2022 to December 31, 2024 and an additional 18 months until June 30, 2026; The needs cover 10 years between 2025 and 2035.

The analysis of the data presented in Table 3 indicates a distinct territorial differentiation of economic losses and needs in the field of water supply and sanitation in Ukraine. In general, losses

throughout the country for 34 months of the conflict are estimated at \$4.6 billion. USD, while the total losses cover USD 12.7 billion. and the needs for recovery and reconstruction are USD 11.3 billion. USA. It is noteworthy that the largest losses and needs are concentrated in Luhansk (losses – USD 1.59 billion, needs – USD 2.99 billion), Kharkiv (losses – USD 0.83 billion, needs – USD 1.53 billion) and Zaporizhzhia (losses – USD 0.55 billion, needs – USD 1.0 billion) regions. In addition, it should be noted that in some regions (Zakarpattia, Volyn, Vinnytsia, Ternopil, Lviv, Ivano-Frankivsk, Kyiv (city), Kirovohrad, Khmelnytskyi, Chernivtsi) data on damages, losses and needs are absent or not subject to assessment, which emphasizes the lack of empirical data and the need for additional regional research. Therefore, the above state of affairs indicates the importance of integrating information systems for monitoring and assessing infrastructure risks into the national water management policy.

The overall picture indicates an urgent need for priority funding for restoration work in the affected regions. Particularly noteworthy is the fact that critically affected regions account for more than 70% of total recovery needs, which points to the strategic importance of a differentiated approach to investment and reconstruction planning. Emphasizing the above, we note that the restoration of water supply and sanitation in Ukraine requires significant financial resources, as well as an integrated approach to management, i.e. taking into account territorial risks, coordination between central and local authorities and the use of modern technologies to increase the resilience of systems to future crisis impacts. Along the way, this demonstrates that effective water resources management is an important factor in ensuring socio-economic stability and minimizing cumulative losses in the event of repeated emergencies.

6. Conclusions

Based on the study, it should be stated that the destruction of water supply and water infrastructure in Ukraine as a result of military aggression has led to a significant increase in economic losses in households, agricultural and industrial sectors, at the same time exacerbating the existing disparities in access to water resources between urban and rural areas. The analysis of the structural characteristics of water use demonstrates the high dependence of the agricultural sector on water resources, and industry – on the stability of water supply and the efficiency of waste management, which confirms the need for priority restoration of critical infrastructure facilities. At the same time, the territorial differentiation of losses and reconstruction needs indicates the concentration of more than 70% of financial resources in the most affected regions, such as Luhansk, Kharkiv and Zaporizhzhia, which determines the strategic importance of differentiated investment and reconstruction planning. Therefore, the results of the study emphasize the relevance of an integrated approach to the modernization of water supply systems, including the restoration of irrigation and drainage networks, the use of modern technologies and increased monitoring, which are decisive for ensuring socio-economic stability and the sustainability of water management in the context of post-war recovery.

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Media as a Partner of State Authorities: Management Models of Interaction in the Context of Democratic Development

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The article examines the interaction between mass media and state authorities as a key factor in the development of democratic institutions and effective governance in the information society. It is argued that media perform a multidimensional function: they serve as a communication channel, a social institution of public oversight, and a transformative resource for shaping public opinion and the public agenda. The theoretical part defines the concept of "state-media partnership" through three components: informational, supervisory, and collaborative, based on which a model of interaction is proposed that ensures media autonomy, pluralism of opinions, and citizen participation in shaping the public agenda. The methodological framework of the study includes an analysis of national and European legislation (the Constitution of Ukraine, Laws of Ukraine "On Information," "On Access to Public Information," "On Media"; the EU Charter of Fundamental Rights; European Court of Human Rights practice), a comparative analysis of international press freedom indices, and an assessment of the Ukrainian media landscape in the context of political transformation and Russia's hybrid aggression. The empirical part identifies the following patterns: media contribute to citizen socialization, the development of political culture, and civic engagement, while their independence is often limited by economic and political dependence; structural heterogeneity and concentration of media ownership create risks of manipulation and political confrontation; the development of digital platforms increases the speed and efficiency of communication but requires enhanced journalistic professionalism and legal regulation. Based on these results, practical recommendations are proposed: ensure editorial autonomy of media, promote pluralism and social responsibility, integrate media into public governance processes through transparent and reciprocal communication mechanisms, harmonize national legislation with European standards, and develop the institutional capacity of state authorities in the field of information policy. The scientific novelty lies in integrating national legislation, international standards, and media practices into a comprehensive model of state-media partnership, which allows evaluating the quality of interaction, predicting the democratization effect of the information space, and forming management decisions aimed at increasing transparency, efficiency, and public trust.



KEYWORDS

mass media, state authorities, partnership, democratic development, freedom of speech, media pluralism, information policy, digital platforms, institutional capacity, criteria for interaction effectiveness.



Медіа як партнер державної влади: управлінські моделі взаємодії в умовах демократичного розвитку

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СТАТТЯ	АНОТАЦІЯ
Дослідницька DOI: 10.70651/3041-2498/2025.11.05 Отримана: 25.09.2025 р. Прийнята: 06.11.2025 р. Опублікована: 15.11.2025 р. Авторське право © 2025 автора  Цей твір ліцензовано на умовах Ліцензії Creative Commons «Із Зазначенням Авторства – Некомерційна 4.0 Міжнародна» (CC BY-NC 4.0).	У статті досліджено взаємодію засобів масової інформації з органами державної влади як ключовий чинник розвитку демократичних інститутів і ефективного управління в інформаційному суспільстві. Обґрунтовано, що медіа виконують багатовимірну функцію: вони виступають каналом комунікації, соціальним інститутом суспільного контролю, трансформаційним ресурсом для формування громадської думки та публічного порядку денного. Теоретична частина окреслює поняття «партнерство держави і медіа» через три складові: інформаційну, контрольну та партнерську, на основі чого запропоновано модель взаємодії, що передбачає автономію медіа, плюралізм думок та участь громадян у формуванні суспільного порядку денного. Методологічна основа дослідження включає аналіз національного та європейського законодавства (Конституція України, Закони України «Про інформацію», «Про доступ до публічної інформації», «Про медіа»; Хартія ЄС про основоположні права; практика ЄСПЛ), порівняльний аналіз міжнародних індексів свободи преси та оцінку українського медіаландшафту в умовах політичної трансформації та гібридної агресії РФ. Емпірична частина виявляє такі закономірності: медіа забезпечують соціалізацію громадян, сприяють формуванню політичної культури та громадської активності, водночас їхня незалежність часто обмежується економічною та політичною залежністю; структурна різноманітність і концентрація медіавласності створюють ризики маніпуляцій та політичного протистояння; розвиток цифрових платформ підвищує швидкість і ефективність комунікацій, але потребує посилення професіоналізації журналістики й правового регулювання. На підставі отриманих результатів запропоновано практичні рекомендації: забезпечити редакційну автономію медіа, стимулювати плюралізм і суспільну відповідальність, інтегрувати медіа у процеси публічного управління через прозорі і взаємні механізми комунікації, гармонізувати національне законодавство із європейськими стандартами та розвивати інституційну спроможність державних органів у сфері інформаційної політики. Наукова новизна полягає в інтеграції національного законодавства, міжнародних стандартів і практик функціонування медіа в комплексну модель партнерства держави та медіа, що дозволяє оцінювати якість взаємодії, прогнозувати ефект демократизації інформаційного простору та формувати управлінські рішення, орієнтовані на підвищення прозорості, ефективності та довіри громадян.



КЛЮЧОВІ СЛОВА

засоби масової інформації, державна влада, партнерство, демократичний розвиток, свобода слова, медіаплюралізм, інформаційна політика, цифрові платформи, інституційна спроможність, критерії ефективності взаємодії.

1. Introduction

In modern democratic countries, the media (hereinafter referred to as the media) are often characterized as the “fourth estate” or “right hand of democracy”, since they play a key role in shaping public opinion and political assessments. Television, print media, radio and Internet portals provide citizens with access to information, facilitate discussion of political events and increase the level of public awareness. At the same time, politicians are in the constant field of attention of the media, they are forced to respond to critical questions, explain the decisions made and their actions, since public resonance in the media can directly affect their political careers. Information disseminated by the media often becomes an instrument of political competition, and individual media scandals can lead to the loss of office or a decrease in the public authority of a politician.

In this context, the media are not only a source of information, but also a powerful tool for political influence and regulation of social processes. That is why the issues of building effective interaction between government agencies and the media, as well as the development of a high-quality information policy, are extremely relevant. For Ukraine, which has chosen a democratic path of development, such interaction should be based on the principles of protecting the rights and freedoms of citizens, legality, respect for order, civic activity, equality and tolerance. Ensuring harmonious cooperation between state institutions and the media is an important prerequisite for the stable functioning of the political and social system and the strengthening of democratic values.

2. Literature Review

The problems of interaction between the media and state power in modern Ukraine are one of the key ones in the context of building an effective, transparent and democratic political system. In recent years, there has been a tendency to rethink the role of the media as a partner of state institutions, which not only informs citizens, but also influences managerial decision-making, the formation of public opinion and the increase of the legitimacy of political actions.

The problems of interaction between the media and state power in modern Ukraine are one of the key ones in the context of the formation of an effective, transparent and democratic political system, because the media perform the function not only of informing citizens, but also of an intermediary in the process of managerial decision-making and the formation of public opinion, which is emphasized by D. Bulgakov [1]. At the same time, P. Verbytskyi [13] emphasizes that the effectiveness of this interaction depends on the extent to which state bodies are able to organize communication on the principles of openness and accountability, and journalists are able to adhere to professional ethics and ensure the availability of information for citizens. Thus, the role of the media goes beyond the traditional coverage of events and becomes a tool for shaping public opinion, capable of influencing the legitimacy of political decisions, as N. Volos notes [21].

I. Parubchak [7] emphasizes that the integration of traditional and digital platforms increases the transparency of management processes and ensures deeper public involvement, creating prerequisites for effective interaction between the government and society. In this context, the media cease to be just a communication channel and turn into a partner of the state in the formation of a political order, where the balance between control and freedom of speech determines the quality of democratic procedures, R. R. Sharipov emphasizes [12].

At the same time, the regulatory framework for interaction between the media and the state determines the boundaries and methods of this interaction. The Constitution of Ukraine [17], the European Convention on Human Rights [14], the International Covenant on Civil and Political Rights [15], as well as the laws “On Access to Public Information” [19] and “On Media” [20] enshrine the principles of transparency, openness and accountability of authorities. M. Kudina [4] emphasizes that compliance with these principles directly affects the level of freedom of speech and public trust in political institutions, forming the basis for partnership between the media and state bodies.

D. Bulgakov [1] notes that the implementation of this partnership implies that the media not only cover the activities of the authorities, but also actively contribute to increasing the transparency and accountability of management decisions, providing the possibility of public control. O. Zahirnyi [25] adds that the institutionalization of communication channels through the media makes it possible to

formalize the processes of information exchange and regulate information flows, which increases the efficiency of management procedures and reduces the risk of information manipulation.

Y. Yakovenko [22] and R. Sharipov [12] emphasize that modern partnership models combine traditional forms of control with innovative approaches to public engagement, which ensures transparency, openness and social legitimacy of decisions. At the same time, as N. Volos notes [3], such systemic interaction contributes to the development of civic activity and strengthening social trust in political institutions.

The introduction of effective management models of partnership between the state and the media is critical for the democratic development of Ukraine, ensuring a balance between freedom of speech and public responsibility, as well as for increasing citizens' trust in political institutions, M. McCombs and D. Shaw emphasize [6]. Thus, the formation of systemic interaction that integrates regulatory, technological and communication aspects is a key task of the Ukrainian political system in the period of democratic transformations.

Thus, modern scientific opinion shows that the media in the conditions of democratic development are not only a source of information, but also an active partner of state power. They contribute to the formation of public opinion, increasing trust in political institutions, ensuring transparency and accountability of decisions, as well as the integration of citizens into the process of managerial decision-making. The implementation of effective management models of interaction between the state and the media is critically important for the development of a democratic political system and strengthening social stability in Ukraine.

3. Problem Statement

The purpose of the study is to analyze the interaction of state bodies and the media as a key factor of effective governance in the context of democratic development, to determine models of cooperation and levels of media involvement in information policy, as well as to formulate criteria for assessing "high-quality" communication between the government and society. The paper provides for the study of modern approaches to the organization of interaction between public authorities and the media, analysis of information exchange channels, methods for ensuring transparency and accountability of public authorities, as well as practices of public involvement through media resources that help strengthen public trust and increase the effectiveness of managerial decisions.

4. Methods and Materials

In the process of studying the interaction of the media with public authorities, a set of qualitative methods was applied, which made it possible to comprehensively analyze the essence, forms and features of communication between the authorities, the media and the public. The methodological basis is a systematic approach, which allows us to consider public administration and the media space as an integral social and administrative system, where interaction with the media is an integral element of democratic development.

The paper uses the analysis and synthesis of scientific sources, which provided the identification of the theoretical foundations of the concept of "partnership between the government and the media", the clarification of its content in the domestic and foreign scientific tradition, as well as the systematization of approaches to assessing the effectiveness of information interaction in public administration.

The application of the comparative method made it possible to investigate different models of interaction between state institutions and the media in the countries of the European Union and to identify practices relevant to the Ukrainian context. The comparison was based on the analysis of scientific publications, recommendations of the Council of Europe, the European Union and other international organizations, as well as documents regulating freedom of speech, media pluralism and citizens' access to information.

An important tool was the content analysis of regulatory legal acts of Ukraine, in particular the Laws "On Information", "On Access to Public Information", "On Media" and the Constitution of Ukraine, as well as regulatory documents of the National Council on Television and Radio Broadcasting. This method made it possible to find out how much the legislative framework contributes to ensuring freedom of speech, media independence and public accountability of authorities.

A structural and functional analysis was also applied, which made it possible to reveal the relationship between the functions of public administration and the role of the media in the formation of public opinion, increasing the transparency of managerial decisions and the development of democratic communication.

The method of analysis of documents and practices of information interaction is used, which includes the study of official websites of government bodies, public reports, information campaigns, press releases, communication strategies and public consultations. This made it possible to assess the real mechanisms of cooperation between the state and the media in Ukrainian conditions, as well as the level of openness and accountability of the authorities.

To summarize the results obtained, a logical-generalizing method was used, which contributed to the formation of analytical conclusions on the effectiveness of the existing models of partnership between the government and the media, as well as to outline the directions for improving the communication policy of state bodies.

Thus, the selected methodological toolkit provided a comprehensive disclosure of the topic, allowing to combine theoretical analysis, legal assessment and study of practical experience of interaction between the state and the media as a key factor in democratic development and improving the efficiency of governance.

5. Results and Discussion

In modern society, the media have acquired the status of one of the leading institutions of social communication, which play an important role in the processes of public administration, political mobilization and public control. The media have become an integral part of social and political life, forming an extensive system of interaction with state authorities. This interaction presupposes the coordination of actions, the presence of a common goal, the professional competence of the parties and the provision of high standards of information activity [13, p. 21].

This partnership is not a purely technical form of communication between the government and society, but is a multidimensional process within which new management models of cooperation are formed. Such models are aimed at updating, modernizing and increasing the efficiency of both participants in the communication process. At the same time, Y. Yakovenko argues that the interaction between state structures and the media is not always based on a complete coincidence of positions or assessments of individual political and social decisions, which sometimes leads to the emergence of certain conflict situations or even information confrontation [22, p. 76].

In the context of the development of democratic institutions, the media are considered not only as a communication channel, but also as a powerful transformative resource capable of influencing the formation of managerial decisions, public moods and political culture of society. Modern media provide the process of socialization of the individual, acting as a means of transmitting information that adapts in accordance with the level of knowledge, cultural experience and the value system of the individual [21]. It is through this channel that citizens are integrated into the socio-political space of the state.

In the conditions of the information society, the possession of reliable, timely and structured information becomes one of the most significant management resources. The ability to use it effectively determines the competitiveness of both individual institutions and the state as a whole, allowing to optimize the use of material, human and organizational resources [7, p. 241].

An indicator of the maturity of the democratic development of the state is the level of implementation of freedom of speech – a fundamental value that testifies not only to the legal culture, but also to the strength of democratic principles, the establishment of the rule of law. The right to freedom of expression is enshrined in Article 10 of the Convention for the Protection of Human Rights and Fundamental Freedoms (1950), ratified by the Verkhovna Rada of Ukraine in 1997.

At the same time, the Convention allows for certain restrictions if they are provided for by law and are necessary to protect national security, territorial integrity, public security, morality, reputation or rights of others. Thus, freedom of speech is considered not as an absolute category, but as an instrument of democratic governance, balancing between the citizen's right to information and the responsibility of the state for maintaining social stability.

Similar provisions are contained in Article 19 of the International Covenant on Civil and Political Rights (1966), which repeats the basic principles of the Convention and clarifies the limits of the exercise of freedom of expression in the global dimension [15].

The law enforcement practice of the European Court of Human Rights has significantly contributed to the development of the national legislation of the Member States in the field of protection of the right to information. The case “Leander v. Sweden” (1987) is indicative, in which the Court concluded that the state does not have a general obligation to provide access to any information [14, p. 4]. At the same time, further judicial practice has expanded the content of Article 10 of the Convention, extending its effect to public information of public interest.

In particular, in the case of *Hungarian Helsinki Committee v. Hungary*, the ECtHR identified four criteria, the restriction of which can be qualified as interference with freedom of expression: the purpose of the requester, the nature of the information, the role of the requester and the readiness of the requested information. In the judgment in the case of *Studio Monitor v. Georgia*, the Court emphasized the need to specify the specific purpose of the information request, stressing at the same time that the freedom of journalistic investigations is not absolute and must be correlated with the requirements of national legislation [22, p. 76].

Strengthening the democratic foundations of the social order is impossible without the institutionalization of transparent and balanced relations between public authorities and the media, which ensure the openness of the authorities, accountability of their actions and the development of civil control. In this context, the formation of legal mechanisms to guarantee freedom of speech, media pluralism and unhindered access to information is of particular importance.

At the supranational level, the fundamental document in this area is the Charter of the European Union on Fundamental Rights, Article 11 of which enshrines freedom of expression, freedom to receive and impart information, as well as guarantees of media pluralism as a key principle of the functioning of a democratic society [2]. This norm reflects the deep idea of the European legal order – the recognition of the media not only as a technical tool of communication, but as an independent public institution designed to ensure a balance between the authorities, society and citizens.

In the Ukrainian legal field, constitutional guarantees of freedom of speech and the right to information are enshrined in Article 34 of the Constitution of Ukraine, which defines the right of every citizen to freely collect, store, use and disseminate information in any lawful way. At the same time, it is envisaged that the exercise of this right may be limited in order to protect national security, territorial integrity, public order, healthcare, reputation of others, prevent the disclosure of confidential information or maintain the authority of justice [17]. This formulation demonstrates the desire to harmonize national legislation with pan-European standards in the field of information human rights.

The legal regulation of information relations in Ukraine is provided by a set of special regulatory legal acts, among which the Laws of Ukraine “On Information”, “On Access to Public Information” and “On Citizens’ Appeals” occupy a key place.

The Law of Ukraine “On Information” defines the basic principles of the information policy of the state, outlining it as an integral system of directions and methods of activity aimed at creating, collecting, using, distributing, protecting and protecting information [16]. This document forms the normative basis for the functioning of the information space, within which managerial interaction between government institutions, the media and society is carried out.

The Law of Ukraine “On Citizens’ Appeals” specifies the mechanisms for exercising the constitutional right of citizens to participate in public administration by making proposals to improve the activities of government bodies, identifying shortcomings in the work of officials and appealing against their actions [18]. In this way, this act provides an institutional link between the authorities and society, in which the media often act as an intermediary and catalyst for public communication.

At the same time, the Law of Ukraine “On Access to Public Information” plays a special role in the establishment of open government, as it establishes legal mechanisms for exercising everyone’s right to access information in the possession of state authorities, local governments, as well as other managers of public information [19]. Defining clear procedures, deadlines and grounds for refusal to provide information is an important step towards ensuring the transparency of the activities of state institutions and strengthening citizens’ trust in the authorities.

An important stage in the development of national information legislation was the adoption in 2023 of the new Law of Ukraine “On Media”, which adapts the domestic legal system to the standards of the European Union. This law regulates the activities of the media on the principles of transparency,

impartiality, good faith and equality, determines the legal status, competencies and powers of the National Council of Television and Radio Broadcasting of Ukraine [20]. Its adoption was the fulfillment of one of the key requirements for Ukraine's European integration progress, which testifies to the state's desire for systematic harmonization of domestic norms with the European legal space.

The Law "On Information" also defines information policy as a set of strategic directions and practical tools of state activity regarding the collection, distribution, use and storage of information [16; 13, p. 23]. The main priorities of the modern information policy of Ukraine are: affirmation of freedom of speech and press, ensuring unhindered access of citizens to information, maintaining political pluralism, preventing censorship and obstruction of journalists' professional activities, as well as creating a competitive, high-quality information product in order to integrate the national media space into the European and world contexts [1, p. 134].

To conduct an effective state information policy in Ukraine, researchers pay attention to the need (Fig. 1).

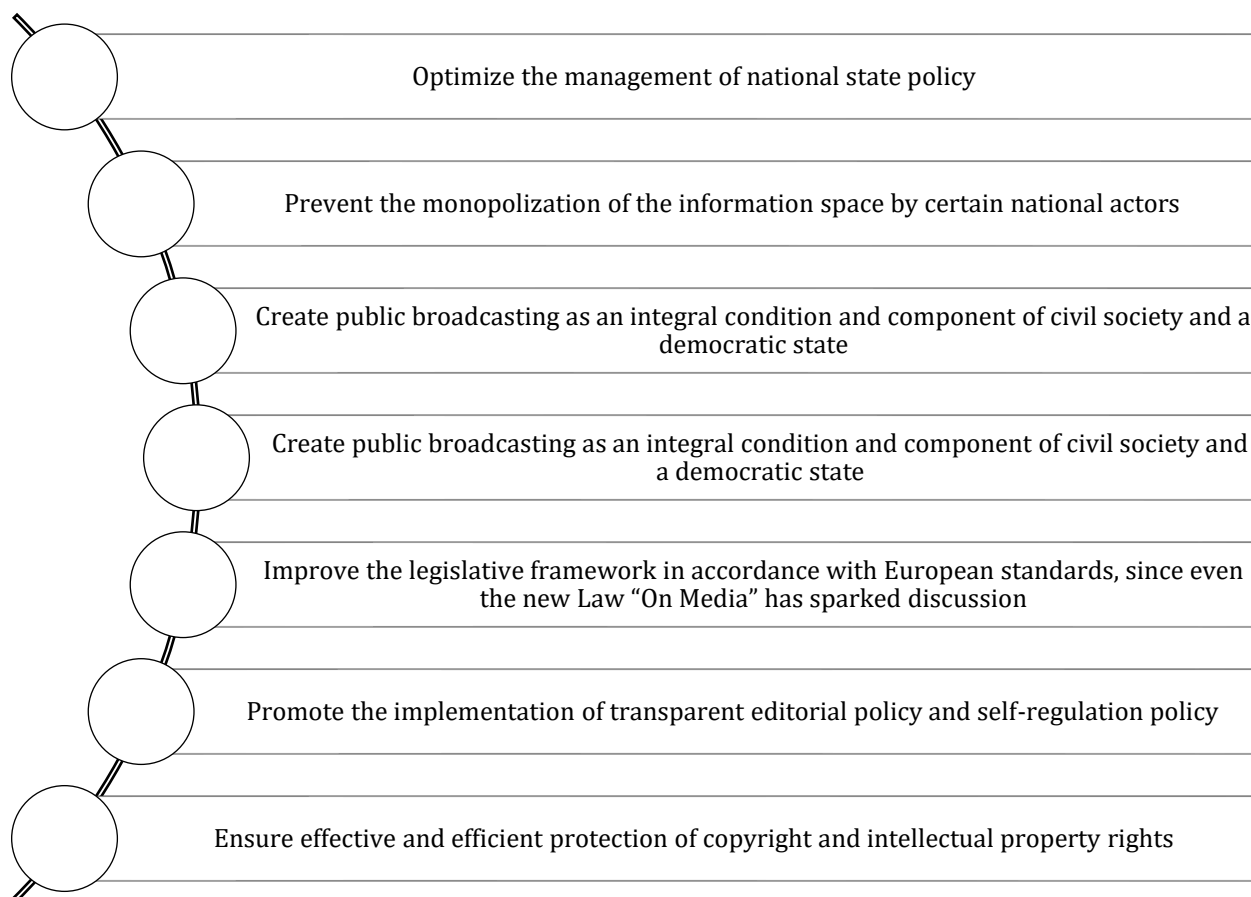


Figure 1. Leading Directions for Ensuring Effective State Information Policy in Ukraine

Source: Compiled by the author based on [22, p. 77–78].

In the scientific discourse, different approaches to the typology of models of interaction between the media and state power have developed. In this context, the typology proposed by American researchers F. Siebert, T. Peterson and V. Schramm, who identified four basic models: totalitarian, authoritarian, liberal and socially responsible [25, p. 57], is considered classic. The further evolution of scientific thought is represented by the approaches of D. Gallin and P. Mancini, who, based on the criteria for the development of the media market, the level of political pluralism, professionalization of journalism and the degree of state participation in the field of communications, identified three typical models: polarized pluralism, democratic corporatism and liberal [12, p. 188–189].

The substantive characteristics of these models are summarized in Table 1. Based on the data of Table 1, it should be noted that the discourse of democratic development is dominated by tendencies of institutionalization of partnership interaction between the state, civil society and the media, which

forms the basis for the creation of effective managerial models of communication in the information space.

Table 1. Typology of Models of Interaction between Mass Media and State Power

Model	Key Features	Functional role of the media	Examples of States/Political Systems
Totalitarian	Full state control over the information space; Censorship; monopolization of communication.	A tool for propaganda, legitimation of the regime, formation of ideological narratives.	Communist and National Socialist regimes of the twentieth century.
Authoritarian	The dominance of the government in determining the directions of media activities; partial privatization of the media while maintaining political control.	A means of controlling public opinion, stabilizing the political order.	Arab monarchies, post-Soviet autocracies.
Liberal (classical)	Freedom of speech, market competition, pluralism of opinions, lack of censorship.	The institution of public control, the arena of public discussions, the implementation of democratic values.	USA, Great Britain, Canada.
Socially responsible	Balance between freedom and ethical obligations to society; developed civil society.	Formation of moral standards, promotion of social dialogue and social integration.	Scandinavian countries.
Polarized pluralism	Low level of professionalization of journalists; political bias of the media; dependence on elites.	A channel of political struggle, a mouthpiece for the interests of individual parties or groups.	Italy, Spain, Greece.
Democratic corporatism	High professionalization of journalism, participation of social institutions in communication, self-regulation.	A means of maintaining a communication balance between the state, business and the public.	Germany, the Netherlands, Austria.
Liberal (according to Gallin and Mancini)	High level of autonomy of journalists; developed press market; minimal state intervention.	Independent media control, formation of a public space for discussion.	USA, Great Britain, Canada.

Source: compiled by the author based on [7, p. 243–244].

In modern democratic societies, the interaction between public authorities and the media is based on the principles of openness, publicity and communicative partnership. The mechanism of such interaction provides for close communication between the authorities and the public through the media sphere, which ensures the implementation of the right of citizens to receive objective, reliable and complete information about the activities of the state. The completeness and quality of information support of management processes directly affect the level of validity, fairness and effectiveness of political decisions, and therefore the legitimacy of the government itself in the eyes of society [25, p. 57–59].

In a democratic society, the media are considered not only as a communication channel, but as an autonomous social institution that performs the function of public control over the activities of government structures, forms the public agenda and creates space for the implementation of civil dialogue. The independence of the media from political elites, ensuring pluralism of opinions, the possibility of conducting a critical analysis of the government's activities – all this constitutes a fundamental criterion for the development of a democratic system. It is through the media that the formation of public consciousness, public understanding of political processes and the consolidation of citizens around common values take place.

In this context, public debates, the participation of independent experts in public discussions, and their presence in the media space – in print and electronic publications, on television, in social networks – play a key role. Such openness contributes to improving the quality of state decisions, strengthening the feedback between the authorities and society. Journalists, acting as intermediaries between citizens and government institutions, at the same time become catalysts for social activity: they stimulate public participation in public initiatives, charity events, solidarity campaigns, human rights movements, etc.

The prohibition of censorship is an integral feature of a democratic system. However, authoritarian political regimes often use the justification of censorship practices by the needs of national security, the fight against extremism or the protection of state secrets. In practice, such arguments often mask the desire to hide the facts of corruption abuses or political manipulation. Interference in media

activities, persecution of journalists, restrictions on freedom of speech not only violate fundamental civil and political rights, but also become a factor in destabilizing the political process, undermining trust in state institutions.

Ukraine currently occupies an intermediate place between the classical models of media-power relations, which characterizes it as a state with a transitional model. According to the classification of F. Siebert, T. Peterson and V. Schram, in the Soviet period there was a totalitarian model, which provided for the complete subordination of the mass media to state and party structures. With independence, the process of transformation of the communication paradigm began, within which the media gradually gained autonomy, expanded the thematic spectrum and diversified information formats, which indicates the movement towards the democratization of the media sphere.

At the same time, according to the typology of D. Gallin and P. Mancini, the modern Ukrainian media landscape has features of a model of polarized pluralism, which is characterized by a low level of professionalization of part of the journalistic community, significant dependence of the media on political, financial-industrial groups, and insufficient development of self-regulation mechanisms. However, there are prerequisites for a gradual transition to a democratic-corporate model, which provides for increasing the role of civil society in media control and strengthening the independence of journalism.

Mass media in modern Ukraine are increasingly integrated into the processes of public dialogue, organize public forums, meetings of citizens with representatives of political parties, public organizations, authorities, contribute to the formation of a culture of public discussion of managerial decisions [7, p. 241]. State authorities, in turn, use the media to inform the population, conduct communication campaigns, and popularize state projects and concepts.

The development of digital technologies and the integration of Ukraine into the global information space contribute to the intensification of communication processes, increasing the speed of information exchange both at the national and international levels [7, p. 242]. These trends necessitate the formation of a new model of interaction between the authorities, the media and civil society, based on the principles of trust, openness and mutual responsibility. In such conditions, effective participation of citizens in public processes is possible only if critical thinking, information literacy and civic engagement are developed.

An important component of effective interaction between the institutions of state power and the mass media is legislative support, which determines the legal framework for the functioning of journalistic activities and communication policy in the state. The legislative framework of Ukraine is generally based on the democratic principles of freedom of speech, openness and pluralism of opinions, but requires further improvement, harmonization with European standards and adaptation to the new challenges of the digital age [7, p. 247].

Despite the formal consolidation of the principle of media independence, the real state of the domestic information space is characterized by a significant influence of business and political groups. Ukrainian journalists state the existence of a systemic dependence of the mass media on oligarchic capital, which is manifested in editorial restrictions, selective coverage of events and non-transparent media ownership. In such conditions, information policy is formed under the influence of narrow group interests, which leads to distortion of the public picture of reality, manipulation of public opinion and a decrease in the level of trust in the media as a public institution. The deformation of the information space negatively affects the process of democratic decision-making and creates risks of increased political polarization.

In the scientific discourse, the need to create a public broadcasting system that would operate on the basis of editorial autonomy, financial transparency and independence from state and corporate structures is increasingly emphasized. Such broadcasting is considered as a key factor in building a socially responsible model of interaction between the authorities and the media, based on democratic values, self-regulation and partnership with civil society [16].

For the average citizen, the media remain the main source of information about the activities of government bodies, socio-economic processes and international events. Through the media, not only knowledge is formed, but also value guidelines, social narratives, and ideas about political reality. The specificity of the media lies in their dualistic nature: on the one hand, they are a product of public opinion, and on the other hand, they are a powerful tool for its formation [13, p. 22–23].

According to Y. Yakovlenko, in the ideal dimension, the media should perform the function of a communicative bridge between the state and civil society, ensuring the circulation of information,

transparency of management processes and accountability of the authorities to citizens. If the mass media express the positions of democratic institutions, ensure the representation of various social groups and at the same time form mechanisms of public control over the authorities, then this is what indicates the maturity of the democratic system [22, p. 79].

In Ukrainian realities, however, the information environment often acts as an arena of political confrontation between different elite groups. Political communication acquires a fragmented and conflicting character, which causes disintegration processes in society. Part of the media is under direct or indirect state control, the other is under the influence of private owners and political forces, which leads to selectivity in the presentation of materials, violation of standards of journalistic ethics and restriction of freedom of speech [23]. This situation reduces the level of public trust in the media and negatively affects the development of information democracy.

International institutions constantly monitor the state of freedom of speech in the world, which makes it possible to compare Ukrainian realities with global trends. Thus, according to the World Press Freedom Index, which is published annually by the international non-governmental organization Reporters Without Borders, in 2023, Norway, Denmark, Sweden, Ireland and Finland took the highest positions – countries where the maximum level of independence of journalism, high ethical standards and effective mechanisms for protecting freedom of speech are ensured [6]. Germany, traditionally considered a country with comfortable conditions for journalists, took 21st place in 2023 (compared to 16th in 2022), showing a certain downward trend in stability. A feature of the German media system is the combination of socially funded broadcasters with private commercial media, which creates a balance between economic efficiency and social responsibility.

Instead, the last, 180th place in the ranking is consistently occupied by North Korea – a state with a complete lack of freedom of speech, strict censorship, information isolation and repressive control over journalistic activities [3].

According to the international non-governmental organization Reporters Without Borders (RSF), Ukraine's position in the World Press Freedom Index has shown significant positive dynamics in recent years. Thus, in 2022, Ukraine ranked 106th, which reflected its starting position in the face of significant changes in the media space. In 2023, the country rose to the 79th position, demonstrating notable progress – an increase of 27 positions [8]. In 2024, the trend of improvement continued: Ukraine took 61st place, which indicates the further strengthening of freedom of speech and democratization of the media sphere [10]. On the other hand, in 2025, there was a slight deterioration in the indicator – 62nd place, which may be associated with a complex of external and internal challenges, including the ongoing war and information threats [11] (Fig. 2).

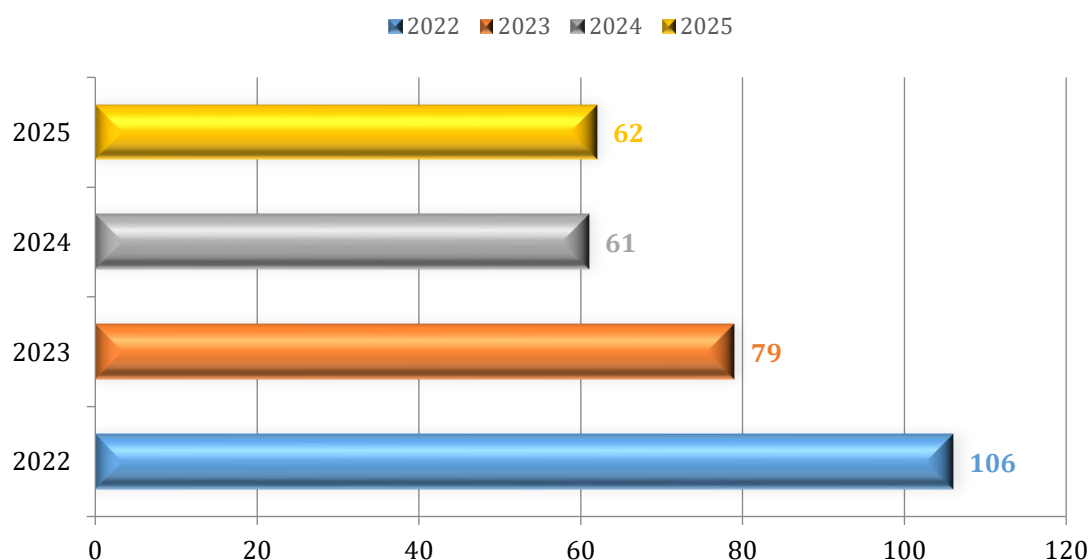


Figure 2. Dynamics of Ukraine's position in the World Press Freedom Index (2022–2025)

Source: Compiled by the author based on [8; 10; 11].

The modern media landscape of Ukraine is characterized by significant structural heterogeneity, a combination of state, commercial and public media initiatives. At the same time, most of the leading TV channels, news agencies and print publications are under the control of financial and industrial

groups or political elites, which forms the phenomenon of oligarchic concentration of media ownership. As a result, the media are often used as a tool of political struggle, manipulative influence on public consciousness and a means of legitimizing corporate interests. Ukrainian journalists often face pressure, threats, or censorship restrictions, which indicates the incomplete implementation of constitutional guarantees of freedom of speech [21].

In 2024, Ukrainian local media continued to operate in the conditions of a full-scale war, facing constant challenges, among which the main ones remained staff shortages and financial instability. Despite this, the newsrooms were able to adapt internal processes, optimize resources and introduce new work strategies, which made it possible to partially stabilize activities. About 40% of media outlets noted that the work has become somewhat easier due to streamlining internal processes, more efficient use of grant funding, and strategic project planning. At the same time, the mobilization of male staff worsened the problem of staff shortages, forcing newsrooms to redistribute responsibilities and form predominantly female teams. Grants remain the main financial model, with more than 50% of newsrooms receiving more than 80% of income from donors. The local advertising market and reader support are not yet able to compensate for the lack of grants, which limits long-term planning and infrastructure development. The development of internal strategies and policies has become a condition for obtaining funding and at the same time an indicator of external dependence of editorial offices. Content formats include news, interviews, longreads, analytics, and investigations, with video production increasing and adaptation to social platforms decreasing. The psychological state of the teams remains tense, about half of the participants rate it as neutral or unsatisfactory. Working with the temporarily occupied territories and border zones is complicated, and the risks associated with power outages, shelling and the threat of mobilization are taken into account in organizational processes. All these factors demonstrate the need for flexible management models that can ensure the interaction of the media with government agencies, support for strategic planning and content adaptation to effectively inform the population. Local media, acting as a partner of state authorities, can be a channel of communication with citizens, a tool to support state campaigns, and at the same time a guarantor of pluralism and independence through transparent internal processes, diversified financial models, and the development of digital platforms [9].

Figure 3 shows the main challenges of local media in Ukraine and management responses in 2025 [9].

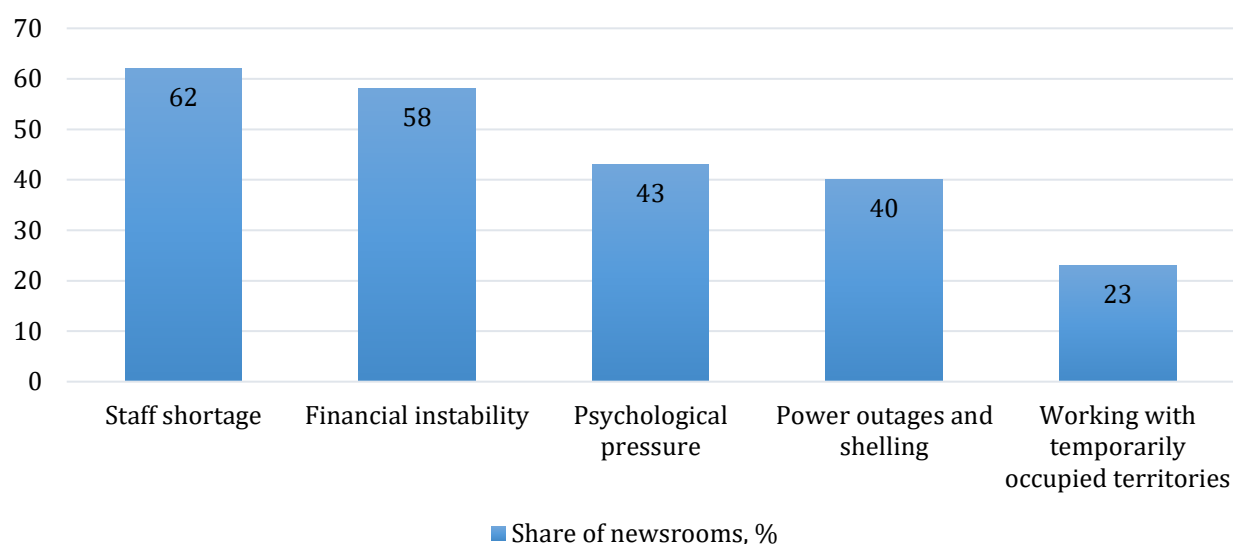


Figure 3. The Main Challenges of Local Media in Ukraine and Management Responses in 2025

Source: Compiled by the author based on [9].

The problem of media independence has become especially relevant in the context of the hybrid aggression of the Russian Federation, a component of which is a systemic information war. The Ukrainian information space is subject to constant cyberattacks, disinformation campaigns and attempts to undermine trust in national institutions through bot networks, “fake” pages and pseudo-analytical resources. As a result, the state was forced to take a number of protective measures, including a ban on the broadcasting of Russian TV channels and access to enemy Internet platforms, as well as the

creation of mechanisms for cyber protection of strategic telecommunications infrastructure facilities [1, p. 135].

The situation in the temporarily occupied territories remains difficult, where independent journalism is virtually absent, and the population is deprived of access to Ukrainian print and television media. In the regions directly bordering the front line, the professional activities of journalists are associated with a high level of risk, in particular, numerous cases of death or injury of representatives of the media community are recorded.

The negative factors that hinder the formation of an independent media sphere are:

- economic dependence of editorial offices on state or political structures;
- low level of political culture;
- deficit of professional and ethical solidarity in the journalistic environment;
- fragmentation and insufficient integration of the national information space [12, p. 192–193].

At the same time, in recent years, there has been a gradual regulatory and institutional strengthening of the industry. Reforming the media sphere is accompanied by the development of related areas – anti-corruption policy, increasing the level of public integrity, implementing European principles of transparency of management and reforming higher education, which ensures the professionalization of journalism. A symbolic confirmation of positive trends was the improvement of Ukraine's position in the World Press Freedom Index.

6. Conclusions

Thus, in the current conditions of globalization, digital transformation and the ongoing Russian-Ukrainian war, the media act as a key communicative intermediary between society and government institutions, influencing the processes of political socialization, the formation of public opinion and the legitimization of managerial decisions. The media not only inform, but also participate in the formation of the public agenda, perform the functions of social control and democratic feedback.

In the context of European integration, the model of interaction between the media and state authorities in Ukraine can be defined as transitional – from mixed oligarchic-administrative to liberal or democratic-corporatist. A promising direction of its further evolution is the institutionalization of public television and radio broadcasting, increasing the level of media literacy of citizens, professionalization of journalists and strengthening the ethical standards of the industry. Only with the development of civil society, the establishment of the principles of political integrity and real pluralism of opinions, it is possible to form a socially responsible model of media power as an attribute of a mature democracy.

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The Quality Management of Public Services in the Digital Age

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This article looks into how modern digital technologies can significantly enhance the quality of public services and make governance in the public sector more efficient. It highlights the role of innovative digital platforms, like the “Diia” app, the “Smart City” concept, Internet of Things (IoT) technologies, electronic SIM cards (eSIM), and advancements in artificial intelligence and virtual/augmented reality. These tools foster better interaction between citizens and government bodies, standardize administrative processes, and promote greater transparency and accessibility in public services. The findings suggest that digitalization not only speeds up service delivery but also reduces bureaucratic hassles and boosts public trust in government institutions. The study examines specific examples of digital technology applications in Ukraine’s public sector: integration of services within “Kyiv Digital”, open budget platforms, the “Safe City” system, implementation of IoT solutions for resource management, and the use of VR/AR technologies in cultural, educational, and social spheres. The role of digital platforms in creating an interactive environment for citizens, implementing socially significant projects, and supporting international communication is highlighted. It is emphasized that the successful digitalization of public services is impossible without infrastructure development, high-speed connectivity, digital competencies of personnel, and protection of personal data. It is established that the implementation of digital solutions in public administration enhances the efficiency of administrative processes, integrates citizens into decision-making, ensures transparency and control, and fosters a systematic approach to public service quality management. At the same time, key challenges are identified, including uneven development of digital infrastructure, the digital divide among the population, and ethical aspects of automation. In conclusion, it is demonstrated that the comprehensive application of digital technologies creates conditions for adaptive, transparent, and high-quality public service delivery in the modern digital era.

KEYWORDS

digital technologies, public services, quality management, digitalization, Smart City, eSIM, IoT, VR, AR, artificial intelligence, digital transformation, digital competencies, transparency of administrative processes.



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У статті досліджуються сучасні цифрові технології як основний чинник підвищення якості публічних послуг та ефективності управління у державному секторі. Наголошується, що розвиток інноваційних цифрових платформ, таких як застосунок «Дія», концепція «Smart City», технології Інтернету речей (IoT), електронні SIM-картки (eSIM), штучний інтелект, віртуальна та доповнена реальність, створює умови для оперативної взаємодії громадян із органами влади, стандартизації управлінських процесів та підвищення прозорості та доступності адміністративних послуг. Показано, що цифровізація дозволяє скоротити час на отримання послуг, зменшити бюрократичне навантаження, а також підвищити довіру населення до державних інституцій. Досліджено конкретні приклади застосування цифрових технологій у публічному секторі України: інтеграція сервісів «Київ цифровий», платформи для відкритого бюджету, системи «Безпечне місто», впровадження IoT-рішень для контролю ресурсів, а також використання VR/AR-технологій у культурній, освітній та соціальній сферах. Висвітлено роль цифрових платформ у формуванні інтерактивного середовища для громадян, реалізації соціально значущих проєктів та підтримки міжнародної комунікації. Підкреслено, що успішна цифровізація публічних послуг неможлива без розвитку інфраструктури, високошвидкісного зв'язку, цифрових компетентностей персоналу та захисту персональних даних. Встановлено, що впровадження цифрових рішень у публічному управлінні сприяє підвищенню ефективності адміністративних процесів, інтеграції громадян у прийняття рішень, забезпеченню прозорості та контролю, а також формуванню системного підходу до управління якістю публічних послуг. Разом із тим виділено ключові виклики: нерівномірний розвиток цифрової інфраструктури, цифровий розрив серед населення та етичні аспекти автоматизації. У підсумку доведено, що комплексне застосування цифрових технологій створює передумови для адаптивного, прозорого та високоякісного надання публічних послуг у сучасну цифрову добу.



КЛЮЧОВІ СЛОВА

цифрові технології, публічні послуги, управління якістю, цифровізація, Smart City, eSIM, IoT, VR, AR, штучний інтелект, цифрова трансформація, цифрові компетентності, прозорість управлінських процесів.

1. Introduction

In the context of modern digital transformation, the public administration system is undergoing significant structural changes caused by both global technological processes and the growing need to improve the quality of public services. The quality of such services is not only an indicator of the effectiveness of the authorities but also a primary factor in the formation of public trust in state institutions.

In the age of digitalization, it is technological innovations – from e-government to the use of artificial intelligence – that determine the level of openness, convenience, speed and individualization of communication between the state and the citizen. At the same time, the introduction of digital technologies is accompanied by several difficulties, in particular, the uneven development of digital infrastructure, the existence of a digital divide between individual regions, the lack of digital competencies among the population and ethical challenges arising in the process of automating management decisions [2; 7].

The Digital 2023: Global Overview Report states that at the beginning of 2023, more than 68% of the world's population used mobile devices, 64.4% had access to the Internet, and more than 60% actively interacted on social networks [20]. At the same time, these indicators demonstrate the unprecedented depth of digital integration of humanity into the global information space, which forms the basis for the transformation of state institutions towards service management models focused on the needs of citizens. At the same time, despite the intensive development of digital technologies, the problem of the “digital divide” remains, which causes inequality in access to digital resources and affects the quality of public services.

Taking into account the above, we see the importance of developing digital public administration platforms that provide access to electronic services, analytical tools, information bases and feedback mechanisms. As V. Kokhan notes, digital platforms act as the core of the transformation of public administration, forming a new architecture of interaction between citizens, business and government [5, p. 82]. They allow minimizing administrative barriers, increasing the efficiency of communication, and creating an ecosystem of transparent management processes.

2. Literature Review

The problems of quality management of public services in the digital age are the subject of active study by domestic and foreign researchers. O. Bulgakova et al. propose a methodology for assessing the quality of electronic services in the public administration system, taking into account that the leading parameters are speed, convenience and user trust. Scientists prove that without effective monitoring of citizens' satisfaction indicators, digital initiatives cannot be considered fully successful [2].

M. Dubel examines the impact of digital platforms on economic processes, proving that the digital economy forms new rules of interaction between the state and business, where priority is given not only to efficiency, but also to transparency of managerial decision-making [3]. A. Zhornytska notes that the digitalization of civil society creates new opportunities for the active participation of people in public administration. However, this also requires the development of institutional trust and ensuring adequate protection of personal data [21].

According to V. Sereda and S. Yessimov, digital platforms for the provision of public services can be classified according to the level of integration, accessibility, and functional flexibility, which makes it possible to create uniform standards for evaluating their effectiveness [13]. In particular, the described approach is of particular importance for Ukraine, where, according to the observations of Y. Semchuk, the development of e-governance is at the stage of formation, and ensuring the quality of public services remains the leading challenge of the state's digitalization policy [11].

O. Rozgon emphasizes that digital platforms are a tool for the functioning of the technology transfer network, and therefore ensure the circulation of knowledge and improve the quality of management decisions through the integration of innovations [10]. In this context, it is worth mentioning the “Digital State UA” initiative launched by the Ministry of Digital Transformation of Ukraine in 2025 [6], which became a logical continuation of *the Concept for the Development of the Digital Economy and Society of Ukraine for 2018–2020* [4]. It provides for the creation of a single space of digital public services, covering both administrative and social services.

An important contribution to the study of the processes of digital transformation of public administration was made by V. Redziuk and D. Darmostuk, who emphasize the need for a comparative analysis of global and Ukrainian digital governance practices [9]. The authors emphasize that the effectiveness of electronic services depends on the degree of technological interoperability of systems, the level of cybersecurity and user trust. At the same time, this position is developed by N. Sokolova, noting that digital technologies in the public sphere are becoming not only a management tool, but also a new form of public communication, in which state institutions must adapt to the principles of openness, flexibility and personalization [16].

In the monograph edited by V. Voronkova and N. Metelenko, the concept of digital transformation of management processes is systematically revealed, which emphasizes that quality management of public services in the digital age should be based on the principles of innovation, adaptability and user orientation [19]. A similar opinion is shared by L. Storozhenko, who analyzes the phenomenon of “netocratization” of public administration, i.e., the transformation of power structures into flexible network formations capable of promptly responding to the challenges of the information society [17].

Thus, the analysis of scientific literature shows that the digitalization of public services forms a new paradigm of public administration, where quality is determined not only by formal performance indicators, but also by the level of trust, accessibility and technological innovation.

3. Problem Statement

The purpose of the study is to establish what role digital technologies play in improving the quality of public services in the context of digital transformation. It is also necessary to analyze both Ukrainian and international approaches to assessing their effectiveness. In addition, it is important to formulate the foundations for creating an innovative quality management system for public services in the digital age.

4. Methods and Materials

The methodological basis of the study comprises a complex of general scientific and special methods aimed at analyzing the impact of digital technologies on public service quality. The method of system analysis was employed to determine the structural elements of the digital ecosystem in public administration. Through theoretical generalization and bibliographic analysis, the works of domestic and foreign scholars were synthesized to define key concepts of digital governance.

The case study method was applied to examine the functionality of specific Ukrainian digital platforms, such as “Diia”, “Kyiv Digital”, and “Smart City” technologies. Statistical analysis was used to interpret data from the “Digital 2023: Global Overview Report” and the Digital Transformation Index of Ukraine. Additionally, comparative analysis allowed for the assessment of various digital tools (IoT, eSIM, VR/AR) in different sectors. The information base includes legislative acts, official reports from the Ministry of Digital Transformation of Ukraine, and open statistical data.

5. Results and Discussion

Ensuring a high level of administrative, social, cultural and educational services is impossible without the systematic introduction of digital technologies, including integrated electronic platforms, e-government systems, Internet of Things technologies, artificial intelligence, as well as virtual and augmented reality. As O. Orlov rightly emphasizes, innovative tools create prerequisites for standardization of management processes, increasing the efficiency of service provision, reducing bureaucratic burden and forming transparent procedures for interaction with citizens [7, p. 53–54]. At the same time, effective quality management of public services in the digital age involves an integrated approach, including infrastructure modernization, development of digital competencies of personnel, ensuring the protection of personal data and active integration of citizens into the process of managerial decision-making [10, p. 22]. This approach allows not only to increase the efficiency of state bodies, but also contributes to sustainable socio-economic development and the formation of new standards of interaction between the state and society in the digital age.

As shown in Table 1, the Diia application and other digital services ensure prompt interaction of citizens with the authorities, simplify the implementation of administrative procedures and maintain the socio-psychological state of the population during martial law

Table 1. Main Digital Platforms of Public Services of Ukraine and Their Functionalities

Digital Platform Category	Example of implementation	Functions	Purpose of use	Expected effect
Government Digital Services	Diia app	Execution of administrative procedures in electronic format; interactive services for children and adults	Ensuring quick and convenient interaction of citizens with authorities; Maintaining the socio-psychological state of the population during martial law	Increasing the availability and efficiency of public services; reducing the bureaucratic burden; Building Citizens' Trust
Electronic documents	Electronic certificates, certificates, passports	Online receipt and storage of documents	Reducing the time for paperwork	Improving the speed and convenience of administrative procedures
Interactive services	Educational and entertainment modules for children	Providing access to interactive educational materials	Psychological support and development of children	Maintaining an emotional state during stressful situations, integrating children into the digital environment

Source: Formed by the author based on [17].

M. Dubel notes that Diia demonstrates the potential of Ukrainian digital transformation and the prospects for its export to other countries, including USAID partner countries [3, p. 17–18]. The first international Diia in DC Summit, held on May 23, 2023, in Washington, D.C., clearly demonstrated the platform's achievements and its role in modernizing public services [6].

The concept of "Smart City" is also an example of the integration of digital solutions to improve the quality of life of citizens. The basic principles of smart cities are comfort, safety, and convenience for residents. Kyiv began implementing Smart City elements in 2015, when Mayor Klitschko signed an agreement with SAP at the World Economic Forum in Davos. This has led to the creation of an open budget platform, as well as the integration of services such as e-tickets, voting for Public Budget projects, as well as payment of utilities and parking [9, p. 169].

In January 2021, all services were combined into a new Kyiv Digital application, which allows citizens to remotely use transport and administrative services, receive notifications and participate in the processes of improving the city. Smart City systems are also actively developing in other Ukrainian cities, such as Ivano-Frankivsk, Lviv, Mukachevo, Drohobych, Zaporizhzhia, Poltava, Ternopil and Kharkiv, and in Mariupol, there is a "Safe City" system, as noted by A. I. Zhornytska [21, p. 657–658].

The introduction of Smart City technologies and digital platforms is impossible without the development of high-speed wireless communication, in particular 5G. Testing of the technology in Ukraine was carried out at the end of 2021, and, according to experts, there were no technical obstacles to its implementation. Licensing issues that previously restricted the use of radio frequencies in the 3400–3600 MHz bands were unblocked by the Supreme Court of Ukraine in February 2023, which opens up prospects for the development of 5G after the end of the war [19, p. 45].

I. Shavkun and Y. Dybchynska note that the latest telecommunication companies already offer ready-made IoT solutions that increase the efficiency of resource management and ensure infrastructure security. Kyivstar has implemented the Smart Metering system for automated control of water, gas and electricity consumption, which allows it to quickly respond to emergencies [14]. Also, the Mobile Network as a Service provides customers with the opportunity to receive a public or private network with a given level of radio coverage. Lifecell has implemented IoT projects for remote reading of electricity, gas and water metering devices for enterprises in different regions of Ukraine.

The introduction of digital technologies in the field of public administration, in particular the Diia and Smart City platforms, increases the transparency and accessibility of administrative services, reduces the time for receiving them and reduces the bureaucratic burden on citizens. However, there are also certain challenges that are directly related to the digital divide, uneven development of infrastructure and ethical aspects of automation of management processes, which are drawn to the attention of O. Orlov [7], Y. I. Semchuk [11] and L. Storozhenko [17].

In the current conditions of digitalization of public administration, ensuring the high quality of public services is becoming a leading factor in the efficiency of state bodies and the formation of citizens' trust. One of the examples of the implementation of modern digital solutions in Ukraine is the technology of electronic SIM cards (eSIM), which is provided by all leading telecommunications companies.

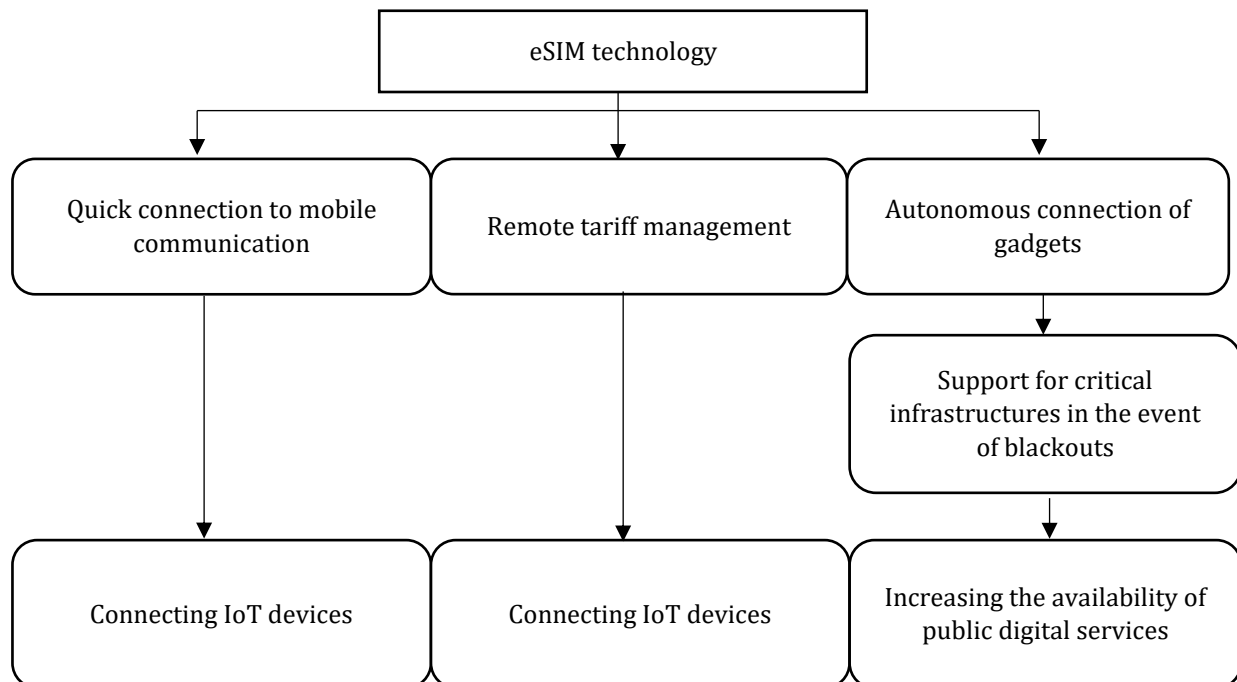


Fig. 1. The role of eSIM technology in the digitalization of public administration and improving the quality of public services

Source: Formed by the author independently.

In this case, it is advisable to note that, unlike traditional SIM cards, eSIM is integrated into the device and allows you to flexibly configure the user profile, including changing the network without physically replacing the card. This is especially true in the context of partial blackouts and unstable network operation, and for telecom companies, this technology provides autonomous and fast connection of various gadgets, including Internet of Things (IoT) devices [14]. Users have the opportunity to connect to mobile communications or change the tariff plan through the online form, which not only reduces the use of plastic, but also increases overall security [11, p. 491]. According to Strategy Analytics forecasts, in 2025 there will be about 326 million eSIM cards in the world, which emphasizes the global trend towards digitalization of communications [8].

New private technologies are emerging on the Ukrainian IoT market that simplify people's lives. For example, there is a smart workplace system that automatically monitors temperature, pressure, light and humidity. It analyzes this data, stores it in the cloud and sends a message to a mobile phone or computer if the indicators are outside the norm [9, p. 169].

In Ukraine, artificial intelligence is gradually being introduced into the public sphere, in particular in municipal administration. A. Zhornytska argues that AI is actively used to optimize administrative processes and automate accounting with resources [21, p. 658]. The Cabinet of Ministers of Ukraine has approved the concept for the development of the digital economy and society for 2018–2020, which creates the necessary legal and organizational conditions for the digital transformation of public administration [4].

The Diia application uses facial recognition technologies based on AI models to authenticate users, which ensures their reliable identification and protection of personal data [15, p. 29]. Deputy Minister of Digital Transformation O. Bornyakov notes that such solutions help identify individuals, in particular using ClearView AI technologies, to maintain security during martial law [12]. Also, the necessary human resources potential has been formed in Ukraine: about 10 thousand IT engineers specialize in AI systems, which opens up new opportunities for the development of solutions in the field of public administration [21, p. 660].

One example of international recognition of Ukrainian developments is the Grammarly platform, which allows users to improve English-language texts taking into account stylistic features and context.

The service offers basic and premium versions: the basic version checks grammar, spelling, and punctuation, while the premium version provides text optimization for clarity, the selection of more accurate words, and the formation of an appropriate style depending on the purpose of the text. Especially important is the function of monitoring the inclusiveness of language, which allows avoiding expressions that may be perceived as discriminatory or sexist in Western culture [3, p. 19]. The company has representative offices in Kyiv, San Francisco, New York, Vancouver and Berlin, which confirms the global nature of its influence [3, p. 22].

During the COVID-19 pandemic in Ukraine, a CRM service was successfully implemented in a network of fitness centers, which made it possible to determine the location of visitors in gyms in real time, monitor social distance and notify administrators about violations. The system also provided an opportunity to remotely track the number of visitors and make decisions on visiting the halls in accordance with quarantine requirements [10, p. 24].

In the first days of the full-scale war in Ukraine, the Fundraising for humanitarian aid to Ukraine project was launched, which was initiated by Ukrainian IT developers from Sirens Gallery. They used open-source models to create about 2000 paintings based on textual descriptions of the events of the war, of which 1991 were put up for sale in NFT format. It is worth noting that this project eventually raised more than 250 thousand dollars for humanitarian aid and reconstruction of the country, demonstrating how digital solutions can affect socially important areas [19, p. 43].

In addition, Ukrainian cities are actively implementing virtual and augmented reality technologies in the public sector. For example, in Lviv, in 2018, a 3D scanning project of architectural monuments called "Pocket City" was launched. This initiative allows buildings to be digitized in detail for further analysis and restoration. In addition, today 24 buildings have been scanned in Lviv, which greatly facilitates the restoration of monuments, inspired by the experience of the restoration of Notre Dame Cathedral [19, p. 45].

The introduction of such digital technologies in the public sphere not only increases the efficiency and accuracy of service provision, but also contributes to effective quality management, reducing bureaucratic barriers and increasing the level of citizens' trust in state institutions. O. V. Bulgakova, K. O. Nesterenko, N. M. Sklyar, O. O. Fomina, P. D. Kaminsky note that the systematic use of electronic platforms allows standardizing processes, monitoring their efficiency and ensuring transparency in the provision of public services [2, p. 20]. Similar conclusions are also confirmed by V. Redziuk and D. Darmostuk, noting that digital platforms are a leading tool for the modernization of public administration and communications with citizens [9, p. 171].

In modern conditions, digitalization is becoming an important factor in improving the quality of public services and expanding citizens' access to cultural, educational and tourist resources. One of the successful examples is the implementation of the project "Pocket City: Chortkiv", completed in 2020 by the NGO "Center Initiative" and Skeiron with the support of a grant from Re_HERIT and the Chortkiv City Council. The project involved the digitization of eight monuments reflecting the city's multicultural heritage. Thanks to the creation of three-dimensional models with a 360° viewing angle, users can virtually view the sights on the Chortkiv website. City, and with the help of an augmented reality application, view them in 3D and listen to historical references [16].

Similarly, augmented reality technologies are used in the Tustan State Historical and Cultural Reserve in the Lviv region. The Tustan AR application allows you to reproduce in real time the medieval fortification buildings of the complex of the IX–XIII centuries. Being near the rocks, visitors can see the reconstruction of the fortress and take virtual tours on the official website of the reserve, which significantly increases the level of interactivity and accessibility of historical knowledge for citizens [16].

Museums are also actively using digital technologies to better interact with visitors. For example, for the 120th anniversary of the Odesa Art Museum, Snapchat has created special augmented reality lenses for exhibits. With the help of the mobile application, you can scan codes and see the dynamic playback of artistic elements. For example, I. K. Aivazovsky's painting "Night on the Black Sea" literally comes to life in augmented reality – waves and clouds move on it. Such innovations attract young people to the cultural environment and set new standards of museum services [5, p. 84].

The tourism industry is also integrating digital tools to improve the quality of services. On the website of the tourist hub "Kyiv Digital" you can find 3D models of fifteen historical monuments of the capital, which were created during the war. They can be viewed in augmented reality format. This allows users to study cultural objects in detail without physical presence, which is very important in conditions of limited mobility of citizens [5, p. 85].

In the educational environment, digital technologies help to increase the efficiency of the educational process. For example, the interactive AR Book system allows you to conduct laboratory experiments on a smartphone, which significantly improves the assimilation of material during distance learning. Research from Ain Shams University confirms that augmented reality increases student engagement and makes learning more effective [16]. In the spring of 2023, a pilot project was launched in Ternopil, Lutsk, Khmelnytskyi and Kamianets-Podilskyi to teach students in grades 7–11. Schoolchildren can conduct laboratory work in physics using special helmets and software. The platform already has more than 200 interactive three-dimensional laboratory and practical works, which are adapted to the curriculum of the Ministry of Education and Science of Ukraine.

Digital technologies open up new horizons for improving public services and strengthening the connection between the state and citizens. Nowadays, virtual (VR) and augmented reality (AR) are especially actively used to popularize cultural and social initiatives, as well as to draw the attention of the international community to events in Ukraine.

In 2023, Advin Ukraine launched several AR and VR projects that combine humanitarian support with communication tasks. The interesting project “Under Sirens” was supported by more than twenty well-known fashion brands. Audio tracks were integrated on the tags of Ukrainian clothes, which in augmented reality turned into the sound of an air raid siren. Thus, Europeans could at least partially feel the realities of the war in Ukraine [1].

Cultural heritage is also becoming an important tool for self-identification and citizen engagement. On December 13, 2022, the Tvorchy band presented a virtual mural in Kyiv on Zhylianska Street right on the wall destroyed by rockets. The mural was dedicated to the 145th anniversary of the birth of composer Mykola Leontovych. The project combines AR images and musical accompaniment of the track Broken Heart, which uses a sample of the folk song “Cranes Have Flown In”. This is a vivid example of the combination of national cultural heritage with modern digital technologies [16].

Digital platforms are actively used to create interactive social products that document tragic and important events. On the anniversary of the start of the full-scale war, the February Year calendar was created, which recreates memorable events through augmented reality. The project was implemented jointly by the advertising agency AdvertGroup, the volunteer headquarters “Volunteers of Dnipro-1” and Advin Ukraine. The goal was not only to remind of the tragic events, but also to show the resilience of the Ukrainian people [15, p. 30]. The VR Museum of War Memory gives visitors the opportunity to experience the realities of destroyed cities through a virtual tour. They are accompanied by a 5-year-old girl who shows her destroyed house, kindergarten and other objects. 360° technology creates maximum immersion and allows the viewer to convey the entire emotional and social context of events in Ukraine [12].

In healthcare, virtual simulators and augmented reality technologies are becoming key tools for improving public services, especially during war. VR simulators from Advin Ukraine help to rehabilitate civilians and military personnel after amputations or with musculoskeletal disorders. When the patient is immersed in a virtual environment, it provides an integrated approach: restoration of limb functions, adaptation to a new physical condition and simultaneous psychological rehabilitation. This helps to overcome post-traumatic mental disorders [16].

Such experiences demonstrate the potential of digital technologies in the field of social and health services, highlighting their ability to increase the efficiency and accessibility of citizen care.

Digital technologies are becoming an important part of our daily lives, especially when it comes to the public sphere. They not only improve the quality of services, but also promote transparency in various processes and citizen engagement. For example, the UN predicts that more than two million new jobs will be created by 2030, and approximately 90% of them will require some digital skills. At the same time, it opens up unequivocally new opportunities for citizens, but it also emphasizes the problem of digital inequality, which is especially significant for Ukraine, where the processes of digital transformation are taking place very quickly [18].

The data of the study “Digital Literacy of the Population of Ukraine” (2021) indicate an improvement in the situation compared to 2019: the percentage of citizens aged 18 to 70 who did not have digital skills at all decreased from 15.1% to 11.1%, and the number of people with a basic level of digital competence decreased from 53% to 47.8%. In 2019, about 47% of citizens expressed interest in learning digital skills. To implement the strategic goal of the Ministry of Digital Transformation – to train six million citizens in digital competencies by 2024 and transfer 100% of services to the online format – more than 6 thousand services were created. digital education hubs. The platform “Diia. Digital

Education” allows you to watch educational series and receive certificates even in wartime, gradually forming the digital culture of the population and a new norm in education [2, p. 22; 6].

In 2022, the team of the Ministry of Digital Transformation developed the Digital Transformation Index to assess the level of digitalization of the regions of Ukraine. This index reflects progress in eight main areas: from institutional capacity to the development of Internet infrastructure, the functioning of Administrative Service Centers, the introduction of paperless technologies, digital education, regional business cards, the availability of electronic services and industry digitalization. The overall index for Ukraine is 0.650 points out of the maximum possible 1. The best results were demonstrated by Dnipropetrovsk (0.916), Ternopil (0.910) and Odesa (0.836) regions, which indicates a significant difference in the level of digitalization and accessibility of public services [13, p. 61; 9, p. 171].

Modern digital technologies, such as artificial intelligence and virtual and augmented reality, are actively changing our daily lives and creating new opportunities to improve the quality of public services. However, it is important to emphasize that the implementation of such innovations in the public sphere is possible only if the confidentiality of data and personal information of citizens is reliably protected.

6. Conclusions

Based on the analysis, it can be concluded that in the context of the modern digital transformation of public administration, ensuring a high level of quality of public services is a determining factor in the effectiveness of the functioning of state institutions and the formation of trust on the part of citizens. The integration of digital platforms provides an opportunity for citizens to quickly interact with authorities, carry out administrative procedures in an electronic environment and gain access to critical social services at any convenient time. The use of such innovative solutions stimulates the modernization of management processes, increases the efficiency of public services and creates systemic prerequisites for optimizing the interaction of the state with the population.

The integration of Smart City concepts, telecommunication solutions and Internet of Things technologies can significantly increase the comfort, security and availability of city services. Automated resource accounting systems, electronic platforms for payment of utilities and administrative services, as well as new generation mobile networks, provide transparency, efficiency and control over the urban infrastructure. The use of digital tools reduces the bureaucratic burden on citizens and increases the efficiency of resource management at the city and regional levels.

Artificial intelligence, virtual and augmented reality open up new opportunities for improving the quality of public services, developing cultural, educational and social initiatives, as well as providing medical and humanitarian support. At the same time, digitalization creates challenges related to cybersecurity, personal data protection, and uneven infrastructure development. A systematic approach to quality management of public services, standardization of processes and efficiency control allow the formation of a transparent, adaptive and modern public administration system that meets the needs of citizens and the requirements of the digital age.

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Socio-Economic Analysis of the Structure and Development Potential of Territorial Communities of Eastern Podillia

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This article presents a comprehensive study of the socio-economic structure and development potential of territorial communities in Eastern Podillia, in the context of the decentralization reform in Ukraine. The relevance of the topic stems from the need for an in-depth analysis of community structures as basic local self-government units, considering their resource capacity, institutional strength, and spatial characteristics, which directly affect regional policy and management effectiveness. The main goal of the study is to perform a socio-economic analysis of the territorial communities in Eastern Podillia, taking into account their structural differentiation and development dynamics. The object of the research is the territorial communities as spatial-administrative entities, while the subject is their structure, development level, and internal potential. The geographical scope includes the southern part of Khmelnytskyi region, the central and northern parts of Vinnytsia region, and part of Cherkasy region. The article applies a range of methods, including index, cluster, and correlation-regression analysis, expert evaluation, and GIS-based visualization approaches. Based on the calculated indicators, the communities were classified into three development levels: high, medium, and low. Specific examples of communities with different development statuses are given, such as Zhmerynka, Kalynivka, and Severynivka. The study identifies key factors that shape the development potential of communities: financial capacity, local economic structure, human capital, infrastructure, and governance quality. The findings reveal regional development disparities and serve as a basis for practical recommendations in strategic community planning based on development potential. The scientific novelty of the work lies in the integrated analytical approach to studying communities of Eastern Podillia, combining quantitative indicators with spatial characteristics. The practical value is in the applicability of results for local governments, regional authorities, and developers of territorial development strategies.

KEYWORDS

effectiveness of management decisions, sustainable development, decentralization, regional policy, structural analysis.



Соціально-економічний аналіз структури і потенціалу розвитку територіальних громад східного Поділля

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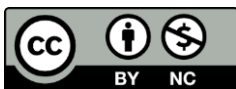
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У статті здійснено комплексне дослідження соціально-економічної структури та потенціалу розвитку територіальних громад Східного Поділля в контексті реалізації реформи децентралізації в Україні. Актуальність теми зумовлена необхідністю поглибленого аналізу внутрішньої структури територіальних громад як базових одиниць місцевого самоврядування, їх ресурсної забезпеченості, інституційної спроможності та просторового розташування, що безпосередньо впливають на регіональну політику та ефективність управлінських рішень. У межах дослідження було поставлено мету – провести соціально-економічний аналіз територіальних громад Східного Поділля з урахуванням їхньої структурної диференціації та розвитку. Визначено об'єктом дослідження територіальні громади як просторово-адміністративні утворення, а предметом – структура, рівень розвитку і внутрішній потенціал цих громад. Географічні межі охоплюють 6 районів 63 територіальних громад Вінницької області. У статті застосовано низку методів: індексний, кластерний, кореляційно-регресійний аналіз, експертне оцінювання, а також геоінформаційні підходи до візуалізації даних. На основі розрахованих показників було здійснено типологізацію громад за рівнем соціально-економічного розвитку, виокремлено три основні групи: високорозвинені, середнього рівня та низькорозвинені громади. Наведено конкретні приклади громад з різним рівнем розвитку: Жмеринська, Калинівська, Северинівська територіальні громади тощо. У ході дослідження ідентифіковано основні чинники, що формують потенціал розвитку громад: фінансова спроможність, структура місцевої економіки, людський капітал, інфраструктура, якість управління. Результати дозволили визначити основні дисбаланси регіонального розвитку, а також сформулювати практичні рекомендації для стратегічного планування розвитку громад з урахуванням їхнього потенціалу. Наукова новизна роботи полягає в застосуванні інтегрального аналітичного підходу до вивчення громад Східного Поділля, що поєднує кількісні показники з просторовими характеристиками. Практичне значення полягає у можливості використання отриманих результатів органами місцевого самоврядування, регіональними управлінськими структурами та розробниками стратегій сталого розвитку територій.



КЛЮЧОВІ СЛОВА

ефективність управлінських рішень, сталий розвиток, децентралізація, регіональна політика, структурний аналіз.

1. Introduction

In the current conditions of transformation of public administration in Ukraine, the process of decentralization, which involves the transfer of powers, resources and responsibilities from the central government to local self-government bodies, is of particular importance. Territorial communities have become a key institutional unit in this process, which are designed to ensure effective local governance, mobilize local resources, implement sustainable development strategies and improve the quality of life of the population.

Territorial communities play an important role in the implementation of regional development policy, since it is at the level of communities that the prerequisites for economic growth, social cohesion, spatial balance and environmental safety are formed. The ability of communities to self-development, effective use of internal potential, coordinated functioning of managerial, economic, social, spatial and environmental structures are the basis for the competitiveness of regions as a whole. In this context, the analysis of the socio-economic structure and natural resource potential of territorial communities is extremely important for the formation of informed management decisions and strategic planning.

Eastern Podillia is a historical and geographical region that covers the Vinnytsia region and is distinguished by both its natural and geographical conditions and socio-economic features. The region has a significant agricultural potential, moderately developed industry, as well as a rich historical and cultural heritage. At the same time, the communities of Eastern Podillia face a number of challenges, including: uneven development, depopulation, weak diversification of the economy and insufficient institutional capacity. That is why the study of the structural characteristics and development of the potential of these communities is an important step in determining the strategic guidelines for their further growth.

The relevance of the research topic is due to the need for a comprehensive understanding of the current state and prospects of territorial communities of Eastern Podillia as important centers of socio-economic development in the context of decentralization. The results of such an analysis can become a theoretical and practical basis for increasing the effectiveness of regional policy, improving local governance and ensuring sustainable development of the region.

2. Literature Review

In modern scientific literature, the topic of development of territorial communities, their structural features, economic potential and management in the context of decentralization and regional development is becoming more and more relevant. At the same time, the study of the region of Eastern Podillia – its communities, spatial-economic conditions and potential – is much less presented, which necessitates a comprehensive analysis.

On the one hand, a number of works consider various aspects of decentralization in Ukraine, in particular, the transfer of resources and powers to local self-government bodies, the formation of territorial communities (TCs) and their impact on local development. For example, the scientific work by O. Dobrianska, "Analytical review of decentralization of power in Ukraine and reforming the educational industry", analyzes the state of decentralization reform in the field of education management, highlighting positive and negative trends [4]. Similarly, O. Shevchenko et al.'s scientific report "Decentralization and formation of the policy of regional development in Ukraine" investigate how the decentralization reform affects regional policy in Ukraine [22]. These studies provide an important theoretical and methodological background for analyzing the role of communities in sustainable development processes.

On the other hand, the issues of local self-government and public administration are considered in a more generalized way. For example, the work "Decentralization of power in Ukraine: Problems and prospects of development" by Yu. Orlovska and R. Kiryukhin highlight the problems of public control over the local budget and, more broadly, the challenges of budgetary autonomy of communities [14]. The textbook of the modern researcher "Local self-government in the conditions of decentralization of powers" (2018) reveals the legal, organizational and financial aspects of local self-government [11]. These sources allow you to understand how the management base of communities is formed and what their main functions and limitations are.

The third significant direction is the study of socio-economic development of rural and small communities. In particular, the scientific work "Development of rural territories of Ukraine in the conditions of decentralization of management: State, problems, prospects" by V. Rossokha and M. Plotnikova we find a thorough analysis of ways for rural communities to increase their potential through gaining experience [20]. This allows us to see a broader context for the development of communities, in particular small or rural.

The fourth direction involves the analysis of regional development, spatial unevenness and structures of socio-economic growth. In particular, K. Mezentshev et al. work "Regional development in Ukraine: Social and spatial inequality and polarization" reveals the issue of socio-spatial inequality in Ukraine [12]. And in the work "Regional Disparities and Economic Growth in Ukraine", scientists K. Huk and A. Zeynalov investigate the factors of regional economic disparities in Ukraine [6].

The outlined layer of scientific research provides a basis for understanding how communities – as minimal units of the regional structure – fit into the larger picture of regional development.

Finally, it is worth mentioning studies that are directly related to the analysis of community development in terms of potential and resources. For example, O. Yevsiukova's work "Renewal and development of territorial communities in Ukraine: Issues and procedural specifics" analyzes the current state of restoration and development of communities, their problems and specifics [23]. M. Pavlova, in her dissertation research "Development of territorial communities in Ukraine through effective attraction of international investments", substantiates the impact of international investments on community development [15].

Based on the analysis of scientific literature and recent scientific publications on the topic we have chosen, it is obvious that the process of decentralization in Ukraine has been studied in detail in terms of legal, financial and managerial aspects, but much less so in terms of specific territorial communities and their natural resource potential for development in specific regions. Research in rural and small-scale development draws attention to the importance of experience, resources, and institutional capacity, but often focuses on general trends rather than regional differences. In addition, studies of regional disparities provide a useful methodological base, but rarely descend to the level of individual communities or territorial units at the level of Eastern Podillia.

As we can see, there is a certain information and scientific deficit of research that would comprehensively analyze the structure and development potential of territorial communities within the historical and geographical framework of Eastern Podillia – their socio-economic, spatial, and resource characteristics, and development dynamics. That is why, when choosing the topic of our scientific research, we make an attempt to fill to some extent the scientific gap where general approaches are applied to a specific regional context. The region we have chosen has its own characteristics (agrarianism, natural-geographical and environmental conditions, historical and cultural background), which require a differentiated approach.

3. Problem Statement

The purpose of the study is to conduct a comprehensive socio-economic analysis of the structure and development potential of territorial communities of Eastern Podillia in order to identify their strengths and weaknesses, form reasonable typological models and develop recommendations for further development.

The object of the study is territorial communities as basic units of the administrative-territorial structure in the context of decentralization. The subject of the study is the structure, level of socio-economic development and internal potential of these communities. The geographical boundaries of the study cover the region of Eastern Podillia – a spatially limited part of the Right-Bank Ukraine with characteristic socio-economic, natural and demographic features.

The main task of our study is to conduct a comprehensive socio-economic analysis of the territorial communities of Eastern Podillia in order to identify their structural organization, level of development, potential and internal resources. As part of this task, we envisage the formation of a complete picture of the current state of territorial communities in the region, the identification of key factors affecting their capacity for sustainable growth, as well as the proposal of practical recommendations for improving the efficiency of their functioning in the context of decentralization.

In order to achieve the goal of the study, a number of specific tasks have been set:

- 1) to determine the structure of territorial communities of Eastern Podillia, in particular by population, spatial characteristics, functional purpose and administrative status;
- 2) to assess the socio-economic state of communities based on statistical indicators (demography, employment, income, infrastructure, budget provision, etc.);
- 3) to identify the key factors that form the development potential of territorial communities (resource base, managerial capacity, investment attractiveness, human capital);
- 4) to classify communities according to the level of socio-economic development, highlighting typological groups;
- 5) to formulate recommendations for strategic planning of community development, taking into account the identified social, economic, environmental features and needs.

The justification for choosing Eastern Podillia as an object of study is based on its historical and geographical identity, significant agricultural potential, structural diversity of communities, as well as on the relevance of regional development problems in the context of internal imbalances and challenges of decentralization. Eastern Podillia is a region characterized by both significant resources and noticeable unevenness in the development of territories.

For the analysis, we used generalized socio-economic indicators, statistical and spatial data, which allow us to assess both the current state of communities and identify the potential for future growth. The spatial scale of the study is limited to the boundaries of the specified region of Eastern Podillia, with a focus on administratively defined territorial communities formed as a result of the last wave of decentralization.

The scientific novelty of the study lies in the implementation of a comprehensive analysis of the territorial communities of Eastern Podillia, taking into account their multi-level structure, specifics of functioning and development prospects in the context of decentralization. The practical significance lies in the possibility of using the results obtained by local self-government bodies, regional management structures, scientists and consultants on spatial and socio-economic planning. The proposed analytical approaches can also be adapted for the study of other regions of Ukraine, which allows expanding the applied base of territorial analysis.

4. Methods and Materials

In the process of research, we used a set of interdisciplinary methods that provide a full-fledged socio-economic analysis of the territorial communities of Eastern Podillia. The basis of the methodological approach is a combination of quantitative and qualitative methods of analysis, which allows comprehensive coverage of both structural and dynamic characteristics of communities.

At the first stage of the study, methods of collecting secondary information were used, in particular, the analysis of official statistics of the State Statistics Service of Ukraine, data from the Ministry of Community Development, local self-government registers, open databases "Diia. Cyfra", monitoring reports of U-LEAD with Europe and other sources. The results of previous studies, reports of international organizations, including UNDP, and analytical documents of domestic think tanks were also involved.

To analyze the socio-economic state of communities, an index method was used, which made it possible to compare communities with each other according to generalized indicators of development (budget revenues, employment, population, level of educational and medical services, infrastructure provision, etc.). The indices were normalized using the min-max method for ease of comparison. Correlation-regression analysis was used to identify the relationships between indicators.

In order to classify communities by level of development, cluster analysis methods were used, in particular the k-means method, which made it possible to group communities according to similar characteristics of socio-economic profile. The spatial distribution of communities was studied using geographic information technologies (GIS), which made it possible to visualize the cartographic structure and dynamics of development.

In addition, the method of expert assessment was applied for a qualitative analysis of the potential for community development (institutional capacity, managerial quality, civic activity). The assessments were based on generalized results of regional ratings, analytical reports, as well as expert interviews with representatives of local self-government bodies.

All data were analyzed taking into account the spatio-temporal context, for the period 2020–2024, which covers the final stage of the formation of territorial communities and their first years of

functioning in the conditions of a full-scale war. The geographical scale of the analysis was determined by the region of Eastern Podillia, which includes 63 territorial communities.

In general, the use of combined quantitative and qualitative methods made it possible to obtain a multidimensional assessment of the state of communities, to identify both structural patterns and local features of development, which significantly increases the scientific validity of the conclusions and recommendations made.

5. Results and Discussion

The analysis of demographic, spatial and functional characteristics of territorial communities in the region of Eastern Podillia confirmed that the existing communities differ significantly from each other in terms of population, area, level of urbanization and economic profile. Based on empirical data, three types of communities have been identified: large (for example, more than 40,000–50,000 inhabitants), medium (approximately 20,000–40,000 inhabitants) and small (less than ~10,000–15,000 inhabitants). For example, the Zhmerynka city territorial community has about 48,952 inhabitants and covers an area of more than 531.7 km²; This is a vivid example of a large community [21].

At the same time, the Severynivka rural territorial community has only ~7,922 inhabitants and an area of 223.1 km² – this is a typical example of a small community.

The Kalynivka city territorial community with a population of ~45,257 people and an area of 844.1 km² already belongs to the medium-large type, but is characterized by an intermediate level of development.

Large communities are characterized by a more developed infrastructure, a higher level of budget provision, and a more stable or less negative demographic trend. For example, the Zhmerynka city territorial community has sufficient human resources, a developed transport network and a significant number of settlements (34) in the community, which creates favorable conditions for economic diversification [8].

Medium-sized communities, such as Kalynivska, show intermediate indicators: they have a sufficient number, but large territories and certain challenges in infrastructure and economic dynamics. Small communities, such as Severynivska, are more likely to experience negative demographic dynamics, have a limited economic profile (mainly the agricultural sector) and a weaker infrastructure base, which complicates their active participation in regional development processes.

In particular, the area of the community also plays a significant role: for example, the Bar City Territorial Community has an area of 766.4 km² and a population of ~40,310, which indicates a more stretched geographical configuration, the need for a larger infrastructure network and the remoteness of individual settlements.

Similarly, communities with a small area and a population of less than ~10,000, such as the Kunkivska rural territorial community (population ~4,161; area 175.4 km²), have a small territorial and human base.

The level of urbanization and the functional profile of communities are also critical. Large urban or urban-rural communities have more businesses, service industries, better infrastructure, and greater investor interest. For example, communities with more than 40,000 inhabitants, such as Zhmerynka or Kalynivska, have significant advantages over small rural communities. At that time, small rural communities are mainly based on the agricultural sector, have a weaker multisectoral economy and limited access to services.

Such differentiation – large, medium, small – corresponds to the trends recorded in methodological approaches to the analysis of the development of territorial communities, where the structure of the community (population, territory, economic base) is recognized as one of the key factors in assessing the development potential. Thus, the analysis of specific communities in Eastern Podillia confirms that it is these parameters – population, area, level of urbanization and economic profile – that help explain the difference in socio-economic status, potential and dynamics of community development [1; 2; 10].

When assessing the socio-economic state of territorial communities of Eastern Podillia, we used the index method, correlation-regression analysis, and clustering. This revealed that the average index of socio-economic development of the communities of Eastern Podillia was approximately 0.75 conventional units with a significant variation from 0.45 to 1.10 conventional units. The highest indices were recorded in communities with developed industry or a significant budget per capita: for example,

Zhmerynka city territorial community at the level of ~1.02 conventional units, which corresponds to the category of “high level” ($IP > 0.90$). Average index values (~0.70–0.85) have, for example, Kalynivka city territorial community (~0.78) and Haisyn city territorial community (~0.72), which fit into the category of “medium level” ($0.60 < IP < 0.90$). The lowest indices were recorded in peripheral rural communities with limited infrastructure – for example, Kunkivska rural territorial community (~0.47) or Raihorod rural territorial community (~0.52), which belong to the “low level” category ($IP < 0.60$).

Table 1. Index for the Development of Territorial Communities of Eastern Podillia

Level of development	Development Index
High	$IP > 0,90$
Medium	$0,60 < IP \leq 0,90$
Low	$IP < 0,60$

Source: Developed by the authors based on the data given in [17; 19; 21].

The correlation analysis indicated a strong positive relationship between the budget per capita and the development index ($r \approx 0.68$), as well as between the level of employment in industry (or manufacturing) and the index ($r \approx 0.55$). This confirms the hypothesis that the economic base of the community is a significant factor in its development.

Table 2. Correlation matrix of community development factors

	Budget per inhabitant	Employment in industry	Infrastructure provision	Development Index
Budget per inhabitant	–	0,68	0,55	–
Employment in industry	0,68	–	–	–
Infrastructure	0,55	–	–	–
Development Index	–	–	–	–

Source: Developed by the authors according to the data given in [3; 13; 23].

As evidenced by the analysis of the data, the outlined results are consistent with the methodological recommendations for the socio-economic analysis of communities. In particular, we understand the importance of taking into account incomes, employment, infrastructure and the dynamics of the region's development for 3–5 years.

At the same time, significant differences between communities indicate the presence of uneven development even within the same historical and geographical region [3; 18].

Based on the results of expert assessment and statistical analysis of the development potential of territorial communities of Eastern Podillia, several key factors that form the potential for community development have been identified. In particular: resource base (land resources, agriculture, natural conditions); managerial capacity (budget, institutions of self-government, attraction of investments); human capital (level of education, migration dynamics, community activity); infrastructure provision (transport, communications, social infrastructure).

Cluster analysis made it possible to distinguish the following types of communities according to the level of potential: “high-potential”, “medium” and “low-potential”. For example, communities with high investment activity and developed industrial or service sectors belong to the first group. As the results of the study confirm, the development potential is not just a function of the economic condition, but is related to the quality of management and infrastructure.

Based on the obtained indices and clustering, a typology of communities in Eastern Podillia by level of development (in conventional units of calculation) was proposed:

Group 1 (high level): communities characterized by $IP > D$, a budget per capita of UAH >, population growth or stability.

Group 2 (intermediate level): communities, IP between D and F , budget medium, partial stabilization.

Group 3 (Low Level): Communities, $IP < F$, Low Budget, Population Reduction.

This classification makes it possible to select clusters of communities that need priority allocation of resources and strategic measures to increase their competitiveness. At the same time, she emphasizes that not all communities with the same structure or resources have the same level of development – differentiation takes place.

For a deeper understanding of the levels of socio-economic development of territorial communities of Eastern Podillia, it is advisable to consider typical examples of communities with different structures, budget provision, and scales. Table 3 contains comparative data for three communities: Zhmerynska, Kalynivka and Severynivska, which demonstrate the characteristic features of communities with high, medium and low levels of development, respectively.

Table 3. Comparison of individual communities in the region of Eastern Podillia

Name of the community	Population (last available)	Budget (total income/year)	Estimated budget for 1 resident	Comment
1. Zhmerynka city territorial community (Vinnytsia region)	~49,474 people (2021)	UAH ≈ 591,050,651 (budget approved for 2025)	≈ 11 945 UAH/inhabitant (591 050 651 ÷ 49 474)	A large urban community with a more significant budget is an example of a community with a high level of development .
2. Kalynivka City Territorial Community (Vinnytsia Region)	~45,789 people	Budget data is not complete; For example, for 2024, the draft budget has been published	It will be approximately lower than in the Zhmerynka community	An example of a middle-level community is a sufficient base, but with a lower budget per resident.
3. Severynivka Rural Territorial Community (Vinnytsia Region)	~3,598 people (2018)	Budget data is less public	Indicative: low budget per resident	An example of a small rural community potentially belongs to the category of low level of development .

Source: Developed by the authors based on the data given in [7–9].

A generalized analysis of the territorial communities of Eastern Podillia allows us to understand that the Zhmerynka city territorial community is an example of a large community with a developed infrastructure, a significant industrial base and a significant budget. As of 2025, its total budget is more than UAH 591 million, which gives about UAH 11,945 per capita. At the same time, the population of the community exceeds 49 thousand people. This combination of high population density, sufficient financial resources and institutional capacity allows the Zhmerynka community to be classified as a group with a high level of socio-economic development. It has stable growth dynamics, functioning industrial enterprises, extensive educational and medical infrastructure, as well as an advantageous geographical location as a railway hub.

The Kalynivka city territorial community is also relatively large in terms of population (more than 45 thousand people), but in terms of budget indicators, it is inferior to Zhmerynska. Based on the published data on the draft budget and the amount of revenues for 2024, we can conclude about the average level of budget provision, which, together with the functioning of the industrial sector and transport infrastructure, allows us to position this community as belonging to the average level of development. It has growth potential, but it needs to increase investment attractiveness and diversify the economy.

In contrast, the Severynivka rural territorial community is an example of a small community with a population of less than 4 thousand people, mostly of a rural type. According to available information, its budget is much more modest, public reporting is limited, and the level of infrastructure provision is lower compared to urban communities. Such communities often face demographic decline, labor migration, dependence on subsidies and lack of a stable economic base. In this case, the Severynivka community illustrates the typical situation of underdeveloped peripheral communities that need targeted support programs, regional subsidiarity, and social entrepreneurship development.

According to the results of the study, the level of socio-economic development of communities is closely correlated with the scale of the community, the structure of employment and the volume of the budget per capita. Urban communities with developed industry are better placed to attract investment and implement long-term development strategies. Rural communities with a small population need special attention from state regional policy, in particular in the field of stimulating local initiative, education, access to digital services and infrastructure. A high level of budget provision is not only a consequence of a larger number of residents, but also the efficient use of resources and the functioning of the local economy [4; 5; 16].

The analysis of the proposed communities of Eastern Podillia confirms the existence of spatial and socio-economic unevenness of development even within the same region. These conclusions can become the basis for further development of a typology of communities and targeted development programs at the regional and interregional levels.

6. Conclusions

Thus, as a result of the study, a comprehensive socio-economic analysis of the structure and development potential of territorial communities of Eastern Podillia was carried out, which made it possible to characterize the current state, spatial differences and key problems of the functioning of basic units of local self-government in the context of decentralization. The results confirmed the hypothesis put forward about significant socio-economic differentiation of communities even within the same historical and geographical region, which is determined by both internal resource characteristics and external factors of regional development.

Based on index, correlation-regression and cluster analysis, it was found that the communities of Eastern Podillia can be conditionally divided into three types: communities with high, medium and low levels of socio-economic development. The highest development indicators are demonstrated by urban communities with a powerful infrastructure, developed industry and a significant budget base, in particular Zhmerynska and similar communities. The average level of development is inherent in communities that have a certain potential, but are limited in the use of resources or face organizational challenges (for example, the Kalynivka community). Communities with a low level of development, mostly rural and demographically vulnerable, have a limited budget, weak infrastructure and need additional support from the state (in particular, the Severynivka community).

Identification of factors influencing the potential for community development showed that the key role is played by: financial capacity, economic structure, infrastructural accessibility, human capital and institutional quality of management. Correlations confirmed the relationship between the level of community development and indicators such as the budget per capita and employment in industry.

The scientific novelty of the study lies in the combination of spatial and statistical analysis with the typology of communities in Eastern Podillia, which made it possible to identify patterns and local features of the functioning of communities within a single region. The practical significance of the results lies in the possibility of using the findings in the process of strategic planning, development of local development programs, optimization of managerial decisions and formation of spatial alignment policies.

The results also demonstrate the need for a flexible, differentiated approach to regional development, which provides targeted support to the least developed communities, stimulation of inter-municipal cooperation, development of human potential and digital infrastructure. Further research can be aimed at an in-depth study of the dynamics of changes in communities, the effectiveness of the implementation of sustainable development strategies, as well as the impact of martial law and post-war reconstruction on the socio-economic and environmental situation in the regions of Ukraine.

Based on the results obtained, we propose the following recommendations for the territorial communities of Eastern Podillia: communities with a low level of development are recommended to intensify the attraction of investments, develop local clusters (agricultural, agritourism, etc.), create partnerships with business; medium-sized communities should increase their institutional capacity: to improve management processes, stimulate civic activity, and modernize infrastructure; highly developed communities should focus their efforts on economic diversification, strengthening human capital, sustainable development and attracting innovation.

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European Integration of Ukraine in the Field of Water Resources Management: Adaptation and Implementation of the EU Water Framework Directive

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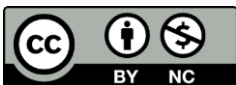
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The article reveals the conceptual foundations of Ukraine's European integration in the field of water resources management, taking into account the provisions of the Association Agreement and the EU Water and Environmental Acquis, which forms an integrated model of protection of surface, coastal and groundwater and determines the systemic tasks of sustainable water use. The need to transition to ecosystem approaches that provide for the prevention of degradation of aquatic ecosystems, gradual reduction of pollution and achievement of natural background levels of priority substances is emphasized. The importance of the directive on reducing the risks associated with floods and droughts in the context of climate change and increasing pressure on water resources was emphasized. The importance of the implementation of Directive (EU) 2020/2184, which leads to the updating of drinking water quality standards, monitoring methods and risk assessment systems, has been stated. The need for the introduction of integrated river basin management and standardization of environmental monitoring in accordance with European technical regulations has been identified. The role of the Law of Ukraine "On Drinking Water and Drinking Water Supply" in approximating national standards to EU standards and increasing the institutional consistency of procedures for assessing the quality of drinking water was noted. Regulatory changes in the field of radiation safety control of water are outlined, reflecting the deepening of integration processes with the EU. The content of the Water Strategy of Ukraine as a tool for adapting legislation to the requirements of the Water Framework Directive and Directive (EU) 2020/2184 is formulated. Ukraine's progress in the implementation of European standards, including the approximation of legislation, the creation of basin councils and the modernization of the monitoring system, was emphasized.



KEYWORDS

European integration, water resources management, EU Water Framework Directive, drinking water quality, river basins, water policy, adaptation of legislation.



Європейська інтеграція України у сфері управління водними ресурсами: адаптація та імплементація водної рамкової директиви ЄС

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СТАТТЯ	АНОТАЦІЯ
Дослідницька DOI: 10.70651/3041-2498/2025.11.09 Отримана: 30.09.2025 р. Прийнята: 03.11.2025 р. Опублікована: 18.11.2025 р. Авторське право © 2025 автора  Цей твір ліцензовано на умовах Ліцензії Creative Commons «Із Зазначенням Авторства – Некомерційна 4.0 Міжнародна» (CC BY-NC 4.0).	У статті розкрито концептуальні засади європейської інтеграції України у сфері управління водними ресурсами з урахуванням положень Угоди про асоціацію та водно-екологічного аспису ЄС. Встановлено нормативно-правові орієнтири, що визначають напрям модернізації національної водної політики відповідно до вимог статей 361 і 365 Угоди про асоціацію, спрямованих на охорону довкілля та формування галузевих стратегій. З'ясовано зміст Водної рамкової директиви ЄС як базового документа, що формує інтегровану модель охорони поверхневих, прибережних і підземних вод та визначає системні завдання сталого водокористування. Наголошено на необхідності переходу до екосистемних підходів, що передбачають запобігання деградації водних екосистем, поетапне зниження забруднення та досягнення природних фонових рівнів пріоритетних речовин. Підкреслено важливість директиви щодо зменшення ризиків, пов'язаних із паводками та посухами, у контексті кліматичних змін і зростання навантаження на водні ресурси. Констатовано значущість імплементації Directive (EU) 2020/2184, що зумовлює оновлення стандартів якості питної води, методів моніторингу та системи оцінювання ризиків. Визначено потребу у впровадженні інтегрованого управління річковими басейнами та стандартизації екологічного моніторингу відповідно до європейських технічних регламентів. Зауважено роль Закону України «Про питну воду та питне водопостачання» у наближенні національних нормативів до стандартів ЄС та підвищенні інституційної узгодженості процедур оцінювання якості питної води. Окреслено нормативні зміни у сфері контролю радіаційної безпечності води, що відображають поглиблення інтеграційних процесів із ЄС. Сформульовано зміст Водної стратегії України як інструменту адаптації законодавства до вимог Водної рамкової директиви та Директиви (ЄС) 2020/2184. Підкреслено прогрес України у впровадженні європейських стандартів, включно з апроксимацією законодавства, створенням басейнових рад і модернізацією системи моніторингу.



КЛЮЧОВІ СЛОВА

європейська інтеграція, управління водними ресурсами, Водна рамкова директива ЄС, якість питної води, річкові басейни, водна політика, адаптація законодавства.

1. Introduction

The problems of adaptation and implementation of European approaches to water resources management are especially important in the context of the deepening of Ukraine's European integration course, because the state of aquatic ecosystems directly determines environmental safety, quality of life of the population and sustainability of socio-economic development. In this context, there is a need for a scientifically grounded definition of ways to adapt the national water policy to European standards, which is an important task of modern science and ensures the formation of an effective, sustainable and environmentally oriented water resources management system.

2. Literature Review

The analysis of works on the problems of European integration in the field of water resources management shows the significant attention of scientists to the issues of adaptation of legislation, institutional mechanisms and management tools. First of all, N. Palyanychko and V. Sakharnatsky substantiate the importance of financial and economic instruments in the modernization of water resources management systems [11]. V. Bredikhina analyzes the normative aspects of the approximation of the water legislation of Ukraine to the EU *acquis* [1]. N. Tarasiuk, I. Magdyuk and V. Kovalska investigate the mechanisms of integration of the requirements of the EU Water Framework Directive into the national hydrological management system [17]. The work of S. Vykhryst substantiates the importance of digitalization of environmental monitoring as a prerequisite for the effective fulfillment of Ukraine's environmental obligations to the EU [20]. M. Serbov considers the possibilities of adapting the world experience in freshwater resources management in the context of the implementation of the Water Framework Directive [14]. G. Shtogrin determines the importance of introducing the principles of integrated management into sectoral subcomplexes of water management [16].

3. Problem Statement

The article is aimed at analyzing the main aspects of Ukraine's European integration in the field of water resources management with an emphasis on adaptation and implementation of the provisions of the EU Water Framework Directive.

4. Methods and Materials

The study is based on a comprehensive analysis of the regulatory, conceptual and institutional foundations of Ukraine's European integration in the field of water resources management. In the course of the work, the following groups of materials were used: international legal documents of the European Union, in particular: EU Water Framework Directive 2000/60/EC; Directive (EU) 2020/2184 on the quality of water intended for human consumption; related technical documents and methodological recommendations of the European Commission and the European Commission environmental agencies for environmental monitoring, basin management and risk assessment; national regulations of Ukraine, including: the EU-Ukraine Association Agreement (Articles 361, 365); the Law of Ukraine "On Drinking Water and Drinking Water Supply"; the Law of Ukraine "On Environmental Protection"; by-laws of the Cabinet of Ministers of Ukraine and the Ministry of Health on sanitary standards, radiation and chemical safety of water; the Water Strategy of Ukraine and strategic documents on river basin management; analytical and statistical sources, including: official data of the State Agency of Water Resources of Ukraine; reports of the European Environment Agency; materials of international organizations (WHO, UNECE, OECD) related to water resources management and adaptation of sectoral reforms. For the processing of these materials, a system of modern scientific methods was used, in particular.

Method of normative and legal analysis. It is used to systematize European and Ukrainian legal acts, determine the scope and content of Ukraine's obligations in the field of adaptation of water legislation, as well as assess the compliance of national standards with the requirements of the EU Water Framework Directive and Directive (EU) 2020/2184. Method of comparative legal analysis. It made it possible to compare the provisions of the EU *acquis* with the Ukrainian regulatory framework, identify gaps, determine the priorities of harmonization and the degree of consistency of mechanisms for river basin management, monitoring and control of water quality. System method. Aims to consider water

management as an integrated ecosystem and administrative system that includes environmental, institutional, sanitary and technological components. Content analysis method. The EU strategic, technical and monitoring documents, reports of the Ukrainian authorities were developed, which made it possible to identify key trends, management tools and compliance indicators. Method of scientific generalization and synthesis. It was used to form a comprehensive picture of the implementation of ecosystem approaches, modern standards of drinking water quality, pool management and monitoring systems.

5. Results and Discussion

The current stage of Ukraine's European integration is characterized by the deepening of sectoral cooperation in strategically important areas, among which water resources management occupies a special place. In this context, the provisions of the Association Agreement between Ukraine and the European Union [19], which form the regulatory framework for cooperation in the field of environmental protection, are of particular importance. Thus, Article 361 of the Association Agreement between Ukraine and the European Union [19] regulates the comprehensive direction of cooperation in the field of environmental protection, which includes the preservation, protection, improvement and reproduction of the quality of the natural environment. In this context, the focus on public health, rational use of natural resources, as well as support for international actions aimed at overcoming regional and global environmental challenges, in particular in the direction of improving water quality and water resources management, including the marine environment, is decisive. The above wording sets the conceptual framework for harmonizing Ukrainian environmental policy with European approaches, which actualizes the modernization of the water resources management system.

It is noteworthy that Article 365 of the Association Agreement between Ukraine and the European Union [19] specifies the direction of cooperation, focusing on the development of sectoral strategies in the areas of water quality improvement and water resources management, also covering marine ecosystems. The document emphasizes the need to form financial mechanisms and incentives to attract investment in infrastructure and technological solutions that ensure sustainable water management.

It is appropriate to emphasize that the adaptation of these norms to the Ukrainian legislative field requires simultaneous updating of methodological, organizational and financial mechanisms. That is why the provisions of the Agreement serve as an important methodological guide for the formation and implementation of a strategically coordinated water management policy.

It should be noted that the important purpose of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy [4], i.e., the EU Water Framework Directive, is to form a comprehensive regulatory framework for the protection of inland surface, transitional, coastal and groundwater waters. It is noteworthy that this directive defines several system blocks of tasks that cover environmental and resource-economic aspects of water policy. In particular, the document provides for the prevention of further degradation of aquatic ecosystems and the improvement of their ecological status, including land and wetlands, the functioning of which is determined by the relevant water regimes.

The analysis of the content of the directive also focuses on the need for a gradual transition to sustainable water use models based on long-term conservation of water resources. In this context, mechanisms for minimizing discharges, emissions and leakage of priority substances and phasing out their flow into water bodies are especially important. Along the way, it is worth emphasizing that this provision is integrated into the broader European environmental policy, focused on eliminating priority hazardous substances and achieving such levels of their concentrations that correspond to natural background values or tend to zero for synthetic components [4].

At the same time, the directive outlines a fundamentally important goal – to ensure a progressive reduction in the level of groundwater pollution and prevent its further spread. The complexity of the methodology here is due to the fact that groundwater plays a critical role in maintaining water balance and providing the population with drinking water, and therefore requires increased institutional attention. Additionally, the need for measures aimed at reducing the risks associated with floods and droughts, which is becoming increasingly relevant in the context of climate change, is emphasized.

Significantly, these tasks are aimed at achieving integrated results, including: guaranteeing sufficient reserves of surface and groundwater of good quality; significant reduction in groundwater pollution; increased level of protection of territorial and sea waters; fulfillment of obligations stipulated by international agreements on the prevention of pollution of the marine environment and the elimination of its consequences [4].

In this regard, it is appropriate to emphasize that Ukraine has undertaken to implement a set of European environmental norms and standards, among which Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast) (Text with EEA relevance) [6] (hereinafter Directive (EU) 2020/2184) on water quality is of particular importance, intended for human consumption. Obligations to adapt this directive necessitate the modernization of national standards for controlling the quality of drinking water, revision of monitoring methodologies and updating approaches to risk assessment in the field of water supply [12].

It should be noted that the implementation of the provisions of the directive provides for a significant transformation of management models in the water sector. Therefore, the Ukrainian water management system requires a transition to integrated approaches at the level of river basins, which corresponds to the conceptual foundations of the Water Framework Directive. It is also important to standardize environmental monitoring procedures, because the reliability and consistency of data directly create the basis for a correct assessment of the ecological state of water bodies. In this aspect, it is useful to introduce complex-level surveillance systems that integrate modern methods of laboratory analysis, remote sensing and digital data processing technologies [7; 15].

It should be noted that Article 6 of the Law of Ukraine “On Drinking Water and Drinking Water Supply” of 10.01.2002 No. 2918-III [10] forms the fundamental guidelines of the state policy in the field of providing the population with high-quality drinking water. It is noteworthy that this article focuses on the need for gradual approximation of drinking water production technologies, wastewater treatment standards, as well as measuring tools and assessment methods to the relevant practices adopted in the EU Member States.

In addition, the provisions of Article 28 of the same Law [18] determine the mechanism for approving safety indicators and individual indicators of drinking water quality. In particular, it is envisaged that the relevant decisions are made by the central executive body responsible for the formation and implementation of state policy in the field of healthcare. Along the way, it should be emphasized that the competence of this body includes the approval of the list of reference methods for measuring the content of pollutants and pesticide residues in drinking water, which significantly increases the integrity and reproducibility of assessment procedures.

Safety indicators and individual indicators of drinking water quality, in accordance with the provisions of the article, should be approved on the basis of international and state sanitary standards, sectoral instructions and recommendations, as well as documents of relevant international organizations. At the same time, in the absence of such requirements, priority is given to EU standards, which rationally correlates with Ukraine’s European integration trajectory in the field of water resources management [18]. Noteworthy is the requirement according to which the approval of indicators that are not in the documents of international organizations or establish a higher level of health protection is carried out only if there is scientifically based evidence that meets the criteria approved by the same international institutions.

In this context, it is appropriate to emphasize that the mechanism for adapting drinking water quality standards defined in the legislation actually creates institutional conditions for synchronizing the national water supply policy with the environmental and sanitary requirements of the EU. This synchronization is of strategic importance because it ensures the compatibility of Ukrainian practice with the provisions of Directive (EU) 2020/2184 and the methodological approaches of the Water Framework Directive.

It should be noted that the Order of the Ministry of Health of Ukraine “On Amendments to the Order of the Ministry of Health of Ukraine dated May 12, 2010 No. 400 and to the State Sanitary Norms and Rules “Safety Indicators and Certain Indicators of Drinking Water Quality under Martial Law and Other Emergencies” dated 29.11.2024 No. 1984 [10] was adopted based on a significant regulatory complex, which includes amendments to part two of Article 26 of the Law of Ukraine “On the Public Health System”, subparagraph 4 of paragraph 115 of the Action Plan for the implementation of the recommendations of the European Commission set out in the Progress Report of Ukraine under the 2023 EU Enlargement Package, as well as the provisions of government acts regulating the activities of the Ministry of Health. It is noteworthy that this order is aimed at ensuring an adequate level of protection of the population by taking into account the requirements of Council Directive 2013/51/Euratom of October 22, 2013 [5], which establishes standards for the permissible content of radioactive substances in water intended for human consumption.

In addition, the analysis of the provisions of the same order details the procedural aspects of hygienic assessment of drinking water quality. In particular, it is indicated that control over radiation

safety parameters in places of water intake of surface and underground sources is carried out in accordance with the established parametric values of sanitary standards [10]. It is advisable to emphasize that the update of sanitary requirements in the direction of monitoring the radiation safety of drinking water indicates the deepening of integration processes between Ukraine and the EU in the field of water management.

It should be noted that the Water Strategy of Ukraine [2] (hereinafter referred to as the Strategy) outlines the basic principles of state policy in the field of protection and rational use of water resources, as well as defines systematic approaches to their reproduction based on integrated management. The document formulates interrelated areas for improving water policy, which provide for increasing the level of water security and reducing risks associated with the use of water resources. It is noteworthy that the strategic provisions are structured taking into account Ukraine's obligations in the field of European integration, which necessitates the harmonization of national norms with the provisions of EU legislation.

In this context, the Strategy contains a detailed orientation on the elimination of terminological inconsistencies in terms of defining the concept of "drinking water", adaptation of the system of standards to the requirements of Directive (EU) 2020/2184 on the quality of water intended for human consumption, as well as the development of environmental standards for surface and groundwater bodies in accordance with the EU acquis. It is appropriate to emphasize that special emphasis is placed on ensuring the preparation and implementation of river basin management plans in accordance with the provisions of Directive 2000/60/EC, as well as on the development of flood risk management plans in accordance with Directive 2007/60/EC. Incidentally, it should be noted that the strategic benchmark is a phased expansion of the water monitoring network, which must meet the requirements and technical standards of the EU, including increasing the number of observation stations and improving the quality of analytical capabilities.

Significantly, the implementation of the directions defined by the document optimizes the internal water resources management system, as well as forms holistic conditions for the transition to the full implementation of the EU water and environmental policy. In this regard, it is worth highlighting the methodology aimed at the formation of environmental standards that provide assessment of the state of water according to integrated indicators and correspond to the ecosystem rationality of the Water Framework Directive.

Despite the ongoing armed aggression, Ukraine has made significant progress in implementing the provisions of the Water Framework Directive. According to the competent authorities [14], the approximation of the main norms of national water legislation to EU law has been completed, the boundaries of river basins have been defined, basin councils have been formed as institutions for stakeholder participation, and the water monitoring system has been modernized, including through the creation of four modern laboratories. Significantly, these developments have received a positive assessment of the European Commission, which confirms the compliance of national measures with the requirements of the European water policy.

The Government of Ukraine has already approved river basin management plans for nine basins, within which 9173 surface water bodies and 173 groundwater bodies have been identified. These include plans for the management of the river basin of the Danube, the Black Sea region, the Crimea, the Azov region, the Vistula, the Dniester, the Southern Bug, the Dnieper and the Don for 2025–2030 [9]. It is worth noting that these plans integrate elements of water body pressure analysis, environmental assessment, action programs and monitoring mechanisms, which are fully correlated with the provisions of the Water Framework Directive.

Significantly, the development of European integration structures in the field of ecology was reflected in the launch of the EU4Green Recovery East program on March 12, 2025, aimed at supporting the Eastern Partnership countries in green reconstruction processes. The program provides EU funding of €21.3 million for 2025–2028, which makes it possible to support the reform of environmental management systems and strengthen institutional capacities in the field of circular economy and sustainable water use.

In this context, it is appropriate to emphasize that EU4Green Recovery East opens up additional opportunities for Ukraine to modernize the water management sector, in particular in the direction of economic assessment of water use, pollution reduction and the development of cross-border cooperation. At the same time, the program expands resources for government agencies and businesses, especially small and medium-sized ones, which will contribute to increasing resource efficiency and strengthening innovative approaches to water system restoration.

At the same time, the order of the Cabinet of Ministers of Ukraine "On Approval of the Concept of the State Target Social Program for the Improvement of Drinking Water Supply of Ukraine for the Period up to 2035" dated 19.11.2025 No. 1271-p [3] emphasizes that solving complex problems of providing the population with high-quality drinking water requires a systematic methodology. In particular, the insufficient level of access of households to the infrastructure of centralized water supply is emphasized, which is especially typical for rural areas, as well as the deepening of risks associated with the unsatisfactory technical condition of water supply facilities and the unprofitability of water supply enterprises [3]. It was stated that these challenges have been significantly intensified as a result of the large-scale destruction of water infrastructure caused by the armed aggression of the Russian Federation against Ukraine, which additionally actualizes the need to form a unified regulatory approach to ensuring water quality.

In this context, it is envisaged to develop and implement the State Standards of Ukraine (DSTU), which should ensure the gradual approximation of national legislation to the EU requirements in the field of drinking water supply [3]. This measure is aimed at unifying technical and sanitary standards in accordance with EU regulations, which in turn creates the necessary prerequisites for adapting the industry to the provisions of the Water Framework Directive and related European acts [13]. It should be noted that the harmonization of standards will help strengthen the institutional capacity of authorities in the field of monitoring, control and planning of water resources.

It is also worth emphasizing that the implementation of DSTU, harmonized with the EU requirements, will create prerequisites for the formation of a single technical space, in the structure of which the processes of production, transportation and quality control of drinking water is subject to unified criteria.

At the same time, the introduction of updated standards implies the need to modernize equipment, digitalize quality control processes and update laboratory analysis methods, which requires significant investments [8]. However, it is these institutional transformations that make it possible to form a modern model of water resources management focused on risk prevention, ensuring the sustainability of water supply and compliance with environmental goals defined in EU policy. In view of this, the adaptation of national standards to European requirements is an important element of Ukraine's integration progress in the field of water policy.

6. Conclusions

Summarizing the above material, it is advisable to state that the European integration of Ukraine in the field of water resources management provides for the harmonization of national policy with the provisions of the EU Water Framework Directive, Directive (EU) 2020/2184 and the relevant provisions of the Association Agreement between Ukraine and the EU, consistently ensures the modernization of regulatory, institutional and technical mechanisms of water management. At the same time, the implementation of these acts actualizes the need to implement integrated approach to river basin management, improvement of monitoring systems and harmonization of water quality standards in accordance with European requirements. In addition, the strategic provisions of the Water Strategy of Ukraine and the update of sanitary standards in the field of drinking water supply confirm the systemic nature of the state policy aimed at increasing the level of water security and environmental sustainability. Finally, the progress made in the development of river basin management plans, the modernization of laboratory infrastructure and the launch of European support programs testify to the progressive strengthening of Ukraine's institutional capacity and its approximation to the comprehensive standards of EU water and environmental policy.

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Cluster Model of Emergency Medical Care Organization: Improvement of Public Administration Tools

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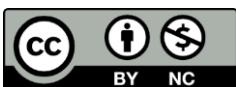
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The article considers the features of the cluster model of the organization of emergency medical care and ways to improve the tools of public administration to ensure the efficiency, coordination and availability of medical services. It is determined that the analysis of budget financing of primary health care and emergency care services is important for assessing the ability of the state to ensure the timeliness and quality of medical interventions. Medical care, centralized dispatch services and training departments contribute to the standardization of procedures, prompt redistribution of resources, and increase the efficiency of interregional coordination. It has been established that the application of the cluster approach involves the optimization of patient transportation routes, centralization of funding, standardization of processes and integration of digital solutions, including telemedicine facilities and call monitoring systems. It is noted that the legal regulation of the functioning of emergency medical care teams and departments forms the basis for the continuity of care, coordination between structures and adaptation to social, demographic and territorial characteristics. It is noted that strategic planning of the activities of institutions within hospital clusters ensures the concentration of management decisions on long-term structural changes and increases the resilience of the health care system. It has been revealed that the introduction of a cluster model of emergency medical care organization provides a synergistic effect of interaction between institutions, increases the efficiency, accessibility and quality of medical services, and also contributes to bringing the health care system of Ukraine to international standards of quality of medical care.



KEYWORDS

emergency medical care, cluster model, public administration, budget financing, standardization, patient routing.



Кластерна модель організації екстреної медичної допомоги: удосконалення інструментів державного управління

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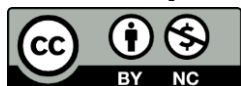
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У статті розглянуто особливості кластерної моделі організації екстреної медичної допомоги та шляхів удосконалення інструментів державного управління для забезпечення ефективності, координації та доступності медичних послуг. Визначено, що аналіз бюджетного фінансування первинної медичної допомоги та служб екстреної і невідкладної допомоги є важливим для оцінювання здатності держави забезпечувати своєчасність і якість медичних втручань. Підкреслено, що інтеграція регіональних центрів екстреної медичної допомоги, централізованих диспетчерських служб і навчально-тренувальних відділів сприяє стандартизації процедур, оперативному перерозподілу ресурсів та підвищенню ефективності міжрегіональної координації. Встановлено, що застосування кластерного підходу передбачає оптимізацію маршрутів транспортування пацієнтів, централізацію фінансування, стандартизацію процесів та інтеграцію цифрових рішень, включно з телемедичними засобами та системами моніторингу викликів. Зауважено, що нормативно-правове регулювання функціонування бригад і відділень екстреної медичної допомоги формує основу для безперервності надання допомоги, координації між структурами та адаптації до соціальних, демографічних і територіальних особливостей. Зауважено, що стратегічне планування діяльності закладів у межах госпітальних кластерів забезпечує концентрацію управлінських рішень на довготривалих структурних змінах та підвищує стійкість системи охорони здоров'я. Виявлено, що впровадження кластерної моделі організації екстреної медичної допомоги забезпечує синергетичний ефект взаємодії установ, підвищує ефективність, доступність та оперативність медичних послуг, а також сприяє приведенню системи охорони здоров'я України до міжнародних стандартів якості медичної допомоги.



КЛЮЧОВІ СЛОВА

екстрена медична допомога, кластерна модель, державне управління, бюджетне фінансування, стандартизація, маршрутизація пацієнтів.

1. Introduction

The health care system of Ukraine is in the conditions of deep structural and functional transformations, which determines the urgent need to improve public administration tools and mechanisms for resource provision of important subsectors of medical care. A significant role is played by the efficiency of the distribution of financial, human and technological resources in the subsectors of primary, emergency and emergency medical care, because the promptness of response and the quality of medical services to the population depend on this. In addition, ensuring optimal coordination and integration of these resources is a prerequisite for increasing the overall capacity of the health system. In this context, the relevance of the study is determined by the need for scientifically grounded improvement of state management mechanisms to ensure the effective organization of emergency medical care (EMD).

2. Literature Review

The analysis of recent studies and publications shows that the problems of improving the organization of EMD cover managerial and technological aspects. Thus, O. Ignatenko and I. Uruzbayeva investigate the development of digitalization of EMD [1]. O. Lyubinetz and V. Milashovska consider the strategic planning of the activities of health care institutions of the hospital cluster [9]. V. Knyazkova, D. Guz, O. Rudynska and V. Krylenko emphasize the formation of clusters of medical institutions as an administrative tool for management in the conditions of decentralization [2]. In addition, S. Sakhanenko considers territorial medical clusters as elements of the formation of agglomerations and the development of their structure [13].

3. Problem Statement

The article is aimed at analyzing the cluster model of EMD organization and ways to improve public administration tools to ensure the efficiency, coordination and availability of medical services.

4. Methods and Materials

The methodological basis of the study is based on the use of a comprehensive interdisciplinary approach, which allows combining the theoretical foundations of public administration, modern concepts of the organization of medical services and tools of system analysis. The basis of the study is the provisions of the theory of state regulation, health care management, spatial organization of medical clusters and principles of assessing the effectiveness of public administration.

To form a theoretical model of the cluster organization of emergency medical care, a structural and logical method was used, which provided an opportunity to systematize the key elements of the functioning of clusters, determine their managerial relationships and establish the logic of interaction between regional centers, dispatch services and medical institutions of different levels. This made it possible to form a conceptual scheme for the integration of resources and processes within a single managerial space.

To study the actual state of emergency medical care and assess the effectiveness of its functioning, a comparative analysis was used, which made it possible to compare regional models of EMD organization, determine differences in approaches to financing, patient routing, staffing and dispatching. The comparison was carried out on the basis of data from the Ministry of Health of Ukraine, the Center for Medical Statistics, reports of the National Health Service of Ukraine and regional programs for the development of health care.

To establish the impact of clustering on the effectiveness of management decisions, the method of system analysis was used, which made it possible to assess multi-level relationships between resource provision, organizational structure, process standards and final indicators of the quality of medical care. Particular attention is paid to the analysis of the mechanisms of centralization of dispatch services, the concentration of specialized equipment, the logistics of patient movement and the role of digital tools in increasing the efficiency of response.

In order to assess the compliance of the cluster model with regulatory requirements, a regulatory analysis was carried out, which included a study of legislative acts, by-laws, standards for the provision of emergency medical care, industry protocols and international recommendations (WHO, OECD, EU Health Systems). This made it possible to identify gaps in the current regulation, identify areas for improving management tools and assess the possibility of adapting European clustering models to the Ukrainian context.

To assess the impact of clustering on the availability of medical services, methods of geographic information analysis were used. Based on cartographic data, the territories with the lowest level of transport accessibility were determined, as well as the optimal routes of movement of teams and the location of bases were modeled in accordance with population density and remoteness from hub hospitals.

In order to form generalized conclusions of the study, the SWOT analysis method was used, which made it possible to assess the strengths and weaknesses of the cluster model, identify potential opportunities for development and risks associated with managerial, financial and territorial constraints.

The application of a comprehensive methodology made it possible to comprehensively study the functioning of the cluster model of EMD, identify institutional shortcomings, assess managerial advantages and develop proposals for improving public administration tools in the field of emergency medical care.

5. Results and Discussion

The analysis of budget financing of primary health care and emergency care services is a necessary element of the study of the modern health care system of Ukraine, since it is these links that provide the basic level of availability of medical services. In this regard, the structuring and evaluation of state expenditures on polyclinics, outpatient clinics and ambulance services make it possible to objectively determine the level of the state's ability to ensure the quality and timeliness of medical services. interventions. Firstly, there is a need to find out how the distribution of budget resources affects the functioning of the relevant medical institutions, including updating the material and technical base, improving the skills of personnel and compliance with the standards for the provision of medical care. Secondly, the assessment of the dynamics of expenditures makes it possible to identify trends in the formation of financial priorities of the state and establish their compliance with the real needs of the health care system.

Therefore, in order to clearly reflect the dynamics of financing important links of the health care system, it is advisable to consider the volume of expenditures of the state budget of Ukraine on polyclinics, outpatient clinics and ambulance and emergency services in the context of individual years (Fig. 1). Therefore, the analysis of the dynamics of expenditures of the state budget of Ukraine on the financing of polyclinics, outpatient clinics and emergency medical care services in 2018–2024. testifies to the tendentious strengthening of financial prerequisites for the modernization of public administration instruments in this area. In particular, the increase in actual funding from UAH 33.18 million in 2018 to UAH 424.69 million in 2024 indicates the priority of the development of the continuous medical care system and forms the basis for the introduction of structurally and functionally new models, including cluster ones.

Taking into account the consistently high performance rates of budget assignments (96–98% in most years), it can be stated that the above financial predictability creates favorable conditions for the systematic planning of management decisions in the field of EMD, while the exceptional values of 2018 and 2021 (72.04% and 84.48%, respectively) indicate the influence of external factors, without violating the general trend towards strengthening public administration and optimizing the budget mechanism. At the same time, in January-September 2025, UAH 33183997.46 was fulfilled with the implementation of the revised equal plan at the level of 72.04% [12].

In view of this, it is important to emphasize that in the context of the formation of a cluster model for providing EMD, financial stability becomes an important tool for the development of management mechanisms [3]. In particular, the targeted allocation of funds for fleet renewal, the creation of modern dispatch systems, the development of telemedicine solutions and digital route maps creates the basis for the standardization of management processes [4].

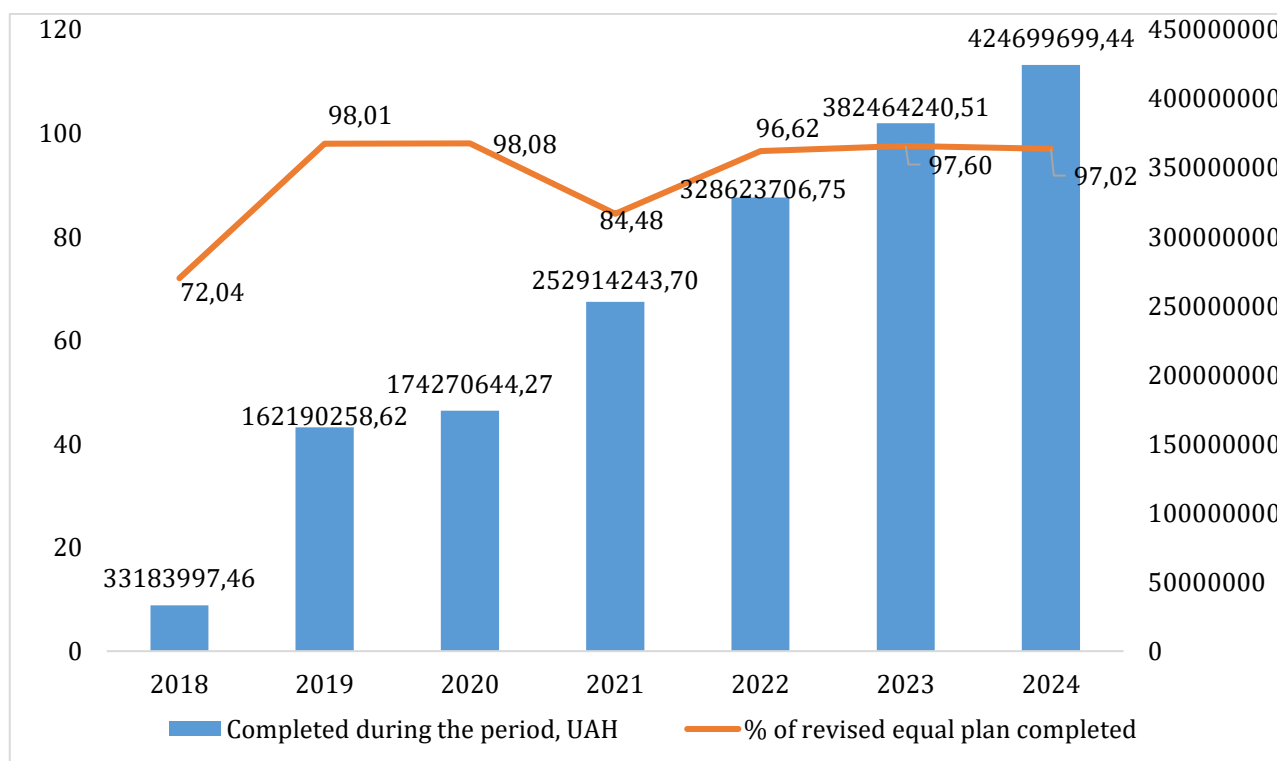


Figure 1. Expenditures from the state budget of Ukraine to finance polyclinics and outpatient clinics, ambulance and emergency care

Source: Compiled based on [11].

Currently, the EMS system in Ukraine functions as a complex network covering the Autonomous Republic of Crimea, all regions, as well as the cities of Kyiv and Sevastopol. Its institutional structure includes EMS and disaster medicine centers, emergency (ambulance) medical aid stations, emergency (ambulance) medical care teams, as well as emergency medical care departments, which are defined in Article 5 of the Law of Ukraine “On Emergency Medical Care” [15]. In this regard, the system assists the population free of charge and focuses on prompt response to emergencies and mass accidents.

In the structure of each EMD station or center, an important role is played by an emergency (ambulance) team, which carries out primary diagnostics, stabilization of patients’ condition and their transportation to appropriate health care institutions. The presented functional distribution ensures the continuity of the medical route (from the scene of the incident to the medical institution) and forms the basis for further integration of regional services into the system of the cluster management model [15].

At the same time, current trends in the development of the EMD system indicate the need to move from an isolated territorial organization to a cluster model, which provides for the pooling of regional resources, standardization of management processes and the creation of interregional centers of competence, which in turn makes it possible to improve the quality of response and optimize logistics routes, especially in cases of emergencies, in particular in the current conditions of martial law.

In the system of the cluster model of EMS organization, the determining factor is the institutional capacity of regional EMS centers, since they ensure the interoperability of institutions, standardization of procedures and the possibility of prompt redistribution of resources between territories. In this context, the activities of the Lviv Regional Center for Emergency Medical Care and Disaster Medicine (<https://stat.loda.gov.ua/hospital/knp-lvivsko-oblasno-rady-lvivskyj-oblasnyi-tsent-r-ekstrenomedychno-dopomogy-ta-medytyny-katastrof>) demonstrate the effectiveness of a centralized dispatch service, an extensive network of substations, a system of personnel training and the implementation of medical transportation tasks in accordance with the current legislation. As a result, the Lviv Center can be considered as an infrastructural basis for interregional coordination, as it has sufficient human, technical and technological potential to integrate into wider clusters of interaction and provide support to adjacent territories in the event of large-scale incidents. The same characteristics can also be traced in the activities of the Odesa Regional Center for Emergency Medical Care and Disaster Medicine (<https://emd.od.ua/pro-nas>), which provides medical response in the city of Odesa and the region.

The above examples of the functioning of regional EMS centers emphasize that effective infrastructure and centralized coordination are a prerequisite for high-quality EMD delivery. In turn, the implementation of such opportunities is impossible without clearly defined normative principles for the activities of structural units that provide a direct response to urgent situations.

According to the Model Regulations on the Emergency (Ambulance) Medical Care Team, approved by the Resolution of the Cabinet of Ministers of Ukraine dated November 21, 2012 No. 1114 [7], a team is defined as a structural unit of an EMS and disaster medicine center or an emergency (ambulance) medical aid station. Its activities are focused on providing EMD to persons in emergency conditions directly at the scene, as well as during transportation to health care facilities.

In continuation of this, the document [16] details the main tasks of the team, which include: the provision of EMD at the pre-hospital stage, the transportation of patients with medical support by order of the dispatcher of the operational dispatch service of the center, as well as participation in the elimination of the consequences of emergencies. All functions of the team are directly related to ensuring the efficiency, timeliness and continuity of assistance, which makes it possible to further standardize such processes at the level of interregional EMD clusters. In this regard, the above regulation consolidates the functional responsibilities of teams and at the same time creates prerequisites for their integration into network structures focused on the sharing of resources and unified response protocols.

Taking into account the above, the activities of the Municipal Non-Profit Society "Regional Center for Emergency Medical Care and Disaster Medicine" of the Dnipropetrovsk Regional Council (<https://emddnipro.itmed.org/about-us>) demonstrate the practical implementation of the principles of the cluster approach in the EMS system. Therefore, the center provides territorial coverage and prompt response through a network of stations and substations, and integrates a centralized dispatch service and automated workstations for coordinated management of call flows. The presented functions allow you to create unified routes for transporting patients, which ensures the rapid delivery of people in critical conditions to specialized healthcare institutions, optimizes the use of resources and guarantees standardized medical care. In addition, the training department of the center provides training for medical and non-medical workers to work in emergencies, which strengthens the integration potential of the system and its ability to function within interregional clusters.

In view of the above, the effective functioning of the network of EMD centers demonstrates the need to integrate organizational practices with regulatory mechanisms governing hospital clusters and patient transportation routes. In this context, the amendments made by the Resolution of the Cabinet of Ministers of Ukraine dated November 5, 2025, No. 1456 [19] ensure the unification of standards, coordination of routes with the Ministry of Health of Ukraine and centralized planning of patient flows, which helps to increase the efficiency of response and optimize resources in the EMS system. The presented changes contribute to the formation of efficient transport corridors and the minimization of the time of delivery of patients with critical conditions to specialized institutions, including state-owned medical institutions, approved by the Ministry of Health of Ukraine.

Due to the improvement of transportation routes, the ability of the EMD system to function in a cluster organization is enhanced, so the integration of municipal and state institutions into the common medical space ensures the rational use of specialized resources. This aspect means that patients with strokes, heart attacks, or severe injuries are directed directly to the nearest facility that has appropriate technological capabilities, which increases the effectiveness of clinical outcomes and reduces mortality [19].

Taking into account the increased efficiency of patient routing within the cluster organization of EMD, the centralization of financing and the conclusion of contracts with one regional EMS center becomes an important mechanism for integrating resources and standardizing processes. Therefore, this coordination ensures the interconnection between individual structures and creates conditions for the optimal distribution of material, technical and human resources, which enhances the efficiency of response and the quality of assistance in critical situations.

Thus, according to the current regulation, the National Health Service of Ukraine enters into agreements with one center of EMD and disaster medicine of communal ownership in each region [18]. This aspect ensures the centralization of funding and creates prerequisites for the formation of an effective cluster model, within which regional EMS structures function as interconnected elements of a single response network and coordinate the activities of teams in the mode of interregional interaction. In the context of the established financial mechanisms, the tariff for medical services for the provision

of EMS is defined as a global rate based on the capitation rate for the readiness to provide services during the year and amounts to UAH 306.3 per year (as of 2025). The introduction of such a rate allows taking into account the size of the population, as well as the specific conditions for assisting in different territorial categories, which in turn strengthens the capacity of regional centers to integrate into cluster structures [18].

Adjustment coefficients are applied to the base capitation rate, which reflects the characteristics of the territories and the conditions for the provision of medical care:

- 1) for settlements in the territories of possible hostilities – 1.48;
- 2) for settlements in the territories of active hostilities – 6.01;
- 3) for mountainous settlements – 1.2 [18].

The use of these coefficients allows for a balance between financial resources between territories with different risks and ensures a rational distribution of resources, which is especially important for optimizing the functioning of cluster structures.

In this context, a full-fledged digital transformation of the EMS system at the pre-hospital stage becomes a prerequisite for the implementation of an effective cluster approach [8], because the improvement of the functionality of the Central 103 IAS, the introduction of uniform standards of interaction between regional systems and innovative solutions for the digitalization of informed consent of patients allow optimizing the work of teams and ensuring transparency of processes at all levels [1, p. 37].

On the example of the Kharkiv region, we note that the territorial structure and digital integration of the bases of EMS teams demonstrate the practical implementation of the cluster approach, which includes 26 branches, 49 permanent and 113 temporary bases to serve the population of about 2.73 million people. The information and dispatch system with GPS monitoring and automated call distribution allows you to quickly send “free” teams, optimize routes and abandon the traditional territorial approach, ensuring the effectiveness of pre-hospital care. In addition, the interaction of the 103 and 112 services and the modern material and technical base increases the level of preparedness of teams for emergencies and supports the continuous process of personnel training, which is important for the sustainable functioning of the EMD cluster model.

Based on the above, it should be noted that the implementation of the cluster approach in the EMS system is manifested through the territorial structure of brigade bases, digital integration and route optimization, which increases the efficiency of pre-hospital care and the readiness of personnel for emergencies. In this context, the regulatory framework, in particular the Model Regulations on Emergency Medical Care Departments [17], ensures the establishment of clear functional standards for the activities of departments, defining their role in receiving, transporting and providing comprehensive medical care to patients in various emergency conditions.

The generalization of the above indicates that the regulation of the department’s activities is not limited only to the definition of its clinical tasks, but provides for a wider range of organizational and coordination processes. This creates the basis for considering additional functional responsibilities aimed at ensuring the continuity of EMS provision and increasing its effectiveness. Therefore, the functional responsibilities of the department also include supporting the exchange fund of immobilization equipment, analyzing the causes of deaths, conducting training activities to improve the quality of work, as well as ensuring coordination with EMS teams and operational dispatch service. In addition, it is envisaged to use telemedicine tools for providing consultations and introducing new methods of diagnosis and treatment on the basis of evidence-based medicine, which creates the basis for a systematic approach to the organization of an EMS cluster network, where different departments interact as a single structure [17].

In addition, strategic planning of the activities of health care institutions integrated into the hospital cluster is carried out, taking into account the demographic characteristics of the service area and the functional tasks of each institution. This mechanism ensures the concentration of managerial decisions on long-term structural changes that form the basis for improving the efficiency of medical care. Thanks to this, conditions are created for the coordinated development of cluster elements and their ability to adapt to external challenges.

At the same time, the development of hospital clusters depends on the level of participation of the population and medical personnel in decision-making processes to improve the availability and quality of medical services. As evidenced by the study [9], social inclusion contributes to the formation of an understanding of the role of the health care system in regional development and strengthens

responsibility for the state of public health [9, p. 87]. Accordingly, the structured interaction between the cluster institutions and the population determines the fundamental parameters of the system's stability.

In this context, the new models of EMS organization in Ukraine, which are being implemented in the process of modernization of regional EMS services, are demonstrative. In particular, the creation of territorial EMD and disaster medicine centers, which function as single management entities at the regional level, ensures vertical and horizontal coordination between substations, dispatch services and hub hospitals. Information on the structure of these centers and their activities is officially published by the Ministry of Health of Ukraine (<https://moz.gov.ua/uk/ekstrena-medichna-dopomoga>). At the same time, the health care management system provides for the use of administrative methods that function as instruments of state regulation of the activities of medical institutions [6]. In the structure of the hospital cluster, these methods strengthen coordination between medical care entities and ensure the consistency of management decisions. Therefore, the presented integration is important for building a system focused on effectively responding to challenges related to conditions requiring emergency care.

In addition, it should be noted that the regulatory regulation of the functioning of operational dispatch services in the field of EMD is interrelated with the provisions of the Resolution of the Cabinet of Ministers of Ukraine dated 17.10.2012 No. 1031 "On Approval of the Procedure for the Functioning of the System of Emergency Assistance to the Population at the Single Telephone Number 112" [14]. This act defines the organizational principles for the creation and operation of the 112 system as an integrated network of dispatch services, which ensures the acceptance and initial processing of citizens' appeals. The presence of such provisions forms the regulatory basis for further coordination between rapid response services, including in the EMS segment, since the routing of calls to the relevant EMS center is carried out in the system of the general structure of the 112 system. Accordingly, the development of a unified operational dispatch service at the regional level is based on the principles of integration, standardization of response algorithms and unification of procedures for taking calls, which contributes to reducing response time and rational distribution of workload between ambulance teams.

The transformation of the health care system through medical reform is aimed at ensuring equal access of the population to quality medical services and reorienting management approaches so that the patient is at the center of the system [2]. In the cluster model, this means revising patient routing principles, expanding access to pivotal hospitals, and increasing the role of analytical tools for monitoring response.

In this regard, the example of the implementation of the Electronic Health System (eHealth) in the direction of modules related to EMD patient routing is important. The presented solution strengthens the ability of the state to manage patient flows and ensure their rapid direction in the structure of the cluster network.

It should also be noted that back in 2019, the Government approved the Concept for the Development of the EMS System, which defined the strategic guidelines for the modernization of the system and formed the basis for its structural transformation [10]. In the context of the implementation of the provisions of the Concept, it was envisaged to create prerequisites for a significant increase in the quality and availability of EMD, since in a critical situation, each person must receive timely and technologically provided intervention. At the same time, attention was focused on the need to strengthen the prestige of professions in the field of EMD, which provides for the formation of a fair and competitive system of remuneration for employees [16]. The tool demonstrated above clearly follows the principles of the cluster model, in which human resources are considered as an important element of the capacity of the regional network.

Therefore, the main result of the introduction of the cluster form of organization of health care institutions is the formation of conditions for improving the quality, efficiency and accessibility of medical care due to the synergistic effect of interaction between diversified institutions [5]. This form provides an opportunity to build a comprehensive and continuous chain of service provision, integrated into a single interdisciplinary platform at the intersection of healthcare, education, science and production, which in turn contributes to bringing medical care to the level of international standards [13, p. 367; 20].

Taking into account the above provisions, it is advisable to emphasize that in the EMD system, the cluster model provides optimization of patient routing and increase in response speed due to the concentration of resources, standardization of management procedures and integration of information flows. Therefore, one of the important practical manifestations of this process should be the functioning

of a single operational dispatch service at the regional level, which acts as a center for coordination of calls, operational monitoring and distribution of resources. This mechanism, in turn, will create the basis for strengthening the manageability and accountability of EMDs within the cluster

6. Conclusions

Thus, the analysis of the study allows us to state that the implementation of the cluster model of EMD organization provides an increase in the efficiency, accessibility and efficiency of medical services through the integration of regional centers, standardization of management processes and optimization of patient transportation routes. In this context, financial stability, centralization of resources and regulatory regulation of the functioning of teams and departments create prerequisites for continuity of care and integration of technological and digital solutions. In addition, the use of unified dispatch systems and telemedicine facilities allows to increase coordination between EMD entities and ensure rapid response in critical situations, while strategic planning and taking into account demographic, social and territorial characteristics contributes to the stability of the cluster network and the formation of a single medical space integrated into the system of public health management, which ultimately creates a synergistic effect of interaction between institutions and provides implementation of international standards for the quality of medical care.

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Practices of Implementing Museum Projects with the Ukrainian Cultural Foundation's Support: Problems and Recommendations

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ABSTRACT

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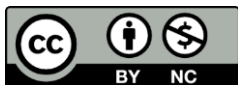
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The article provides a comprehensive analysis of the implementation of museum projects supported by the Ukrainian Cultural Foundation, aiming to identify key institutional, regulatory, and managerial barriers that prevent museums from fully participating in grant competitions. The relevance of the study is determined by Ukraine's European integration course, the need to modernize the cultural sector and strengthen the role of museums as outposts for preserving heritage and building national resilience in the context of full-scale war. The study aims to identify and systematize the patterns of success, regional distribution and institutional problems of museum initiatives supported by the UCF. The methodological basis comprises a systematic and comparative analysis of the regulatory and legal framework, as well as an empirical analysis of the UCF's rating lists and project registers for the period 2018–2025. Quantitative methods were used to calculate the share of successful applications and track regional distribution, as well as a case study method for in-depth analysis of the partnership model for project implementation. The main results show that, despite the UCF's catalytic role in stimulating digitalization, inclusiveness and innovation in the museum sector, the direct competitiveness of state and municipal museums remains low. This is due to limited financial autonomy, complex budgetary and treasury procedures, as well as low institutional capacity and staff shortages. As a result, the partnership model ("civil society organization as executor – museum as partner") dominates, covering about 80% of successful museum initiatives, providing flexibility but not solving the problems of systemic reform. Significant regional unevenness in the distribution of projects has been identified. It has been established that museum projects that are structurally "rigid" (exhibitions, digitization) are structurally losing out to "mixed" (event-based, educational) projects within the existing UCF lots. The conclusions emphasize the critical need for systemic reform of the legal status of museums to increase their financial autonomy. Further research should focus on developing specific proposals for the creation of a specialized grant lot for "hard" museum projects within the structure of the UCF, which is a necessary condition for ensuring their sustainability and full participation in Ukraine's cultural policy.

KEYWORDS

Ukrainian Cultural Foundation, museum projects, project management, grant funding, institutional capacity, cultural policy, partnership model, digitization, regulatory restrictions, cultural heritage.



Практики реалізації музейних проєктів за підтримки Українського культурного фонду: проблеми та рекомендації

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У статті здійснено комплексний аналіз практик реалізації музейних проєктів, підтриманих Українським культурним фондом, з метою визначення ключових інституційних, нормативних та управлінських бар'єрів, які перешкоджають повноцінній участі музеїв у грантових конкурсах. Актуальність дослідження зумовлена євроінтеграційним курсом України, необхідністю модернізації культурного сектору та посиленням ролі музеїв як форпостів збереження спадщини та формування національної стійкості в умовах повномасштабної війни. Мета дослідження полягає у виявленні та систематизації закономірностей успішності, регіонального розподілу та інституційних проблем музейних ініціатив, підтриманих УКФ. Методологічну основу склали системний та компаративний аналіз нормативно-правової бази, а також емпіричний аналіз рейтингових списків та реєстрів проєктів УКФ за 2018–2025 рр. Застосовано кількісні методи для розрахунку частки успішних заявок та простеження регіонального розподілу, а також метод кейс-стаді для глибокого аналізу партнерської моделі реалізації проєктів. Основні результати демонструють, що, попри каталітичну роль УКФ у стимулюванні цифровізації, інклюзивності та інновацій у музейній сфері, пряма конкурентоспроможність державних і комунальних музеїв залишається низькою. Це спричинено обмеженою фінансовою автономією, складними бюджетними та казначейськими процедурами, а також низькою інституційною спроможністю та кадровим дефіцитом. Як наслідок, домінує партнерська модель («громадська організація як виконавець – музей як партнер»), яка охоплює близько 80 % успішних музейних ініціатив, забезпечуючи гнучкість, але не розв'язуючи проблеми системної реформи. Виявлено значну нерівномірність регіонального розподілу проєктів. Встановлено, що музейні проєкти, які є структурно «твердими» (експозиції, цифровізація), структурно програють у конкуренції зі «змішаними» (подієвими, освітніми) проєктами в межах існуючих лотів УКФ. У висновках наголошено на критичній необхідності системної реформи правового статусу музеїв для підвищення їхньої фінансової автономії. Подальші дослідження мають бути сфокусовані на розробці конкретних пропозицій щодо створення спеціалізованого грантового лоту для «твердих» музейних проєктів у структурі УКФ, що є необхідною умовою для забезпечення їхньої сталості та повноцінної участі в культурній політиці України.

КЛЮЧОВІ СЛОВА

Український культурний фонд, музейні проєкти, проєктний менеджмент, грантове фінансування, інституційна спроможність, культурна політика, партнерська модель, цифровізація, нормативні обмеження, культурна спадщина.



1. Introduction

In the current context, as Ukraine develops into a democratic, open, and European-oriented state, culture plays a key role, as it is a factor that not only strengthens social stability and preserves national heritage but also actively contributes to the development of civic identity. Given that cultural institutions, particularly museums, are evolving from simple centers for preserving historical memory to multifunctional platforms for public dialogue, informal education and innovation in public administration, it is only logical that the state's attention is focused on finding effective mechanisms to support the cultural sector, among which grant instruments stand out for their transparency, flexibility and compliance with established European practices. The proposed topic is particularly relevant given Ukraine's European integration course, as the fulfilment of obligations under the Association Agreement with the EU, as well as active participation in the Creative Europe, Horizon Europe and EU4Culture programmers, requires a comprehensive modernization of approaches to cultural process management, which includes the mandatory implementation of project management and a significant increase in the institutional capacity of relevant organizations.

Therefore, the Ukrainian Cultural Foundation (UCF), which was established as an instrument for the consistent implementation of state policy in the field of culture, has become a key link in the process of bringing the national funding system closer to European standards based on the principles of openness, competitiveness, independent expertise and a focus on clear results, and it is thanks to its programmers that museum institutions have been among the most active beneficiaries. Given that grant support allows museums to effectively overcome chronic underfunding, implement necessary inclusive solutions, actively use digital technologies and expand educational and research programmers, their role has significantly increased in the context of full-scale war, when they have become important outposts performing the functions of preserving cultural heritage, documenting war events, supporting communities and building national resilience, which makes improving the effectiveness of their funding mechanisms a direct state interest. Of additional importance is the cooperation of museums with non-governmental organizations (NGOs) and charitable foundations, which, as project applicants, ensure that the excessive regulation inherent in state and municipal institutions is circumvented, thereby contributing to greater flexibility, innovation and mobility of museum projects, which is a critically important element of modern public administration, and therefore research into the implementation of museum projects supported by the UCF is urgently needed.

2. Literature Review

State cultural policy is a comprehensive system of management decisions and mechanisms, the primary purpose of which is to shape, develop comprehensively, and sustainably support the cultural environment. Its integral task is to ensure broad access for citizens to cultural goods, as well as to preserve the national heritage. The essence of this policy lies in the synergistic combination of regulatory, financial, institutional and infrastructural measures, which together create the necessary conditions for the sustainable development of culture in the state, while guaranteeing the realization of citizens' constitutional rights in the field of culture. According to the works of Ukrainian researchers, including O. Kulynich, A. Havrashenko [1], A. Bondarenko [2], and others, cultural policy should be based on key principles of democracy, subsidiarity, public participation, and systematic support for cultural institutions.

Contemporary conceptual approaches to cultural policy increasingly view culture not simply as a humanitarian sphere or a space for symbolic production, but as a powerful strategic tool for developing human capital, strengthening local communities and increasing social resilience. In international documents, including recommendations from UNESCO, the EU and the UN, culture is clearly defined as one of the basic factors of sustainable development, capable of ensuring the necessary synergy between social, economic and institutional transformations [3–5]. In particular, in the context of the Sustainable Development Goals, it acts as a catalyst for educational change, the development of innovative infrastructure, the strengthening of inclusiveness and the expansion of public participation in the production of cultural products [6]. It is through cultural institutions, such as museums, that society gains the opportunity to critically reflect on the past, shape national identity and integrate different social groups. Thus, culture becomes a strategic resource that actively works to strengthen national

unity, social cohesion, and ensure sustainable development in the face of challenges, including military ones [7].

The European approach to the development of culture and creative industries emphasizes the strategic role of the cultural sector as a key factor in economic growth, employment, and social cohesion. The European Parliament's Resolution "On promoting the European cultural and creative sectors as sources of economic growth and job creation" clearly states that "cultural and creative industries are one of the most dynamic sectors of the EU economy, generating high added value and providing around 8.5 million jobs" [8], which emphasizes the critical need to support the institutional capacity of cultural organizations, simplify access to funding and develop partnerships between public and non-public institutions. The requirements outlined in the documents directly correlate with the Ukrainian context, where museum institutions, as part of a broader cultural ecosystem, need to strengthen their financial autonomy, professionalize their management, and improve grant mechanisms, reinforcing the argument for the need to reform state cultural policy mechanisms in Ukraine.

The effectiveness of state policy in the field of culture today is determined by the ability of its instruments to respond quickly to current challenges, ranging from military threats and large-scale risks to cultural heritage to the need for digital transformation. In the context of full-scale war, these challenges are becoming increasingly acute, and culture is being seen as a critical element of national security, social stability, and memory policy [9–11]. In this context, the role of the Ukrainian Cultural Foundation is growing significantly, as it not only ensures the transparent distribution of state resources but also creates an environment for innovation and modernization of cultural infrastructure. This is in line with UCF's development strategy, which emphasizes the priorities of inclusiveness, innovation and support for cultural heritage [12], and correlates with international approaches to the role of culture in sustainable development [13]. Thus, grant-making institutions are becoming a catalyst for the state's strategic priorities, contributing to the preservation of heritage and the strengthening of Ukrainian society's resilience.

3. Problem Statement

This study aims to conduct a comprehensive analysis of the implementation of museum projects supported by the Ukrainian Cultural Foundation, to identify key institutional and regulatory issues that hinder the full participation of museums in grant competitions. Additionally, it aims to systematize the patterns of success and regional distribution of museum initiatives.

4. Methods and Materials

The methodological basis of the study was a comprehensive approach that combined qualitative and quantitative methods of analysis, as well as systematic and comparative analysis methods. The first stage involved a systematic analysis of the regulatory and legal framework to determine the institutional, financial, and legal framework in which museum institutions operate as applicants for grant programs, as well as an analysis of reporting documentation and grant agreements to identify typical operational problems related to budgeting, treasury services, and risk management. The key quantitative method was empirical analysis of the UCF's rating lists and project registers for 2018–2025 [14–21], which made it possible to conduct a comprehensive selection of museum-related projects (exhibitions, re-exhibitions, digitization) and calculate the share of successful applications, as well as track the regional distribution of initiatives and the dynamics of the dominance of the partnership model. In the second stage, the case study method (in-depth analysis of individual successful and problematic projects) was used to detail the identified patterns and reveal the cause-and-effect relationships between the institutional status of the applicant and the effectiveness of the grant initiative. Thanks to comparative analysis, the requirements of the UCF were compared with the practices of financing cultural heritage in leading European programs in order to formulate recommendations for improving Ukrainian grant policy, and based on the quantitative and qualitative data obtained, using methods of synthesis and generalization, a unified model of the problem field of museum project implementation was formulated and practical recommendations were developed, covering the need for structural changes in the regulatory framework, museum management practices and the architecture of the UCF's grant programs.

5. Results and Discussion

The Ukrainian Cultural Foundation is a key and central institution for grant support in Ukraine, performing strategic functions in the implementation of state cultural policy aimed at modernizing the cultural sphere, enhancing its institutional capacity and introducing modern European management standards. Its activities are clearly defined and regulated by the Law of Ukraine “On the Ukrainian Cultural Foundation” [22], which directly names the Foundation as an instrument for implementing state policy in the fields of culture, arts, creative industries and cultural heritage. According to the Law, the key functions of the UCCF include providing competitive support for cultural projects, offering independent expertise, stimulating innovative practices, fostering international cooperation, and creating conditions for integrating Ukrainian culture into the global space. Over the years of its work, the Foundation has formed a large-scale support ecosystem: reports show that the total amount of state investment exceeded UAH 2 billion for more than 2,900 funded projects, reaching an audience of millions of people [23], confirming its significant social impact and its role as a catalyst for new cultural practices and the development of human capital in the cultural sphere.

The UCF provides support within a multi-sectoral model that encompasses a wide range of cultural practices, including visual and audio arts, cultural heritage, literary initiatives, performing arts, and creative industries [24–25]. This model not only reflects the diversity of Ukraine’s cultural field, but also creates an opportunity to implement a comprehensive approach, supporting both traditional forms (restoration, heritage preservation, museum exhibitions) and contemporary and experimental practices, including digital platforms, VR/AR projects and cross-sectoral partnerships. The Foundation’s strategic documents, particularly the UCF Strategy for 2019–2021 [26], emphasize the importance of a systematic transition from passive heritage preservation to an active model of creating contemporary cultural meanings, engaging communities, and developing cultural participation. In this context, museum projects play a crucial role in ensuring the continuity of cultural memory and serving as platforms for representing identities. The 2024–2027 strategic cycle further emphasizes that culture and creativity should become key factors in the victory, restoration, and strengthening of national identity [12], which indicates the Fund’s transition from an institution supporting individual projects to one of strategic influence that shapes cultural priorities in response to wartime challenges.

According to Ukraine’s multi-level system of state cultural policy (Table 1), cultural policy operates as a comprehensive, hierarchically structured model, where each level performs a distinct yet interrelated function, ensuring the comprehensive implementation of strategic tasks in the cultural field.

Table 1. Multi-level system of Ukraine’s state cultural policy

Level	Content and main elements
1. Strategic level (regulatory and legal framework)	– Constitution of Ukraine – Law “On Culture” – Law “On the Protection of Cultural Heritage” – Law “On Museums and Museum Affairs” – Law “On the Ukrainian Cultural Foundation” – Cultural development strategies, state programs, concepts
2. Institutional level (policy implementation bodies)	– Ministry of Culture and Information Policy of Ukraine – Ukrainian Cultural Foundation – Ukrainian Institute – State Service for the Protection of Cultural Heritage – Regional and local cultural administrations
3. Level of instruments (implementation mechanisms)	– Legal instruments: normative acts, regulations, instructions – Economic instruments: grants, subsidies, budget programs – Organizational instruments: planning, programs, institutional changes – Administrative instruments: control, supervision, monitoring, reporting
4. Operational level (policy implementers)	– Museums and nature reserves – Public organizations – Cultural institutions – Creative enterprises – Educational and scientific institutions

Source: Compiled by the authors.

Thus, at the strategic level, the legal and conceptual foundations of cultural policy are established, including constitutional norms, relevant laws, and long-term state strategies. It outlines the fundamental principles, overarching goals, and guiding directions for the country's cultural development. The institutional level is represented by state bodies and institutions responsible for policy formation and implementation. The key actors in this context are the Ministry of Culture and Information Policy of Ukraine and the Ukrainian Cultural Foundation, which ensure the implementation of state policy in the organizational and managerial dimensions. The instrumental level combines all the means and mechanisms for implementing cultural policy. It covers legal, economic, administrative and organizational instruments, including grant programs, financial incentives, regulatory documents and monitoring mechanisms. The operational level encompasses the direct implementers and beneficiaries of the policy – museums, public organizations, cultural institutions, creative groups, and educational institutions – which actually implement cultural projects and initiatives in practice.

It is important to emphasize that the grant mechanisms of the Ukrainian Cultural Foundation occupy a central place in the instrumental level of this system. The UCF is a key instrument for implementing state policy aimed at supporting innovative projects, ensuring the development of the cultural ecosystem, and forming a long-term social impact. The role of the UCF in the public administration system is primarily to perform a modernization function – the transition from an administrative and distributive model of cultural funding to a competitive, independent and expert-oriented model that fully complies with European standards [27–28]. The Foundation contributes to the formation of a culture of transparent, responsible, and effective management of budget funds, and also acts as an intermediary between the state, the public sector, and cultural institutions. The UCF grant programs mustn't be only a financial mechanism but also a tool for introducing values and modern management approaches into the museum sector, particularly in the areas of inclusiveness, digitalization and project management, as a mechanism of “soft power” [29], which contributes to the gradual modernization of museum institutions, the expansion of their competence and the formation of a new management culture through competitive requirements and project implementation standards. Thus, the UCF acts as a catalyst for structural changes that would not have taken place solely through traditional budgetary mechanisms.

The regulatory framework governing the activities of the UCF, in particular the Law of Ukraine “On the Ukrainian Cultural Foundation”, subordinate acts and instructions of the applicant, creates a systemic framework for competitive selection and implementation of projects, which has a direct impact on the conditions for participation of museum institutions in grant programs. The relevance of analyzing this framework is reinforced by the fact that museum institutions, as budgetary organizations, face legislative restrictions that do not apply to the public sector [30], leading to unequal conditions in the field of project activity. The correlation between UCF grant support and the functioning of museums is systemic and directly follows from current legislation: according to the Law of Ukraine “On Museums and Museum Affairs” [31], museums perform a socially important mission of preserving and promoting cultural values, which is inherently a knowledge-intensive and infrastructure-related activity. That is why UCF's grant instruments, aimed at modernization, digitization, heritage preservation, and inclusive practices (in particular, the “Cultural Heritage”, “Inclusive Culture”, and “Local Culture”), are becoming key mechanisms for development, as basic budgetary funding does not usually cover such needs.

In addition to special legislation, the opportunities for museums in grant activities are significantly determined by regulations such as the Regulations on the Museum Fund of Ukraine [32], which establishes requirements for the accounting, protection, scientific attribution and accessibility of museum objects. Since the UCF funds projects aimed at preserving, researching and promoting cultural heritage, the regulatory obligations of museums to preserve their collections set the basic institutional context and framework for grant activities, determining the specifics of competitive applications. Thus, there is a direct correlation between the UCF's grant support and the fulfilment by museums of their legally defined functions of collecting, studying, preserving and exhibiting cultural values. In the context of the competitive selection procedure, updated in 2025 [27], particular attention is paid to the expert evaluation procedure, which is of fundamental importance for museum institutions, as it is at these stages that the project's compliance with the Fund's strategic priorities, the museum's level of institutional readiness and the realism of the work plan are determined. As a result, museum institutions' projects are subject to a dual reporting system – to the UCF and to their governing bodies (e.g., regional culture departments) – which creates an increased administrative burden and requires

museums to have additional resources, including competent personnel in project management and accounting.

The applicant's instructions and descriptions of LOTs (programs) are no less important, as they define specific thematic priorities and specific requirements for projects, which shape not only the content of future projects, but also the strategic priorities of the museums themselves, which are forced to adapt their activities to current trends in cultural policy. At the same time, an analysis of grant agreements [14–21] and regulatory documents reveals that state and municipal museums are often unable to act as direct project implementers due to several institutional, financial, and legal restrictions outlined in budgetary and treasury legislation. In particular, requirements regarding the procedure for advance payments, the opening of special accounts with the State Treasury Service (STS), and the need to make purchases through the Prozorro system make it extremely difficult to meet the deadlines set out in grant agreements.

The situation is further complicated by the legal regime of martial law, since, in accordance with CMU Resolution No. 590 [33], the STS makes payments according to special rules, where priority is given to defence and critical expenditures. This often leads to delays, blocking, or postponement of payments for cultural institutions, making it virtually impossible to implement project schedules within the established deadlines. It is precisely because of these financial, legal, and administrative barriers that, in about 80% of museum projects (Fig. 1) implemented with the support of the UCF, civil society organizations, or charitable foundations acted as formal implementers, while museums took the position of partners, providing content and access to their collections.

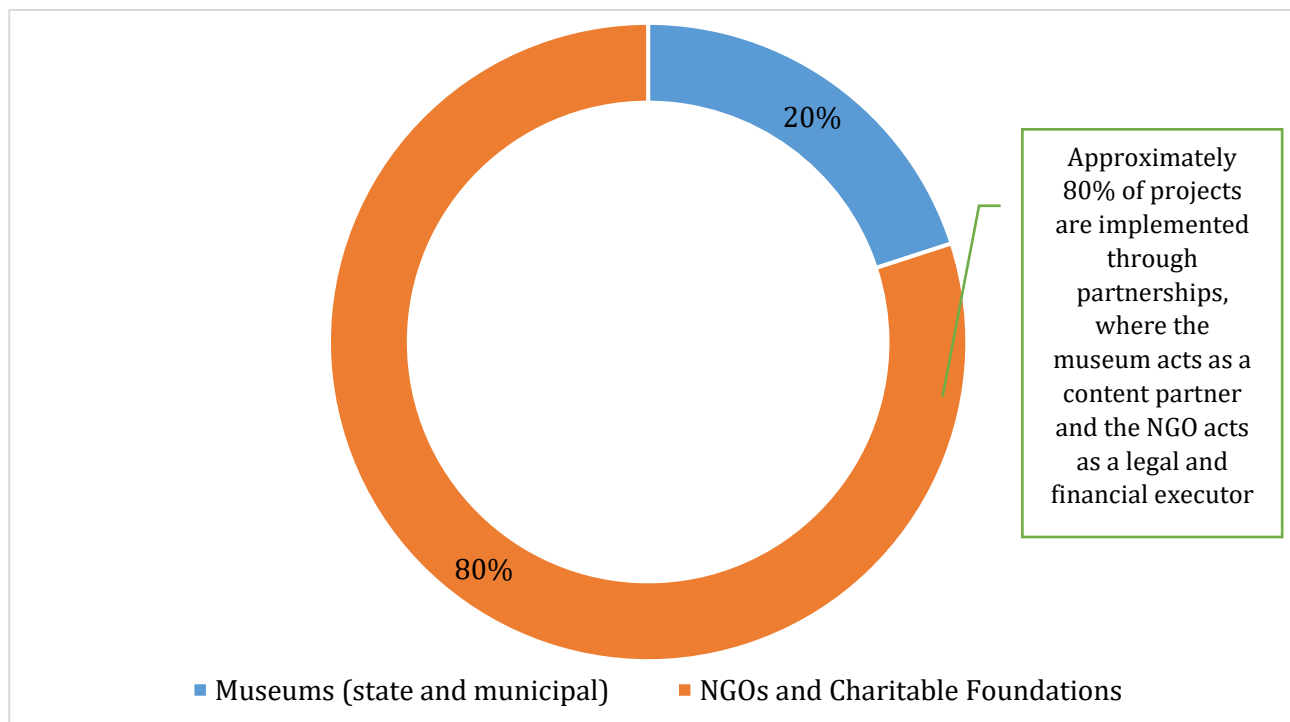


Fig. 1. Distribution of types of applicants for UCF museum projects

Source: Compiled by the authors.

This model of “CSOs as implementers – museums as partners” did not arise as a structural choice of institutions, but as a forced adaptation to the limited financial autonomy of museums and their insufficient institutional capacity. An example of this is a comparison of two projects in Ostroh: the project “Exhibition “Ostroh Icon Painting Workshop” [34], implemented by the museum itself (KZ “DIKZ m. Ostroh”), was burdened by numerous treasury and procurement procedures, while the project “Exhibition “Ostroh Tatars” [35], implemented in partnership with a non-governmental organization, proved to be much more mobile and dynamic in its operational processes. Therefore, such a structural imbalance clearly demonstrates the discrepancy between the high potential of museum specialists and the limited capabilities of museum institutions as legal entities. Thus, although the regulatory framework of the UCF defines a clear logic of support, legislative restrictions on budgetary institutions form a unique regulatory ecosystem in which the participation of museums in grant programs is

possible but requires partnerships and the adaptation of management practices to the current requirements of grant funding.

The analysis of grant agreements, reporting documentation, and rating lists from the Ukrainian Cultural Foundation is crucial for tracing the actual mechanisms of museum project implementation and identifying patterns that may not be apparent in regulatory documents alone. Unlike general conceptual provisions and procedures, it is empirical material (agreements, registers of beneficiaries, final and interim reports) reflects the practice of applying grant instruments in the museum sector, which allows us to assess not only the quantitative parameters of support, but also the specifics of budgeting, staff participation, and partnership formation, as well as to identify typical difficulties that arise in the process of implementing initiatives.

The rating lists of projects obtained as a result of a targeted analysis of the UCF programme archive for 2018–2025 [14–21] enabled the tracking of the dynamics of museum participation in competitions and the identification of success factors. Methodologically, the study was based on a comprehensive selection of projects whose primary product was an exhibition, re-exhibition, creation of a museum space, digitization, or digitization of museum collections. Based on the coding of projects according to the criteria of applicant type, programme, lot, and competition result, the share of successful applications was calculated, which ranged from 18 to 25% for the museum sector. This indicator is relatively high for a sector that traditionally operates under conditions of limited resources, but it shows that projects related to digitization and inclusion had a better chance of success in 2020–2025 because they matched the Fund's strategic priorities, while large infrastructure projects were more likely to be rejected due to high budget risks.

At the same time, the ranking lists show a clear trend towards the dominance of projects submitted in partnership with non-governmental organizations or charitable foundations, confirming the general model according to which most museums can only participate in grant competitions through more institutionally flexible structures that act as official project implementers. A notable example is the project "Ostroh Academy: 445 Years of Higher Education in Ukraine", which was implemented by the International Charitable Foundation "Renaissance of Ostroh Academy" [36]. It demonstrates the advantages that a museum institution gains when the applicant is a charitable foundation with broader financial and organizational capabilities, which ensures greater flexibility and efficiency in the implementation of complex exhibition tasks, such as modernizing a museum space into a contemporary educational and communication platform.

To assess the regional activity of the museum sector, 71 completed museum projects supported by the UCF were analyzed, the main result of which was the creation of new exhibitions (Fig. 2). The data revealed a significant unevenness in the spatial distribution of museum initiatives: the highest concentration of projects is in the Kyiv region (17 projects), which is explained by the presence of a significant number of cultural institutions, specialists and active public organizations. The Lviv region ranks second in terms of the number of implemented projects (11 projects), reflecting its strong cultural potential and extensive network of museum institutions. Cherkasy and Rivne regions are in third place (6 projects each), demonstrating the cultural dynamics of these regions. Ivano-Frankivsk and Kharkiv regions show an average level of activity (3 to 4 projects), indicating developed local initiatives and effective partnerships between museums and NGOs. In a number of other regions – namely Zakarpattia, Volyn, Poltava, Luhansk, Kherson, Ternopil, and Zhytomyr – the number of projects implemented ranges from one to two, indicating the sporadic activity of individual museums or a lower level of institutional capacity and grant infrastructure. However, the presence of implemented initiatives in most regions of Ukraine, such as the Kherson region project "Competitive Community – Competitive Museum!" [37], demonstrates the nationwide nature of grant programs and confirms the potential for further strengthening regional museum institutions.

Summarizing the results, it can be said that the spatial distribution of UCF museum projects is uneven and depends on the development of the local cultural environment, the density of the museum network, the level of training of specialists and the activity of the public sector, and among the successful cases there are projects of various nature – from digital reconstructions to inclusive solutions and large-scale exhibitions. Thus, the project "Virtual Museum of the Heritage of the Princes of Ostroh" [38] was one of the first examples of systematic digital representation of heritage, while "History to the Touch: The Fortress of Chyhyryn" [39] focuses on inclusivity through the creation of tactile models for blind visitors, which is in line with the barrier-free strategy.

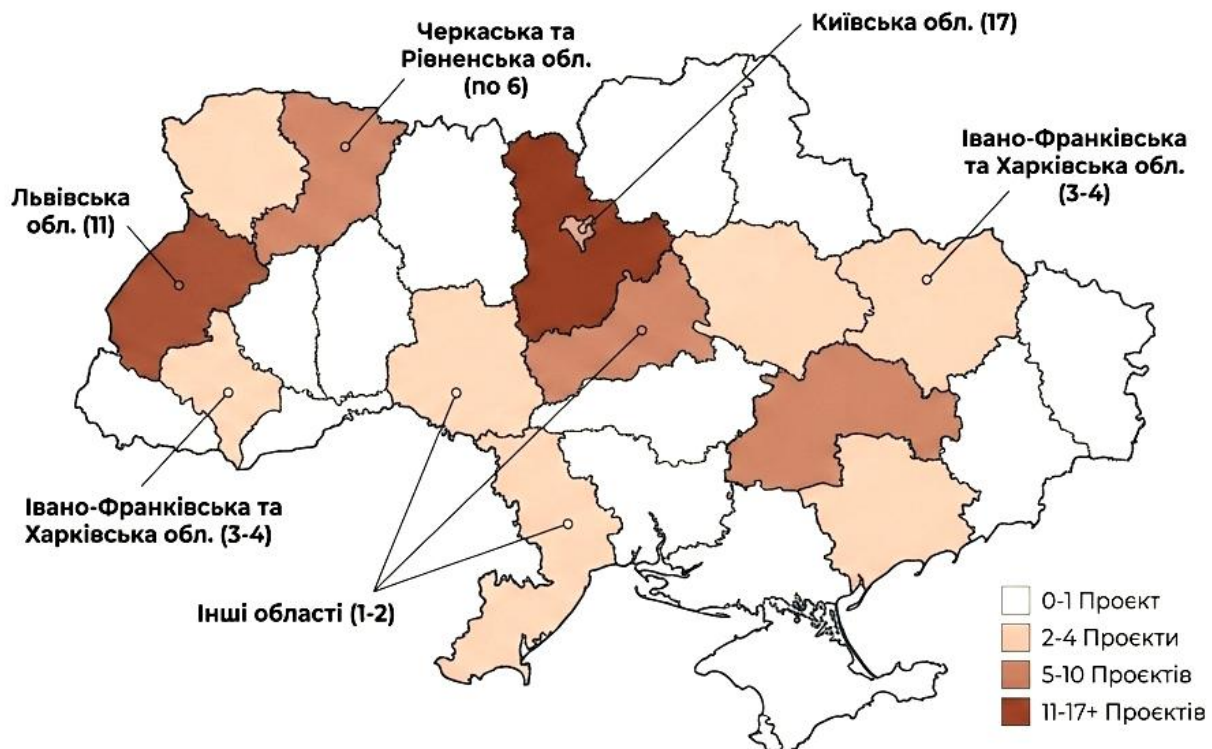


Figure 2. Territorial distribution of museum projects supported by the UCF, the main result of which was the creation of new exhibitions

Source: Created by the authors.

It should be noted that the most successful museum initiatives are those that combine three key factors: alignment with the UCF's strategic priorities (digitalization, inclusiveness, local culture, heritage), a high level of institutional capacity of the team, and a clear concept for interpreting cultural content. UCF grants are not only a financial support tool, but also a catalyst for qualitative changes in the museum sector, stimulating innovation, digital transformation and the development of inclusive and educational practices, which confirms the need for institutional changes to meet the requirements of the modern grant model.

At the same time, an analysis of grant agreements and regulatory documents reveals that state and municipal museums are often unable to act as direct project implementers due to several institutional, financial, and legal restrictions embedded in the current budget and treasury legislation. In particular, requirements regarding advance payments, opening special accounts with the State Treasury Service of Ukraine, and the need to make purchases exclusively through the Prozorro system make it extremely difficult to meet the deadlines set out in grant agreements. The situation is further complicated by the legal regime of martial law, since, in accordance with CMU Resolution No. 590 [30], the State Treasury Service makes payments to budgetary institutions according to special rules, where priority is given to defence and critical expenditures, which often means delays, blocking or postponement of payments for cultural institutions.

It is precisely because of these financial, legal, and administrative barriers that, in about 80% of museum projects implemented with the support of the UCF, civil society organizations or charitable foundations acted as formal implementers, while museums took the position of partners, providing content and access to their collections. The model of "CSO as implementer – museum as partner" arose not as a structural choice of cultural institutions, but as a forced adaptation to the limited financial autonomy of museums and insufficient institutional capacity.

UCF grants have become a key factor in the modernization of the museum sector, but the level of accessibility and effectiveness of their use largely depends on the institutional capacity of museums and the existence of partnerships with public organizations. This confirms the need to improve both the regulatory framework governing the activities of budgetary cultural institutions and the internal organization of museum activities, which will enable the fuller utilization of the potential of grant support in contemporary cultural policy.

The experience of implementing museum projects within the framework of the Ukrainian Cultural Foundation's grant programs shows that the main barriers to the full participation of museums in competitions are not the weakness of their ideas, but limited institutional capacity, an imperfect regulatory environment and unequal conditions of competition between different types of applicants. As a result, a significant portion of potentially important and socially valuable museum initiatives do not receive funding, as confirmed by rating lists, in which museum-related projects consistently rank highly but are not supported due to fierce competition with other, more flexible sectors.

One of the key problems is the institutional inability of many museums to operate in the context of the modern project cycle, which requires rapid decision-making, flexible budget planning and the ability to quickly engage highly qualified external specialists. Researchers emphasize that most state and municipal museums remain institutions with a complex administrative hierarchy, low salaries, limited human resources and a lack of specialized project management, communications or fundraising departments [40–41], which creates a significant imbalance between the budgetary sphere and non-governmental organizations, which operate in a more flexible legal environment, have financial autonomy and can quickly form teams for the needs of a specific project.

The institutional capacity of most Ukrainian museums remains limited due to an outdated management model inherited from the Soviet administrative-command system, which operates within a rigid vertical hierarchy that hinders rapid decision-making, restricts autonomy in programming activities, and reduces flexibility in responding to audience needs. In this context, a review of contemporary models of cultural heritage management in Ukraine reveals that the effectiveness of museum projects depends directly on the ability of local institutions to adapt to new financial and management mechanisms. The White Paper on Local Cultural Heritage Management emphasizes that the traditional budgetary maintenance model is insufficient for modern tasks such as digitizing collections or creating innovative exhibitions [42]. That is why it is crucial to attract grant resources, non-governmental partners, and develop project capacity, which in fact reflects the recommended approach to multi-level financing – a combination of budgetary, grant, partnership and philanthropic resources.

The staffing crisis is one of the most critical institutional problems: low salaries, lack of competitive working conditions and the outflow of young professionals lead to chronic ageing of the workforce. Many museums lack specialists in modern areas of museum work, such as project management, digital technologies, communications, or fundraising, which reduces their ability to attract extra-budgetary resources and implement innovative formats. A separate problem is the technical incapacity and backwardness of the material and technical base, as the lack of modern equipment and digital infrastructure makes it impossible to digitize collections, create multimedia products and implement inclusive solutions.

In addition, regulatory and financial constraints significantly hinder the development potential of museums. Current legislation provides museums with extremely limited opportunities to independently manage their own revenues, and the budget system does not allow for the flexible redistribution of resources or rapid procurement, which is critically necessary for the implementation of grant initiatives. An additional institutional challenge is the lack of a systematic model for interaction with local authorities, where the activities of museums are often perceived as “subsidized” – with no expectation of innovation or economic impact.

In summary, the institutional problems of Ukrainian museums are complex and cover managerial, legislative, financial, and personnel and technical components. Without systemic reform aimed at increasing autonomy, modernizing the regulatory framework, creating professional teams and upgrading infrastructure, museums will remain uncompetitive in the project environment and will not be able to fully fulfil their role in the state cultural policy system.

Another important factor that reduces museums' chances of receiving funding is the structure of the UCF's grant programs, which do not have a separate category for museum projects. Most museum applications are submitted in “mixed” lots – “Cultural Heritage”, “Local Culture”, “Reintegration through Culture”, “Inclusive Art”, etc., where they have to compete with event, marketing, educational, or product projects. An analysis of the rating lists shows that it is precisely such “soft” projects – festivals, residencies, video production – that more often receive high ratings due to faster implementation, predictable results, and lower cost.

In contrast, museum projects are structurally “hard”: they involve the creation of new exhibitions, the purchase of equipment, the digitization of collections, and the production of tactile models, which is

accompanied by high technical risks, longer production times, and more complex logistical processes. This makes them less attractive in a competitive environment where expert councils are forced to compare projects from different sectors based on the same criteria, and a serious challenge is the large number of museum projects that, according to existing ratings, could be supported but did not receive funding due to the limited budget of the lot or the significant number of applicants from other sectors.

The UCF grant structure lacks a programme that would guarantee national or regional museums at least a minimum amount of funds directed exclusively towards institutional capacity building or exhibition renewal, creating an imbalance in the museum sector, which remains “dissolved” between several lots. All this suggests that museum projects require special competition conditions rather than participation in mixed programs, where they are structurally disadvantaged in terms of risk, complexity and cost, as confirmed by the results of expert surveys, which revealed the low project capacity of regional cultural institutions [43].

Therefore, the key challenges for the implementation of museum projects are low institutional capacity, regulatory and staffing constraints, systemic inequality between museum and “soft” projects, as well as the fragmentation of grant programs, which require not only the adaptation of internal museum procedures, but also a review of state policy regarding their legal status and funding. The effectiveness of museum projects largely depends on the ability of museum institutions to implement modern management practices adapted to the conditions of grant activity, which requires the formation of the museum’s internal institutional capacity for project activity and the creation of structural units responsible for the preparation and support of grant projects. Equally important is the optimization of internal administrative procedures to ensure greater synchronization with grant requirements, minimizing the time required for the approval of financial transactions and the conclusion of contracts. Improving project management is inextricably linked to the digital transformation of the museum’s internal activities, including the introduction of digital document management and progress monitoring systems, as well as the development of partnerships with non-governmental organizations, universities and IT companies that can provide access to professional competencies that museums lack.

Improving the effectiveness of project management is impossible without addressing the issue of low wages in the museum sector, as salary restrictions effectively prevent museums from attracting highly qualified specialists – designers, programmers, engineers, managers – to implement complex digital or innovative projects on their own. Thus, improving the effectiveness of project management requires comprehensive changes: from the development of staff competencies and internal administrative optimization to the introduction of digital tools, partnership models and updated approaches to risk management, which will enable museums to become full participants in the grant sector and competitive applicants within the framework of state cultural policy.

6. Conclusions

Thus, the analysis shows that although the grant mechanisms of the Ukrainian Cultural Foundation have become a key catalyst for the modernization of the museum sector, stimulating digitalization, inclusiveness and innovative project activities, structural institutional barriers, including low financial autonomy, outdated management models and regulatory restrictions on budgetary institutions, significantly reduce the direct competitiveness of museums, which has led to the dominance of the partnership model, which, although it ensures the operational implementation of projects, at the same time exacerbates the issue of the need for systemic reform of the legal status of museums and their institutional capacity. In view of this, further research should focus on developing specific recommendations for the creation of a specialized grant lot for “hard” museum projects within the structure of the UCF, as well as on exploring opportunities to update the legislative framework in order to increase the financial autonomy of museum institutions, which is a necessary condition for ensuring their sustainability and full participation in the implementation of state cultural policy in the context of wartime and post-war challenges.

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Political Image as a Tool for Strategic Positioning in Post-Pandemic Electoral Campaign

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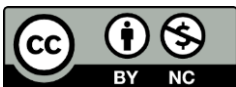
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The article examines political image as a tool for strategic positioning in post-pandemic electoral campaigns. The main focus is on analyzing the impact of crisis conditions, media communications, and digital platforms on the formation and effectiveness of political leaders' images in Europe and North America. Research aim: to determine how political image influences citizens' electoral preferences in the post-pandemic period, identify effective strategies for its formation, and assess the role of media and social networks in building voter trust and support. The study is based on a comprehensive approach that includes content analysis of public speeches and media materials of political leaders, comparative analysis of post-pandemic electoral campaigns, analysis of sociological data and approval ratings, case studies (using Donald Trump in the USA and Angela Merkel's government in Germany as examples), and synthesis of data from various sources. The study revealed that political image becomes a key factor for campaign success under crisis conditions. Candidates who demonstrated competence, transparency, and effective crisis management received consistently positive audience perception and increased approval ratings. Active use of media and digital platforms enhances the influence of image on public opinion, builds trust, and legitimizes political authority. Comparative analysis of campaigns in different countries confirmed the universality of these strategies in Europe and North America. In the post-pandemic period, political image is a critical tool for strategic positioning, shaping voter behavior and determining electoral outcomes. Its effective construction and management are an integral part of modern political management. The study confirms that integrating digital technologies and media strategies into image formation becomes a key factor for candidates' competitive advantage. Furthermore, the results can be used to develop practical recommendations for improving the effectiveness of electoral campaigns in various political contexts.

KEYWORDS

political image, strategic positioning, electoral campaigns, post-pandemic period, media communications, digital platforms, public opinion, voter trust.



Політичний імідж як інструмент стратегічного позиціонування у виборчих кампаніях постпандемічного періоду

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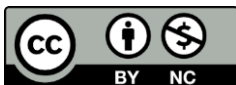
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У статті розглядається політичний імідж як інструмент стратегічного позиціонування у виборчих кампаніях постпандемічного періоду. Основна увага приділяється аналізу впливу кризових обставин, медіа-комунікацій та цифрових платформ на формування та ефективність іміджу політичних лідерів у Європі та Північній Америці. Мета дослідження: встановити, як політичний імідж впливає на виборчі уподобання громадян у постпандемічний період, визначити ефективні стратегії його формування та оцінити роль медіа та соціальних мереж у конструюванні довіри та підтримки виборців. Дослідження базується на комплексному підході, що включає контент-аналіз публічних виступів і медіа-матеріалів політичних лідерів, порівняльний аналіз постпандемічних виборчих кампаній, аналіз соціологічних даних та рейтингів підтримки, кейс-стаді (на прикладі Дональда Трампа у США та уряду Ангели Меркель у Німеччині) та синтез даних з різних джерел. Дослідження показало, що політичний імідж стає ключовим фактором успішності кампаній у кризових умовах. Кандидати, які демонстрували компетентність, прозорість та ефективне управління кризами, отримували стабільне позитивне сприйняття аудиторії та підвищення рейтингу підтримки. Активне використання медіа та цифрових платформ дозволяє посилити вплив іміджу на громадську думку, формувати довіру та легітимізувати політичну владу. Порівняльний аналіз кампаній у різних країнах засвідчив універсальність цих стратегій у Європі та Північній Америці. Доведено: політичний імідж у постпандемічний період є критичним інструментом стратегічного позиціонування, що визначає поведінку виборців та результати виборчих кампаній. Його ефективне конструювання та управління є невід'ємною складовою сучасного політичного менеджменту. Дослідження підтверджує, що інтеграція цифрових технологій і медіастратегій у формування іміджу стає ключовим фактором конкурентної переваги кандидатів. Крім того, результати можуть бути використані для розробки практичних рекомендацій щодо підвищення ефективності виборчих кампаній у різних політичних контекстах.



КЛЮЧОВІ СЛОВА

політичний імідж, стратегічне позиціонування, виборчі кампанії, постпандемічний період, медіа-комунікації, цифрові платформи, громадська думка, довіра виборців.

1. Introduction

In the current conditions of globalization processes and rapid socio-cultural changes, the political image occupies an important niche in the context of strategic positioning in election campaigns. This aspect became especially important in the post-pandemic period, when the pandemic COVID19 radically changed the ways politicians interact with society, increased the role of the media environment and digital platforms in shaping public opinion, and significantly increased attention to the competence, ethics and value characteristics of political leaders. The formation and promotion of a political image in crises requires careful consideration from both the point of view of the socio-psychological perception of voters and communication strategies aimed at managing the perception of an individual or a political institution. Studies of recent years show that successful image construction allows not only to increase the candidate's support rating, but also to mobilize the electorate, consolidate the trust and legitimacy of political decisions in crisis conditions. In this context, a comparative analysis of post-pandemic election campaigns in different regions of the world, in particular in Europe and North America, is relevant, since different political cultures and communication practices form specific models of image and the appropriate reaction of the audience. The study of voter behavior and changes in rating support in these countries allows us to identify key patterns that determine the effectiveness of image-making strategies in the crisis period.

2. Literature Review

Political image is considered a key tool for strategic positioning in election campaigns, as it allows voters to form a clear idea of the candidate and increase their recognition. Akaiomova [1] explores the main characteristics of political image and emphasizes its role in creating a positive perception of political actors. Lavrenko [9] focuses on the specifics of the formation of the image of candidates for parliamentary campaigns, identifying the key mechanisms of influence on the electorate. Lavrentii [10] considers the image as a subject of scientific analysis, highlighting its socio-psychological aspects and significance for the strategic management of political processes. Dankevych et al. [2] explore the genesis of branding as a public administration tool, showing how strategic positioning helps to form a holistic image of a political leader or organization.

In the context of the post-pandemic period and crises, the political image is of particular importance for communications with voters. Maidanskyi and Zienkin [11] analyze anti-crisis strategies for forming a political image during war and crisis, demonstrating the effectiveness of adaptive positioning. Sviderska et al. [17] highlight the practices of strategic communications in shaping the image of military-political leadership in the face of external threats, which emphasizes the role of media and communication channels. Fesun [4] explores the socio-psychological aspects of the leader's perception, showing how the emotional component of the image affects the trust of citizens. The analysis of these works allows us to identify the key areas of using the political image for strategic positioning in election campaigns of the post-pandemic period [1; 2; 4; 9–11; 14; 15; 17].

3. Problem Statement

The pandemic has COVID19 highlighted the importance of the competence of political leaders, their ability to respond quickly to crises, and the role of media and digital platforms in broadcasting political messages. At the same time, traditional methods of forming a political image, which relied on direct interaction with the electorate, have lost their effectiveness, and strategic communication decisions have become critical for mobilizing voters and maintaining the legitimacy of the government.

The complexity of the modern political landscape lies in the fact that the image of a politician is now not only a reflection of his personal qualities, but also the result of a complex interaction of ontological, value, ethical and symbolic components perceived by voters through the prism of socio-psychological processes. The question remains unresolved which elements of the political image most effectively affect the support of voters in crisis conditions and how they interact with strategic communications in different political cultures.

The purpose of this article is to analyze the political image as a tool of strategic positioning in the election campaigns of the post-pandemic period, with an emphasis on the relationship between the

actions of political leaders, the components of their image and the reaction of voters, as well as to identify the most effective approaches to its formation and promotion.

Research objectives:

1. To analyze the political image as a tool for strategic positioning in the context of the pandemic crisis.
2. To determine the main components of the political image (ontological, anthropological, value and ethical) and to investigate their role in the formation of public opinion during crises.
3. To identify patterns and specifics of the interaction of strategic communications, politicians' actions and voters' reactions in the crisis period.

4. Methods and Materials

The study was based on a comprehensive review of scientific papers and reports related to achieving the set goals. The work used a comprehensive methodological approach that combines quantitative and qualitative methods of analyzing the political image in the post-pandemic period. Content analysis was used to systematically examine public speeches, official statements, media materials, and social media activity of political leaders, including Donald Trump, Angela Merkel, and other European political figures. The main objective of this method was to identify the ontological, value, and ethical components of the image that shape the public's perception of the politician. The analysis was carried out at the level of topics, frequency of mentions of key characteristics of leaders, as well as the use of symbolic and emotional elements of communication, reflecting strategies for image formation in crisis conditions. Comparative analysis was used to assess the effectiveness of image-making strategies in different countries. This method made it possible to compare the approaches used by leaders in Europe and North America, determine their interaction with the media environment, and evaluate the results in the form of changes in voter support. The analysis of sociological data included the processing of the results of national and international surveys (Gallup, Pew Research, YouGov, Ipsos) in order to quantify changes in public opinion in response to the actions of politicians during the crisis. A comparison of rating indicators before and during the pandemic was carried out, which made it possible to identify a correlation between communication strategies and audience support. The case study was used for an in-depth analysis of individual campaigns, including the campaign of Donald Trump in the United States and the government of Angela Merkel in Germany. This method made it possible to identify the specifics of constructing a political image during crises, identify the most effective communication solutions and assess the impact of specific actions of leaders on public perception.

The synthesis of data from different sources involved the integration of the results of content analysis, benchmarking, sociological surveys, and case studies. This made it possible to form a comprehensive conclusion on the relationship between image-making strategies and changes in candidate support ratings, as well as to assess the effectiveness of various components of the image in the post-pandemic period.

5. Results and Discussion

It is advisable to understand the political image as a complex of ideas, symbolic meanings and emotional reactions that arise in citizens in relation to a certain politician or institution. It is formed under the influence of communication decisions, media presentation and the wider cultural environment and plays the role of a kind of intermediary between the government and society, determining the level of trust, a sense of legitimacy and the readiness of citizens for political participation. One of the productive areas of political image research is the socio-psychological approach, which focuses on the processes of social perception. In this case, the image is considered the result of cognitive and emotional processing of information: the set of impressions that voters form about the personality of a political leader. Such ideas are formed on the basis of the behavior and style of communication of the politician, as well as information obtained from sources trusted by the audience [5]. The image formed in this way affects the attitude towards the politician and can determine electoral preferences, consolidating both at the conscious and subconscious levels. Thus, the political image can be described as a rational-emotional construct that arises under the influence of both purposeful

communication (media, advertising, public speaking) and on the basis of voters' personal impressions of the actions and characteristics of a political actor.

The issue of political image as a tool of strategic positioning in election campaigns of the post-pandemic period is the subject of active research in modern political science and political psychology. A significant part of the research focuses on four main approaches to the analysis of political image: ontological, anthropological, value, and ethical [1; 10; 17]. The ontological approach considers the political image as a reflection of the real characteristics of an individual or social institution in the mass consciousness. Image is "a more or less adequate image of a person that is more or less adequate to the real subject, which is formed in the mass consciousness at the conscious and subconscious levels" [10]. The researchers emphasize that the ontological component of the image is critically important in crises, as it forms the primary trust and assessment of the leader's competence [3]. In the context of pandemic challenges, COVID-19, this means that political leaders who demonstrated effective crisis management received a stable positive perception of the audience and an increase in the public support rating.

The anthropological approach focuses on the personal characteristics of the leader – behavior, communication style, intellectual and emotional qualities. For example, A. Akayomova believes that the political image is a specific type of image, since it combines general psychological and communicative characteristics with features inherent in the political sphere [1]. In the scientific literature, it is often interpreted as a constructed and purposefully disseminated image of a candidate, party or political movement. However, it is worth remembering that the image arises and functions in the mass consciousness regardless of the use of election technologies: it can be formed spontaneously, under the influence of the social experience of citizens and the information environment, and sometimes even contrary to the ideas of political strategists.

Studies show that in the post-pandemic environment, the perception of emotional competence and empathy of politicians has become a determining factor for voters in many European countries. For example, analytical reviews show that leaders who demonstrated open communication and concern for public health received significantly higher ratings of support than those who focused only on economic or political messages [18].

The values approach focuses on the targeted creation of additional value by a political image, which is constructed to mobilize the audience and legitimize the authorities. Through a system of declared and demonstrated values, voters identify a politician, interpret his motivation and make trust decisions. Studies on political branding emphasize that basic values form the "core" of the political image, determining not only the style of communication but also the strategic positioning of the candidate in the competitive environment [13]. M. Scammell proves that the political image functions as a symbolic carrier of values that must meet the expectations of the "citizen-consumer" and the social norms of a certain political culture [16]. Guzmán and Sierra's research also shows that trust, honesty, and responsibility are the key value characteristics on the basis of which voters evaluate a political actor, and thus they form the structural elements of the image that have a lasting impact on electoral preferences [5]. In the post-pandemic period, the value component included an emphasis on shared values, social solidarity and the responsibility of political leaders, which became especially relevant during the health crisis.

The ethical approach considers the political image as a manifestation of the internal moral characteristics of the leader, which form trust and respect from society. G. Fesun notes that the image of a political leader should include honesty, transparency, responsibility and compliance with ethical standards [4]. In post-pandemic campaigns, it was the ethical component that often determined the long-term stability of the image, especially in countries where citizens traditionally value the moral responsibility of politicians [2].

In addition to theoretical approaches, considerable attention in modern research is paid to the role of media and social networks in the formation of political image. For example, Ferkas and Bene demonstrate that communication strategies built on visual images and emotional messages can significantly enhance the perception of competence and trust in politicians [3]. According to another study, strategic communications are a key tool for synchronizing ontological, value, and ethical components of the image [18]. In the Ukrainian context, researchers also emphasize the importance of strategic communications in shaping the political image and legitimacy of power. The emphasis is placed on the integration of traditional media channels and digital platforms to ensure the effective positioning of political actors in the minds of citizens [1; 10; 17].

In the context of post-pandemic election campaigns, one of the most important factors was the crisis political image of the leader. According to available research, the level of trust in politicians was growing, in line with their real ability to respond to the crisis. A striking example is the rating of Chancellor Angela Merkel, who maintained clear, rational communication throughout the pandemic, but at the same time, emotionally significant. The involvement of specialists from various fields allowed the government of Angela Merkel to demonstrate a high level of efficiency in public administration in a crisis. This had a positive effect on the level of public trust: if at the beginning of March Merkel's support was about 35% of citizens, then at the end of May it increased to about 72%. In July, Germany took over the presidency of the Council of the EU, for which it had been preparing for a long time, but the pandemic made adjustments, making it a priority to coordinate measures to counter COVID-19. Angela Merkel, who already had experience in managing during the global financial crisis of 2008 and the migration crisis of 2015, again demonstrated the ability for confident and consistent leadership in the European Union [15].

The growth of her credibility was facilitated, in particular, by the agreement with French President Emmanuel Macron on the creation of the EU Economic Recovery Fund in the amount of 750 billion euros. This decision was unprecedented because, for the first time, the EU member states agreed to the formation of joint debt obligations. Thus, according to the results of the summer polls of the Pew Research Center, Merkel ranked first in terms of international trust among seven global leaders: 76% of respondents in 13 countries expressed confidence in her ability to make effective decisions in the field of international politics. French President Emmanuel Macron was in second place with 64%, followed by British Prime Minister Boris Johnson (48%). The lowest level of trust was demonstrated by the then US President Donald Trump – 16% of respondents [14; 15].

The social component of the Chancellor's image was to express support and empathy with citizens for the difficulties caused by the pandemic. The value component manifested itself in the fact that it appealed to the values of solidarity, responsibility and collective action. A. Merkel emphasized the importance of the responsibility of every citizen to overcome the pandemic, which made it possible to unite society around a "value image" that carries a deeper meaning than just political rhetoric. The ethical component in the image of A. Merkel was manifested in her addresses, which were characterized by transparency and openness. She did not downplay the difficulties, recognized the risks, and her actions generally met the stated standards of responsibility. This strengthened her credibility as a stable, ethically responsible leader. Due to the combination of ontological, anthropological, value, and ethical components of the political image, A. Merkel was able not only to increase her popularity but also to consolidate support for the authorities in a very difficult time.

In fact, similar trends were observed in other countries. For example, in the United States, despite the polarized reaction of society, part of the electorate retained trust in the authorities and expressed support for their decisions. Despite the difficult epidemiological and economic situation, Donald Trump's ratings remained relatively stable, although the level of his support decreased slightly compared to March 2020. According to various sociological measurements, the president's support was kept in the range of 44–49%, that is, at about the same level as before. American political scientist and director of the Center for Politics at the University of Virginia, Larry Sabato, explained this by the stability of Trump's electoral base. According to him, Supporters of the president perceived the pandemic and the economic downturn caused by it as factors that are not under the direct control of the head of state. At the same time, the key role is played by the fact that the core of his electorate remains exceptionally united, mobilized and committed. "People understand that it is difficult to blame the president for the emergence of a pandemic or economic collapse directly related to processes that he cannot control. But most importantly, his base electorate remains extremely strong, united and committed to supporting Trump. It doesn't matter what he does, they will still support him" [7].

The first states to ease strict quarantine restrictions and allow the resumption of non-critical businesses, including massage parlors and fitness centers, were Georgia, Texas, and Florida. D. Trump openly supported the decision of the Republican governors, emphasizing that the resumption of economic activity would help reduce losses in the national economy. At the same time, a number of analysts warned that such a strategy could turn into political risks for the president, especially among moderate Republicans.

As Norman Ornstein of the American Enterprise Institute noted, the trends in the spread of the disease are not changing in favor of the White House: "We are seeing that new cases of the virus are beginning to appear in rural areas and regions where Trump's support is highest..." Larry Sabato also

emphasized the possible political consequences: "If there is a second wave of the virus and if the economy does not show a tangible improvement in the third or fourth quarter, as Trump claims, then, in my opinion, he may face serious problems during re-election" [8].

Firstly, at the beginning of the pandemic (March 2020), the approval rate of his reaction jumped: a Gallup poll showed that about 60% of Americans approved of Trump's actions towards COVID-19 [7]. But already in the summer of 2020, the rating fell sharply: in July, only 33% of Americans supported his approach to the fight against the coronavirus [8]. This demonstrates that the effect of uniting around the leader during the crisis may have worked at its start, but later, many voters began to critically assess his competence in crisis management. Secondly, Trump often focused on economic and social "opening" – he promoted both the rapid lifting of restrictions and priorities for business. This resonated with a part of the electorate that valued economic freedom more than strict quarantine restrictions. On the other hand, his messages were contradictory: on the one hand, the need for measures, on the other hand, "treatment cannot be allowed to be worse than the disease itself." This created value tensions. Third, according to Pew Research, 57% of Americans believed that Trump was broadcasting "wrong messages" about the coronavirus, and many criticized his credibility [6]. In addition, the studies show interesting behavioral dynamics: people who had a positive attitude towards Trump as a leader adhered to less protective measures (masks, distance) – this indicates a strong emotional/personal component of the image that influences behavior [12]. At the same time, part of Trump's communication strategy through Twitter was aimed at diverting attention from negative news about COVID: research shows that he used tweets to change the topic and scope of the discussion. His approach was often reminiscent of a "leader who risks more than others", although he did not always make the most stringent decisions, which in part attracted those who feared excessive restrictions. Trump's emotional style (media briefings, intense social media presence) supported the image of a "strong, direct leader," but it also created criticism of the credibility of his messages. On the other hand, according to observations, Trump's advertising campaign (YouTube video) increased the number of vaccinated people in certain counties [12]. This demonstrates that his image could be beneficial for public health, especially among some of his supporters: a combination of the value and symbolic components of the image of a "leader who supports vaccines" could be used to influence behavior.

In general, a comparative analysis of post-pandemic election campaigns in Europe and North America shows that the effectiveness of the political image largely depended on the candidates' ability to demonstrate competence in crises [13]. In particular, during the COVID-19 pandemic and its socio-economic consequences, voters evaluated politicians not only by their programs or rhetoric, but also by specific actions: the speed of response to the crisis, the ability to provide security and support to citizens, and the effectiveness of communication on measures to combat the pandemic.

As a result, candidates who demonstrated consistency, competence and real results in crisis management received a consistently positive assessment of public opinion and an increase in support rating. This confirms the importance of the ontological component of the image, which reflects the real characteristics of the political subject, and not only his rhetoric or symbolic images. In conditions of uncertainty and increased anxiety of voters, the real actions of a politician are of paramount importance, as they are perceived as indicators of competence and reliability. Moreover, it seems that the positive perception during the crisis period systematically affected the credibility of the political actor: voters evaluated not only specific measures, but also the general management style, the ability to make quick, balanced decisions, as well as transparency and openness in communication. Thus, the ontological component of the image, based on the real characteristics of the politician, becomes a key factor in strategic positioning in the election campaign during crises.

It follows from the study that digital platforms and media enhance the effect of demonstrating competence: the audience perceives a politician as more reliable and stable if his actions are supported by evidence of effectiveness through news, social networks and analytical materials. This confirms that in the post-pandemic period, the ontological and media aspects of the image work in tandem, providing maximum influence on public opinion. It is worth considering several aspects. Firstly, the image of a politician should be multicomponent: just demonstrating real competence is not enough; it is also important to build emotional and value messages that will resonate with the audience. Secondly, the media and social networks play a crucial role in maintaining and spreading this image. In Europe, traditional media (TV, press) were the main channels of communication during the crisis, while in North America, social networks were used more actively to build direct contacts with voters and broadcast crisis messages. Thirdly, the image of crisis management has risks: if a politician does not live up to

expectations or if crisis decisions lead to significant socio-economic problems, the image of a “competent manager” can quickly degrade, which negatively affects ratings after the crisis is over. For example, we can see that in some countries the pandemic crisis contributed to the growth of criticism of political leaders who promised a “quick recovery” during the crisis, but could not fully meet the expectations of voters. This emphasizes the thesis that the image is the object of a long-term response to the public. Thus, an analysis of the practices of European and North American post-COVID-19 campaigns shows that the ontological image (competence, real actions) combined with anthropological, value, and ethical components is the most effective strategy for strategic positioning. This multi-component approach allows not only to receive instant support during a crisis, but also to lay the foundation for stable legitimacy through trust, solidarity, and moral reputation.

6. Conclusions

In the post-pandemic period, the political image has become a key tool for strategic positioning in election campaigns. Its effectiveness is determined by the ability of leaders to adapt communication strategies to crisis circumstances and quickly respond to changes in public demand. The study revealed that candidates who demonstrated competence in crises, maintained public health, and effectively managed economic and social challenges consistently received high levels of trust and support ratings in Europe and North America. Analysis of media and social networks confirmed that constant and consistent communication, which includes emotional and informational messages, significantly increases the recognition and positive perception of political leaders. Digital platforms play a key role in shaping public opinion, especially during periods of limited physical interaction with voters.

A comparative analysis of campaigns in different countries has shown that the strategic use of images to mobilize the electorate, legitimize authorities, and form a positive social narrative is a universally effective tool in the post-pandemic environment. Case studies of specific campaigns (for example, Donald Trump in the United States and the government of Angela Merkel in Germany) have shown that successful image-making strategies involve a combination of information influence, quick response to crisis events, and active use of media resources to form a stable, positive perception of the audience. As a result, it has been proven that the political image in the post-pandemic period actively influences the behavior of voters, determining the results of election campaigns. Its strategic design and management have become an integral element of modern political management.

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Verification and Control of International Treaty Regulation on Missile-Nuclear Armaments

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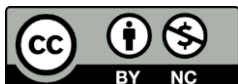
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In the context of the weakening of international treaties on missile-nuclear arms control and the rise of asymmetric threats, traditional verification mechanisms have become increasingly ineffective. The study is relevant for scientifically substantiating the transformation of arms control approaches by integrating intelligence tools as a key element to ensure transparency and confidence. The aim of the article is to develop a conceptual model for integrating intelligence support into verification mechanisms for nuclear and missile systems, considering Ukraine's needs and the current state of international legal regimes. The research employs a complex of general scientific and specialized methods, including systems analysis, analytical, comparative-legal, and synthetic approaches. It examines international agreements, including the Treaty on the Non-Proliferation of Nuclear Weapons and bilateral strategic arms agreements, as well as the use of national technical monitoring means, satellite surveillance, open-source intelligence, and electronic intelligence. The analysis demonstrates that existing verification mechanisms are undergoing a structural crisis due to political paralysis and institutional limitations. Intelligent technologies and big data processing have become the primary source of information for compliance assessment. A three-tier integration model is proposed: organizational level (establishment of an International Nuclear Risk Monitoring Center involving Ukraine, NATO, and the IAEA), technological level (automated satellite data processing, electronic intelligence, and AI-based escalation forecasting), and regulatory level (automation of responses to violations, legally binding data exchange protocols). Integrating intelligence support into international arms control mechanisms allows for a transition from declarative and reactive approaches to preventive risk management. This transformation is especially relevant for non-nuclear states participating in collective security mechanisms, such as Ukraine. The proposed model provides a reliable foundation for building technologically oriented, transparent, and legally grounded arms control systems.



KEYWORDS

intelligence support, verification, arms control, missile-nuclear domain, international legal regimes, strategic stability, risk monitoring, automated analysis systems.



Верифікація та контроль за ракетно-ядерним озброєнням у міжнародно-правових режимах

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СТАТТЯ	АНОТАЦІЯ
Дослідницька DOI: 10.70651/3041-2498/2025.11.12 Отримана: 30.09.2025 р. Прийнята: 14.11.2025 р. Опублікована: 23.11.2025 р. Авторське право © 2025 автора  Цей твір ліцензовано на умовах Ліцензії Creative Commons «Із Зазначенням Авторства – Некомерційна 4.0 Міжнародна» (CC BY-NC 4.0).	У сучасних умовах ослаблення міжнародних договорів щодо контролю над ракетно-ядерними озброєннями та зростання асиметричних загроз традиційні механізми верифікації стають недостатньо ефективними. Актуальність дослідження полягає у необхідності науково обґрунтувати трансформацію підходів до контролю озброєнь із включенням розвідувальних інструментів як ключового елементу забезпечення прозорості та довіри. Метою статті є розробка концептуальної моделі інтеграції розвідувального забезпечення у механізми верифікації ядерних та ракетних систем з урахуванням потреб України та сучасного стану міжнародно-правових режимів. Для досягнення мети використано комплекс загальнонаукових і спеціальних методів, зокрема системний, аналітичний, порівняльно-правовий та синтетичний підходи. Досліджено міжнародні договори, включно з Договором про нерозповсюдження ядерної зброї та двосторонніми угодами щодо стратегічних наступальних озброєнь, а також практику застосування національних технічних засобів контролю, супутникового спостереження, відкритих джерел інформації та електронної розвідки. Аналіз показав, що існуючі механізми верифікації зазнають структурної кризи через політичний параліч та обмеженість інституційних інструментів. Розвідувальні технології та обробка великих даних стають основним джерелом інформації для оцінки дотримання зобов'язань. Запропоновано трирівневу модель інтеграції: організаційний рівень (створення міжнародного центру моніторингу ядерних ризиків за участю України, НАТО та МАГАТЕ), технологічний рівень (автоматизовані системи обробки супутникових даних, електронна розвідка, штучний інтелект для прогнозування ескалаційних дій), нормативно-правовий рівень (автоматизація реакції на порушення, юридично обов'язкові протоколи обміну даними). Інтеграція розвідувального забезпечення у міжнародні механізми контролю озброєнь дозволяє перейти від декларативних і реактивних підходів до системи превентивного управління ризиками. Така трансформація особливо актуальна для держав, що не мають ядерної зброї, але беруть участь у колективних механізмах безпеки, таких як Україна. Розроблена модель забезпечує надійну основу для побудови технологічно орієнтованих, прозорих та юридично обґрунтованих систем контролю.



КЛЮЧОВІ СЛОВА

розвідувальне забезпечення, верифікація, контроль озброєнь, ракетно-ядерна сфера, міжнародно-правові режими, стратегічна стабільність, моніторинг ризиків, автоматизовані системи аналізу.

1. Introduction

The strengthening of asymmetric threats and the weakening of the treaty framework for nuclear missile arms control necessitate a revision of traditional approaches to verification and ensuring strategic stability. The key problem of modern international legal regimes is the limited ability of existing institutions to provide independent and prompt monitoring of compliance with obligations, especially when one of the parties deliberately evades the implementation of agreements or uses the nuclear factor as an instrument of political pressure. The relevance of the study lies in the need for a scientific justification for the transition to a new verification architecture, in which intelligence tools become not an auxiliary, but a system-forming element of international legal regimes, which is especially important for states that do not possess nuclear weapons, but participate in the formation of collective security mechanisms and seek to strengthen their own subjectivity in the global non-proliferation regime.

2. Literature Review

The issue of integrating intelligence tools into arms control mechanisms has become especially acute after the weakening of key international agreements and the growing role of non-inspection verification methods. Modern research focuses on finding the optimal combination of traditional inspection procedures with modern technologies for collecting and processing information.

Kühn [8] analyzes the evolution of verification regimes within the framework of the Treaty on the Non-Proliferation of Nuclear Weapons and bilateral agreements on strategic arms, emphasizing the growing role of national technical means of verification and analysis of open sources. The authors conclude that the effectiveness of verification is possible only under the conditions of creating hybrid systems in which state intelligence agencies cooperate with international organizations and the commercial sector within the framework of clearly defined data exchange protocols. R. Allison [1] examines mechanisms for preventing escalation during the Russian-Ukrainian war, taking into account the nuclear dimension. Particular attention is paid to the effectiveness of early detection of preparations for the possible use of nuclear weapons using electronic reconnaissance and satellite monitoring. The author notes that institutional inertia and the lack of unified protocols for information exchange with non-nuclear partners reduce the overall adaptability of existing control regimes.

M. S. Bell [4] revises classical theories of nuclear deterrence in the context of modern conflicts and points out the lack of consideration of intelligence asymmetry. Non-nuclear-weapon states are forced to rely on external sources of information, while the breaching party uses information opacity to manipulate the level of risk. Based on this, it is concluded that there is a need to institutionalize multilateral intelligence sharing as a condition for restoring trust. A. K. Arndt, L. Horowitz and M. Onderko [3] demonstrate on empirical material that the operational exchange of intelligence information within NATO and the public disclosure of the aggressor's intentions significantly reduced the effectiveness of nuclear coercion attempts in 2022–2024, which confirms the potential of intelligence tools as an active means of countering coercion even in the context of a partial collapse of the treaty system. D. Santoro [14] considers the prospects for the creation of verification mechanisms with the participation of new nuclear states and proposes the phased use of commercial satellite data and open-source analysis as a transitional stage to full-fledged multilateral regimes.

Despite a significant number of publications, most studies remain focused on the bilateral US-Russia format and do not sufficiently take into account the needs of non-nuclear states in a multipolar environment. There are practically no integrated models that would combine international experience, modern technologies of automated analysis and specific security needs of countries in the process of Euro-Atlantic integration. Although academic opinion states the transition to technology-oriented verification, there is a lack of a systematized technological project, a detailed description of data architecture, interfaces for integrating various intelligence tools and protocols for their use in legal regimes. It is this gap, the design of a technological platform for new verification, that this article fills.

3. Problem Statement

The article is aimed at developing a conceptual model for the integration of intelligence support into the mechanisms of verification and control of nuclear missile weapons, taking into account the current state of international legal regimes and the strategic needs of Ukraine.

To achieve the goal, the following tasks have been set:

1. To analyze the limitations of the current verification mechanisms and the reasons for their insufficient effectiveness in the context of weakening of the contractual framework.
2. Determine the role of various intelligence tools (national technical means of control, open-source analysis, electronic intelligence, satellite surveillance) in ensuring transparency and strategic stability.
3. To investigate the impact of modern conflicts on the transformation of approaches to verification and deterrence.
4. Propose a three-tier model of adaptive intelligence support for future international agreements involving Ukraine.

Formulate practical recommendations for the state bodies of Ukraine and international partners on the institutional consolidation of intelligence functions in security arrangements.

4. Methods and Materials

The methodological basis of the study is a complex of general scientific and special methods of cognition, the application of which is due to the interdisciplinary nature of the problem of integrating intelligence support into the mechanisms of verification and control of nuclear missile weapons. The paper uses a systematic approach, which made it possible to consider international legal arms control regimes as complex dynamic systems in which legal, institutional, technological and security components are closely interconnected and interdependent. The application of system analysis made it possible to identify structural dysfunctions of the current verification regimes in the context of a weakening of the contractual framework and to determine the place of intelligence tools as a backbone element of the new strategic stability architecture.

Theoretical methods of analysis, synthesis, generalization and comparison are used to study scientific publications of leading foreign and domestic researchers in the field of international security, nuclear deterrence, arms control and intelligence research. The comparative legal method made it possible to compare the evolution of key international agreements in the field of nuclear missile weapons, their current status and the transformation of verification mechanisms in the context of the actual curtailment of inspection procedures. Based on this, the regularities of the transition from the contractual and inspection model of control to hybrid, technologically oriented forms of monitoring were determined.

5. Results and Discussion

Reconnaissance tools turn from a compensatory agent into a system-forming one. However, this raises a new problem: the modern reconnaissance panorama is scattered and asymmetrical. The data is stored in national databases, the formats for their processing vary, and the access of non-nuclear states (such as Ukraine) to them is limited and indirect, which creates a technological barrier to effective verification. Therefore, the key task is not just to state the importance of intelligence, but to design mechanisms for its integration, standardization and legitimation in the international legal field (Table 1).

The analysis of Table 1 demonstrates a direct link between the erosion of classical contractual mechanisms and the growing critical role of intelligence tools in verification. Each identified challenge – from political paralysis to the complete rupture of inspection regimes – is directly translated into specific intelligence tasks: compensating for the lack of transparency, monitoring unlimited systems, and providing the foundations for new, technology-oriented control regimes. The crisis of the contractual framework not only weakens the old security architecture, but also directly forms the requirements for the new one, in which intelligence support ceases to be an auxiliary tool and becomes a backbone element. Such a transition is especially relevant for states that, like Ukraine, rely on collective security guarantees and need reliable tools for independent monitoring of their compliance.

Table 1. Key International Agreements on Nuclear Missile Arms Control: Current Status and Main Challenges

Deal	Current status	Key challenge for verification	Implications for intelligence support
Treaty on the Non-Proliferation of Nuclear Weapons	Incumbent but politically paralyzed	Lack of mechanisms for coercion and audit of military programs of nuclear powers.	Transition to indirect monitoring. The growing importance of open-source analysis, commercial satellite data, and signal intelligence to detect signs of proliferation and undeclared activity.
Strategic Arms Reduction Treaty	The participation of the Russian Federation is suspended; The action ends in 2026.	Complete loss of direct inspections and transparency on the state of strategic arsenals.	Intelligence becomes the main source of information. Critical reliance on national technical means, satellite surveillance and electronic reconnaissance to track carriers and warheads.
Treaty on the Elimination of Intermediate-Range and Short-Range Missiles	Terminated in 2019	Lack of any legal restrictions and verification mechanisms for this class of missiles.	Monitoring is turning into an intelligence task. Active use of geospatial intelligence to detect the deployment of new missile systems not limited by the treaty.

Source: Compiled by the author based on [2; 5; 7; 15–18].

Intelligence asymmetry plays a special role: non-nuclear states, such as Ukraine, depend on external sources – satellite surveillance, open data analysis, and exchanges within NATO, while the opponent uses opacity to mask actions [4]. The ineffectiveness of Russian attempts at nuclear coercion in 2022–2024 is attributed to NATO's rapid data sharing (satellite surveillance, electronic intelligence) and rapid disclosure of information through open-source communities [3], demonstrating how modern deterrence is based on information openness and multi-channel verification.

The experience of the conflict in Ukraine stimulates a review of the role of intelligence in safeguards mechanisms. The use of space-based surveillance means, stable data channels and agreements for the exchange of information between states form a new monitoring system [13]. First, security guarantees require constant monitoring of the doctrinal changes of the guarantor states using hybrid verification models based on open sources and commercial satellite data as a transitional stage to inspections [18]. Secondly, artificial intelligence is becoming a tool for intelligence analysis – automated detection of deviations in information flows increases the accuracy of forecasts and the efficiency of response [5]. Thirdly, the institutionalization of data exchange, in particular according to NATO practices, should become a component of new guarantees. The exchange between Ukraine and the Alliance through the Joint Intelligence and Security Division has become systematic, complemented by open-source analysis standards for legal weight [10]. Without this, new mechanisms risk repeating the mistakes of the past, and international law risks losing its effectiveness against revisionism. Technological changes, including the integration of artificial intelligence into nuclear force control systems, increase risks and complicate verification [12]. Reconnaissance tools in modern conditions are becoming a key element in maintaining balance. If earlier verification was based on mutual trust of states and inspection procedures, now monitoring through different channels, signal processing and analysis of cyber threats compensates for the weakening of institutions [6; 9; 11].

The technical aspect of risks is exacerbated by cyber threats: penetration of missile control systems, manipulation of remote monitoring data, and the use of artificial intelligence to attack early detection systems create vulnerabilities in national technical controls, which were the basis of arms agreements [12].

As Table 2 shows, the strategic stability crisis is multifaceted: each challenge increases the vulnerability of the system, emphasizing the speed and accuracy of intelligence analytics as a means of maintaining balance. The proposed model of integration of intelligence support into international control regimes provides for three interrelated levels of reform.

- *Organizational level.* It is expedient to establish an International Nuclear Risk Monitoring Center with the participation of NATO, IAEA, the EU and Ukraine. The Center will act as a hub for the exchange of data from open sources, electronic and human intelligence, with annual reports on compliance with obligations [13].

- *Technological level.* It is recommended to expand the use of commercial sources (Maxar, Planet Labs), space-based surveillance systems, and artificial intelligence models for predicting escalation. The

integration of electronic intelligence with machine learning algorithms will create a dynamic system for predicting changes in the behavior of violating states [9; 12].

Table 2. Current Challenges to Strategic Stability and Countering Intelligence Tasks (as of 2025)

Challenge	Description	Impact on strategic stability	Reconnaissance task
Nuclear coercion of the Russian Federation	Systematic Threats of Escalation, Doctrine Update (2024) [6;11]	Weakening of containment norms; erosion of trust in the NPT	Predicting Intent through Electronic Intelligence and Doctrine Analysis
Deployment of tactical nuclear weapons in Belarus	Movement of warheads from 2023; lack of verification [6]	Regional destabilization; risk of NATO-Russia confrontation	Motion monitoring via satellite observation/open-source analysis (Maxar satellites)
Escalation doctrine for de-escalation	Limited nuclear use for de-escalation [9]	Blurring the boundaries of conventional and nuclear war; Increased risks	Analysis of escalation indicators (human intelligence, automated forecast models)
Cyber threats to nuclear infrastructure	Attacks on control systems; AI integration [12]	Undermining verification; creation of "blind spots" in monitoring	Detection of cyber incidents through electronic intelligence and automated analysis

Source: Compiled by the author based on [6; 9; 11; 12; 13].

– *Regulatory level.* It is necessary to consolidate automatic sanctions for confirmed violations, conduct an audit of security assurances (annual reports of the center) and move from political agreements to binding treaties with data exchange protocols [11], which will allow the transition from a reactive to a preventive approach.

The proposed three-level model requires a specific technological implementation in the form of a Hybrid Intelligence and Analytical Platform (GRAP). Its core should be not just an exchange center, but a system with a unified digital environment that integrates heterogeneous sources:

– *Data layer:* automated pipelines for receiving and preprocessing data from commercial satellites (Maxar, Planet), state electronic warfare systems, public information sources (social networks, public procurement) and IAEA sensor networks.

– *Analytics layer:* a set of algorithmic modules (artificial intelligence/machine learning) to perform specific tasks: automatic pattern recognition in snapshots to detect construction; semantic analysis of rhetoric to identify threat patterns; network analysis to identify supply chains.

Presentation and protocol layer: standardized application programming interfaces for secure access by authorized users, automatic report generators, and "digital traces" to capture the origin of data and analysis results, which is critical for the legitimacy of conclusions.

The creation of such a center (technological hub) is a practical prerequisite for the functioning of any institute for the audit of intentions, providing it with objective, technologically verified information raw materials for analysis. Such a platform is not a substitute for national intelligence services, but acts as a technological synergistic multiplier that transforms disparate data into a common operational picture for decision-making. Modern challenges require a conceptual shift towards intelligence as the basis of international security regimes. In the new model, data sharing provides trust, and institutionalized transparency maintains stability. The reform involves not only a technical update, but also a legal rethinking of contracts, with liability norms, sanctions mechanisms and audit of assurances for a comprehensive preventive system.

6. Conclusions

The analysis confirms that the system of international regulation of nuclear and missile weapons is experiencing a structural crisis due to the obsolescence of legal norms, fragmentation of institutions and the rapid evolution of threats. The main drawback, the lack of tools for liability for violations, turns regimes into declarative constructions, which requires the creation of a new contractual framework with a combination of legal obligations and independent verification. Intelligence functions in such a system become the basis of security, ensuring the transition from reactive surveillance to preventive risk management. Their integration forms a model of analytical trust, where information transparency and technological predictability are the key to stability. Ukraine, based on the experience of weakening political assurances and developing monitoring in conflict conditions, can become a platform for testing a new system of collective security, where sanctions mechanisms, audit of assurances and international coordination form a single preventive complex.

Our state, having a unique combat experience in countering aggression using modern monitoring technologies, can become not only a “pilot site”, but an active developer of standards and components of such a hybrid platform. The creation of the national segment of the GRAP and its integration into the systems of cooperation with NATO and the EU is a concrete step to transform Ukraine from an object of guarantees into a subject of the technological architecture of the future global security system.

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