CHAPTER 1
CURRENT TRENDS IN ECONOMIC DEVELOPMENT

ETHICAL ASPECTS OF BIOECONOMY IN POST-WAR RECONSTRUCTION PROJECTS IN UKRAINE

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Abstract. *The study establishes that the bioeconomy is an innovative direction in the development of modern economic systems, as it is based on the principles of rational use of natural resources, integration of advanced technologies, and ensuring conditions for sustainable development. It is clarified that the key foundations of the bioeconomy, which facilitate its interaction with other sectors, include increasing resource efficiency, achieving economic sustainability, ensuring ecological balance, and adhering to principles of social justice. The analysis of bioeconomy development strategies revealed that these strategies often encompass numerous objectives without a clear hierarchical structure, which creates challenges for their practical implementation. It was identified that the successful implementation of these strategies requires their adaptation to national policies, alignment with international standards, and the creation of specific action plans with well-defined measures, timelines, and responsible parties. The study evaluates the significance of the bioeconomy in the context of Ukraine's post-war reconstruction. It is demonstrated that this approach can stimulate economic growth, contribute to environmental recovery, and provide social support. Integrating the bioeconomy into recovery processes enables the rational use of natural resources, the implementation of innovations, the creation of new jobs, and the restoration of economic activity in regions that have suffered significant destruction. It is argued that the application of the bioeconomy in reconstruction projects ensures synergy between economic, environmental, and social outcomes. An organizational-economic management model for the bioeconomy, tailored to the specific conditions of Ukraine's post-war recovery, is proposed. This model involves establishing engineering centers to assess the technical readiness of enterprises, provide consulting services, and coordinate innovative projects. Additionally, the idea of creating regional investment funds to finance innovative initiatives in the field of biotechnology is proposed and substantiated. It is proven that the implementation of this model will promote the rational use of natural resources, reduce environmental risks, and achieve stable economic development.*

Keywords: *bioeconomy; post-war recovery; project management; Ukraine Facility; ethical aspects; management.*

JEL Classification: L 79; M 21; O 32

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Introduction. Post-war reconstruction of Ukraine will require a societal and comprehensive approach to economic development that simultaneously considers social, environmental, and economic dimensions. In this context, the bioeconomy emerges as a promising model capable of ensuring sustainable development through the rational use of biological resources, the introduction of innovative technologies, and the protection of the natural environment. However, integrating the bioeconomy into the reconstruction process necessitates adherence to ethical norms that maintain a balance between economic efficiency, environmental sustainability, and social equity.

Ethical considerations are particularly essential in the context of the large-scale environmental and social losses caused by military actions on Ukrainian territory. The inclusion of biological resources in economic circulation must account for the rights of local communities, the need to restore natural ecosystems, and transparency in managerial decision-making. Ignoring these aspects may lead to environmental depletion, social conflicts, and a loss of trust in governance structures. Thus, the study of ethical aspects of the bioeconomy is necessary to ensure the long-term effectiveness of Ukraine's recovery.

The current research aims to establish methodological foundations for an ethical approach to the use of biological resources, which should become an essential component of state policy and post-war reconstruction strategy. The results will not only minimize potential risks but also create conditions for Ukraine's sustainable development based on the principles and technologies of the bioeconomy.

Literature Review. Research on the ethical aspects of the bioeconomy has recently gained relevance, particularly in the context of post-war reconstruction, where the rational use of natural resources, sustainable development, and social justice come to the forefront. In the scientific domain, the bioeconomy is considered a multifaceted concept that encompasses the integration of biotechnology, environmental practices, and economic strategies to create sustainable management models.

Specifically, studies by Bilousko, T., Bilousko, R. (2024), and Jander, W., Wydra, S., Wackerbauer, J., Grundmann, P., Piotrowski, S. (2020) emphasize that the bioeconomy provides new opportunities to reduce environmental impact by transitioning to renewable energy sources and introducing innovations in agriculture, industry, and other key sectors. Research by Maksimiv, Y., Yakubov, V., Pylypiv, N., Hryhoruk, I., Pyatnychuk, I., Popadynets, N. (2021) also highlights the importance of developing a regulatory framework to govern bioeconomic initiatives, thereby minimizing risks of overexploitation of resources.

The ethical aspects of the bioeconomy in the literature are presented through the lens of adherence to principles of social responsibility, equitable access to resources, and consideration of the needs of future generations. Nifatova, O., and Petrychuk, S. note in their research that successful implementation of the bioeconomy requires transparency in decision-making, involvement of local communities, and compliance with ethical standards in resource allocation.

Among studies focused on post-war reconstruction, the role of the bioeconomy in ecosystem restoration, job creation, and fostering sustainable development is emphasized by Rojas-Serrano, F., Garcia-Garcia, G., Parra-Lopez, C., and Sayadi, S.

(2024). Special attention is given to the use of biotechnology for waste recycling, soil fertility restoration, and mitigating climate change.

Some contemporary authors, including Klymenko, K., Petrukha, S. (2024), and Oleshko, A., Olshanska, O., Budjakova, O., Bebko, S. (2022), underscore that insufficient coordination among government agencies, research institutions, and businesses remains a significant barrier to the implementation of bioeconomic projects. Simultaneously, the importance of developing integrated strategies that account for both national and sectoral specificities is noted.

Thus, an analysis of the scientific literature shows that the bioeconomy is viewed as a promising tool for sustainable development in the context of post-war reconstruction. However, its successful implementation requires the integration of ethical standards into all stages of project realization, as well as a multidisciplinary approach combining environmental, economic, and social aspects.

Aims. The aim of the article is to develop an organizational-economic model for managing the bioeconomy, which will promote the efficient use of biological resources, the implementation of innovative technologies, and the observance of ethical principles in the execution of post-war reconstruction projects in Ukraine.

Research Objectives:

- To investigate the conceptual foundations of the bioeconomy, its principles, its role in sustainable development, and its potential for integration into post-war reconstruction projects in Ukraine;
- To propose a bioeconomy management model that accounts for the specificities of Ukraine's post-war reconstruction, particularly through the establishment of clusters, regional investment funds, and engineering centers;
- To develop organizational components for implementing innovative technologies in bioeconomic projects, including selective breeding methods, precision farming, waste recycling, and the use of digital technologies.

Methodology. The study utilized the method of systemic justification, which was employed for a comprehensive analysis of the ethical aspects of the bioeconomy as a multifaceted phenomenon integrating economic, environmental, and social components. This method enabled the identification of key interconnections between the rational use of biological resources, achieving sustainable development, and integrating ethical principles into Ukraine's reconstruction processes. Furthermore, the systemic approach formed the basis for substantiating the necessity of ethical standards at all stages of bioeconomic project implementation, considering legal, managerial, and social components.

The integration method was applied to combine various scientific approaches and concepts to study the ethical foundations of the bioeconomy, as well as to generalize knowledge in fields such as ecology, economics, and sociology. This method enabled the formation of a unified understanding of ethical principles essential for the effective development and implementation of bioeconomic initiatives. The integration of information from diverse sources served as the foundation for recommendations on the socially responsible use of biological resources and for addressing ecological challenges arising in the course of Ukraine's post-war recovery.

The method of analytical generalization was used to evaluate existing experiences in implementing bioeconomic projects and to study their ethical aspects. This method facilitated a detailed analysis of current practices and scientific approaches, allowing for the identification of the most effective solutions for integrating ethical principles into the bioeconomy. The synthesis of collected data contributed to the development of recommendations for the ethical use of biological resources in Ukraine's recovery context and identified the primary risks associated with neglecting ethical norms, along with proposed ways to mitigate these risks.

Results. The bioeconomy, as an innovative approach to the development of modern economic systems, is based on principles of the rational use of biological resources and the implementation of innovative technologies aimed at ensuring sustainable development. The main principles of the bioeconomy include resource efficiency, economic stability, ecological balance, and social justice, which ensure the harmonious development of society in the face of growing global challenges.

Over the last decade, the term "bioeconomy" has gained popularity and become an integral part of discussions on sustainable development, ecological security, biodiversity conservation, as well as concepts of "green" and circular economies [8]. The bioeconomy is increasingly recognized as a comprehensive concept encompassing not only the processing of biological resources but also the generation of new knowledge, innovation development, and the formation of modern social relations. Consequently, bioeconomy strategies are closely intertwined with the political goals established by various social institutions and are increasingly used as tools for achieving complex societal objectives.

Every economic system, like a natural ecosystem, strives for development, growth, and expansion of its capabilities. However, the key issue remains on what foundations this development should be based to avoid negative consequences for the environment and society. Modern trends of overconsumption, dominant in many economic systems, often stimulate economic growth but simultaneously lead to ecosystem degradation and exacerbate ecological crises. According to the concept of J. Schumpeter, economic growth involves quantitative changes, while development focuses on qualitative improvements, which not only drive growth but also enhance the quality of life. This underscores the importance of incorporating moral and ethical principles to regulate development processes [9].

In the context of the bioeconomy, it is essential to focus on meeting demographically driven needs that ensure the basic conditions for human life, personal development, and harmonious interaction with nature. These needs have clear natural limitations, dependent on population size, natural-geographical conditions, and cultural traditions. They do not harm the biosphere because they align with the natural laws of resource renewability and ensure intergenerational continuity. Thus, meeting these needs within bioeconomic projects for Ukraine's post-war reconstruction allows for the simultaneous restoration of ecosystems and the promotion of societal development (Table 1).

Table 1. Possible Analogies Between Biological and Economic Systems

Participants in food webs	Bio-ecosystem	Economic system
Producers	Organisms capable of producing organic substances from inorganic, that is, all autotrophs (plants)	Agriculture, some branches of energy
Consumers	Organisms that consume ready-made organic substances created by autotrophs (producers). Unlike reducers, consumers are not able to decompose organic substances into inorganic	Most branches of material production and the intangible sphere
Reducers	Organisms that destroy dead remains of living beings, converting them into inorganic and the simplest organic compounds. Reducers return mineral salts to soil and water, making them available to autotroph producers, and thus close the biotic cycle	Certain technologies used in a number of industries: processing of household and industrial waste, wastewater and air purification, land reclamation

Source: developed on the basis of [8; 10]

Analyzing the ethical and rationalist principles of ecosystem functioning, particularly self-organization based on constant energy exchange, it can be asserted that such principles are applicable to economic systems. Energy, as a stable entity, regulates processes in natural systems, maintaining dynamic equilibrium and ensuring their reproduction. A similar approach in economics, particularly in bioeconomics, would contribute to forming a sustainable and self-regulating model that considers natural constraints and focuses on long-term stability. Humanity, as an integral part of the biosphere, must build economic relations according to ecological principles that integrate natural and social components. However, traditional economic theories insufficiently emphasize this interdependence, which is why bioeconomics—the economy of the future—should serve as an example of a sustainable model harmoniously integrated into the planet's ecological processes. Drawing analogies with trophic networks in ecosystems allows parallels to be drawn with economic entities, where the primary role of human activity corresponds to that of a consumer [11]. At the same time, achieving sustainability requires transitioning to more active and responsible resource use, fostering harmonious coexistence between humans and nature while ensuring the effectiveness of bioeconomic projects in the post-war period.

Before the Industrial Revolution, humanity's economic activity, predominantly based on agriculture, organically fit into natural ecosystems, creating a harmonious link between humans and the biosphere. Economic processes of that time were limited to local biotopes, which helped maintain natural equilibrium. However, with technological advances and the emergence of synthetic materials that are not biodegradable, this balance was disrupted, increasing pressure on ecosystems. Modern economic activities focus on intensive resource consumption with minimal return to the natural environment, a trend that has worsened over the past centuries. To address this issue, efforts must be directed toward developing and implementing technologies that enable artificial materials to be reintegrated into natural cycles [12]. From this perspective, biotechnology offers promising solutions, including the development of

materials easily decomposed by natural decomposers or the creation of artificial mechanisms capable of effectively breaking down synthetic substances without harming the environment.

The transition to bioeconomy as a sustainable development model is essential in light of global challenges such as rapid population growth, depletion of natural resources, and environmental degradation. By 2030, the world population is projected to reach 8.3 billion, with most growth occurring in developing countries where living standards and consumer demand are rising [13]. The increasing need for resources such as food, water, and energy necessitates finding new ways to use them efficiently, which bioeconomy can ensure through innovative approaches to production and processing. Implementing biotechnology is often seen as the key to establishing environmentally sustainable production capable of addressing many global problems. Innovative products developed within bioeconomy frameworks can significantly reduce environmental impact. However, the relationship between bioeconomy and sustainable development is not entirely straightforward and requires careful study [14].

Research confirms that biotechnology projects are economically viable and attractive to investors, but they remain highly capital-intensive, creating significant risks for their implementation. This underscores the need to develop an organizational-economic model of bioeconomy that promotes the integration of innovations into the agricultural sector and ensures long-term sustainability and economic development efficiency in post-war recovery projects in Ukraine (Figure 1).

As a result of this study, an organizational-economic model for managing bioeconomy has been developed, considering the specifics of post-war reconstruction in Ukraine and focusing on achieving sustainable development by integrating innovative solutions, efficiently using bioresources, and implementing ethical principles. This strategy includes creating an engineering center to support infrastructure development and ensure favorable conditions for project implementation through administrative support, tax benefits, access to preferential loans, and state subsidies. The main components of this model are:

1. The engineering center, as a key element of the model, evaluates enterprises' technical readiness to implement new technologies, provides consulting services for designing industrial facilities, and coordinates the implementation of innovative projects. To stimulate the development of biotechnology, regional authorities create a regional investment fund that accumulates funds from project initiators, private investors, and state programs, fostering the financing of the innovative component of the economy [15].
2. Project initiators, together with private investors, participate in the development of advanced technologies by conducting research and development activities, which form the technological foundation for projects. The key element in managing the bioeconomy is the infrastructure that facilitates the implementation of specific projects and minimizes risks by distributing responsibilities among participants.

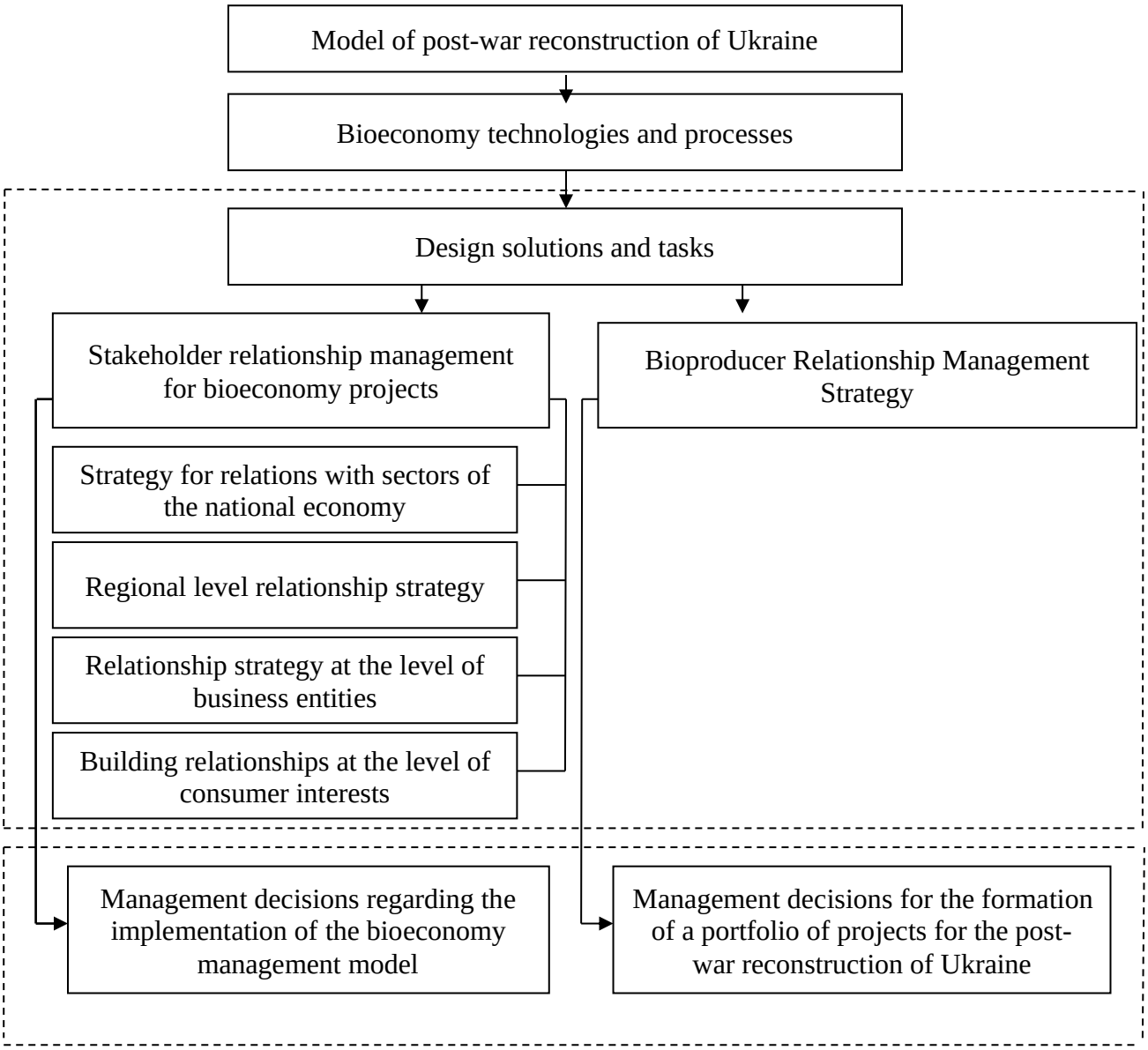

Figure 1. Organizational and Economic Model for Managing the Bioeconomy in Post-War Reconstruction Projects in Ukraine

Source: Developed by the authors

The role of the bioeconomy in ensuring Ukraine's post-war development can become truly pivotal, as it enables simultaneous resolution of economic, environmental, and social challenges caused by large-scale destruction and the loss of natural resources. Restoring ecosystems, including forests, agricultural lands, and water resources, is a top priority that can be achieved through bioeconomy principles, which emphasize not only rational resource management but also the promotion of innovation in the field of biotechnology [16–17].

Additionally, the bioeconomy is expected to contribute to the revitalization of economic activity in affected regions by creating jobs, fostering community development, and attracting investments in sustainable growth. The ethical foundations of modeling the use of biological resources represent an essential aspect of the bioeconomy, as they ensure a balance between economic, environmental, and social interests (Fig. 2).

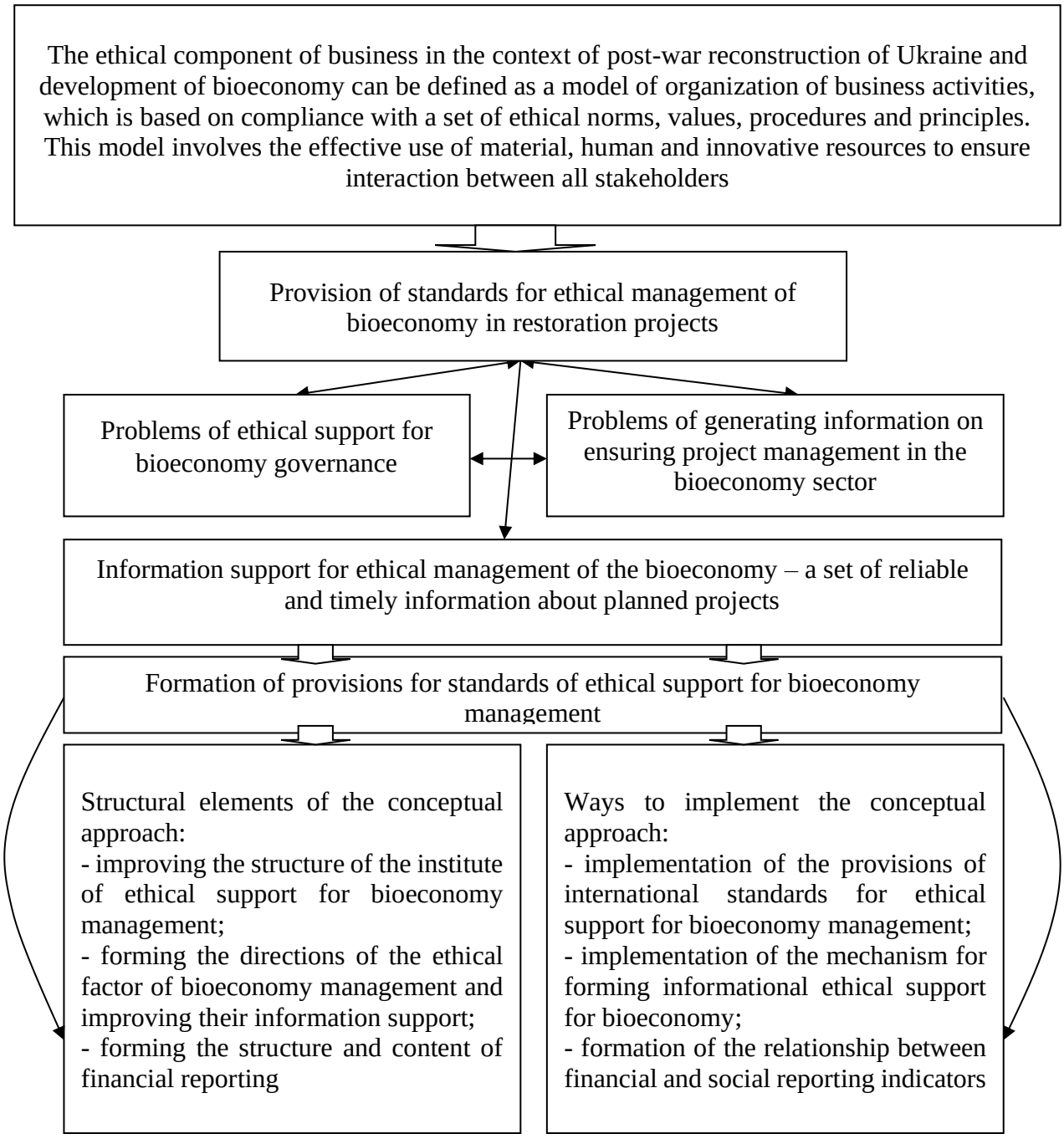

Figure 3. Model for Ensuring an Ethical Basis for Management in the Context of Development Projects for the Post-War Reconstruction of Ukraine's Bioeconomy

Source: Developed by the authors

For the full implementation cycle of projects, EPC (engineering, procurement, construction) contracts are employed, encompassing the complete spectrum of activities—from design and procurement to construction and commissioning. This approach allows for cost optimization, alignment of implementation stages, and risk reduction for all participants in the process.

Contemporary scientific literature [9; 11; 19; 21] highlights numerous potential benefits of bioeconomy, which can serve as the foundation for its incorporation into post-war reconstruction projects in Ukraine. The bioeconomy significantly enhances the efficient use of natural resources by replacing traditional fossil fuel-based technologies with more environmentally friendly and economically viable biotechnological production systems. A crucial aspect of this transformation is reducing CO_2 emissions, which positively impacts the maintenance of ecological balance.

In the realm of production and economic activities, the bioeconomy facilitates a shift toward renewable energy sources, such as biofuels, and improves agricultural technologies, including better conditions for livestock management. Key directions include the implementation of innovative technologies to increase water resource efficiency, reduce fertilizer costs, and develop new perennial legume crops that require fewer resources and enrich the soil [18].

Among the technologies addressing major issues in the agricultural sector and ensuring its resilience, special emphasis is placed on selective breeding methods aimed at improving plants' adaptability to climate change, resistance to diseases and pests, and reducing dependency on external inputs such as fertilizers and water. These innovations simultaneously boost crop yields and nutritional value, ensuring food security under resource constraints.

Alternative practices, such as integrated pest management or using robotics to control weeds, demonstrate substantial potential in creating sustainable production and economic activities. Additionally, precision agriculture, grounded in digital technologies such as sensors, drones, internet platforms, and robots, ensures cost optimization and efficient resource management. Another critical aspect is the development of innovative approaches to waste management that enable energy recovery and reduce environmental impact [19]. These technologies pave the way for sustainable practices in post-war reconstruction, ensuring long-term socio-economic and environmental benefits for Ukraine.

Progressive approaches to production and economic activities, including methods to sustain and enhance soil fertility while ensuring environmental safety, are becoming essential in the context of Ukraine's post-war reconstruction. The adoption of innovative solutions that prevent environmental harm is a key direction in the development of the bioeconomy, aimed at establishing sustainable production systems.

Further research and innovation in resource management and production methods will foster the creation of more productive and environmentally sustainable economic models. In this context, regional clusters play a pivotal role, acting as integrators of various industries by coordinating research institutions, production enterprises, and infrastructure facilities [20]. The bioeconomy, fundamentally based on biotechnologies utilizing renewable biological resources, offers a promising model for integrating ecological and economic interests.

The first stage of implementing the bioeconomy involves establishing an initial production-distribution chain for biomass, enabling the development of fundamental resource management mechanisms. At the second stage, the formation of more complex value-added chains becomes relevant, wherein biomass is transformed into

economically viable products that enhance the competitiveness of regional economies. The methodological framework for transitioning to the bioeconomy includes defining priorities and institutional aspects of such transformation. In this context, it is crucial to develop modules that account for the integration of bioeconomy principles into the national economy, serving as a guideline for shaping new approaches to rebuilding and developing production systems (Table 2).

Table 2. Priority Module for Developing Ukraine's Bioeconomy with Compliance and Implementation of Ethical Components

<table>
<tr><td colspan="5">I. Project organization and management</td></tr>
<tr><td>Institutionalization of the strategy for the socio-economic development of Ukraine until 2030 (Ukraine Facility) to form the foundations of bioeconomy based on the launch of the envisaged clusters</td><td>Development of a biomass circulation program based on industry convergence. Mapping of participants, communication, their involvement in restoration projects</td><td>Ensuring research and innovation. Symbiosis of the work of government bodies, scientists and business representatives. Search for new solutions</td><td>Coordinated policy. Standardization of cluster activities. Implementation of public-private partnership mechanisms</td><td>Ensuring social acceptability of the bioeconomy. Involving broad segments of the population, including youth, based on PR and other social and information technologies</td></tr>
<tr><td colspan="5">II. Vector directions of activity</td></tr>
<tr><td>Development of energy strategies that include energy consumption control and development of renewable energy alternatives, including bioenergy, methanization planning</td><td>Development of territorial platforms of bioprocessing enterprises within the framework of the economic policy of transition to smart industry</td><td>Sustainable development of production and economic activity based on increasing the level of convergence of industries. Comprehensive use of biomass based on reducing the consumption of synthetic materials. Development of anaerobic digestion projects</td><td>Development of the food industry based on pure bio-ingredients and their packaging through the use of environmentally friendly solutions. Ensuring traceability of the agri-food value chain</td><td>Activation of the use of biomaterials in various sectors of the national economy</td></tr>
<tr><td colspan="5">III. Transition to modern digital solutions (technologies)</td></tr>
<tr><td colspan="5">The use of digital technologies, artificial intelligence in business processes and in state regulation processes</td></tr>
<tr><td colspan="5">IV. Foreign economic activity</td></tr>
<tr><td colspan="2">Development of interregional cooperation</td><td colspan="2">Participation in international projects</td><td>Development of export potential</td></tr>
</table>

Source: Developed by the authors

Research confirms the need for a strategic rethinking of economic policy to create a competitive economy that addresses the contemporary challenges of Ukraine's post-war development. Such transformation requires the integration of production, processing, and scientific systems, taking into account economic, social, and environmental realities. An important role in this process can be played by the clustering mechanism, based on strategic management that prioritizes the synergy of science, industry, and production-economic activities [21]. This approach will enable the bioeconomy to take a central position as a platform for institutionalizing innovative developments and research in the coming years.

However, changes in strategic approaches to the development of the bioeconomy have not yet been adequately reflected in practical activities. The absence of large-scale public experiments in transitioning to "green" development principles and multidimensional national progress goals remains a significant challenge. The successful implementation of the bioeconomy is only possible with active government support, which includes investments in research and innovation, the development of industrial and infrastructural bases, as well as the marketing of new goods and services based on biotechnology. The societal benefits of implementing bioeconomy strategies are most evident in supporting education aimed at training specialists for biotechnological industries and encouraging scientific research among students and educators [22]. However, the lack of a long-term vision, clearly formulated goals, implementation stages, resource inventories, and the identification of responsible bodies significantly complicates the future adoption of such policies.

Another significant barrier to the development of the bioeconomy is its regional specificity. The diversity of resource bases, technological potential, and economic advantages in various regions creates substantial variability in strategies, often accompanied by the politicization of this process. Although international organizations and the scientific community propose relevant concepts such as ecosystem services, One Health, critical resource security, carbon dioxide utilization, and carbon-based raw material transformation, these issues rarely receive adequate attention in national strategic documents. Thus, for the comprehensive development of the bioeconomy as a key element in Ukraine's post-war reconstruction, it is necessary not only to adapt global innovative concepts to local realities but also to ensure a systemic approach that combines a long-term strategy, political support, and an ethical component (Table 3).

Table 3. Strategies for Developing Bioeconomy Projects to Ensure the Reconstruction of Post-War Ukraine

Bioeconomy Development Strategies	Organizational Essence	Assessment of Impact on the Economy of Ukraine	Ethical Components of the Strategy	Possibility of Use in Post-War Recovery
Integration of Scientific and Production Systems	Cooperation between Scientific Institutions and Enterprises	Strengthening Competitiveness	Ensuring Ethical Use of Resources	Improving the Efficiency of Recovery Processes
Creating Clusters	Coordination between Business, Science, and Government	Increasing Investment and Jobs	Promoting Social Responsibility	Optimizing Regional Development
Developing Green Energy	Using Bioenergy Technologies	Reducing Dependence on Fossil Resources	Reducing Environmental Impact	Promoting Energy Autonomy
Supporting Biotechnological Innovations	Investing in Biofactories and Production	Increasing Economic Efficiency	Preserving Biodiversity	Innovations in Materials Production
Creating a Global Platform	International Coordination and Exchange of Experience	Improving international cooperation	Harmonization of standards	Enhancing global sustainability
Development of energy strategies	Planning and implementing new solutions	Controlling energy consumption	Developing socially oriented approaches	Supporting renewable energy sources

Source: developed by the authors

In many strategies aimed at developing the bioeconomy, the achievements of modern biomanufacturing are either underappreciated or regarded as a distant future prospect, despite the fact that it is already possible to actively implement biofactories and advanced technological processes to produce such products as biotissues, medicines, bioplastics, or biofuels. The primary obstacle to such implementation is the need for a fundamental restructuring of the economy, which includes shutting down outdated enterprises and carrying out large-scale social reforms that may face resistance from stakeholders [23]. Consequently, most strategies focus on expanding production based on the processing of bio-raw materials, industrial waste, and household waste.

However, the concept of the "green" city, which could become a key component of the bioeconomy, has only been further developed in a few countries and has not become part of national strategies in most states. The problem of coordinating actions among bioeconomy participants with differing interests remains one of the main challenges, emphasizing the need to improve governance systems to achieve sustainable development [24]. Against this backdrop, the role of interregional and international organizations is becoming increasingly important, as their involvement allows for better coordination of efforts among countries towards regionalization and specialization of bioeconomic strategies. Currently, the creation of a unified global platform is a pressing issue. Such a platform would facilitate the integration of national strategies, help highlight the global nature of environmental challenges, underscore the interconnection between the bioeconomy and biomass resources, and efficiently manage value chains. Furthermore, to ensure the successful development of the bioeconomy, standardized metrics for evaluating its achievements need to be implemented. These metrics should be harmonized at the international level, enabling better assessment of the progress and impact of the bioeconomy on sustainable economic development. Establishing unified measurement criteria will allow for the integration of efforts across countries and ensure the achievement of environmental and economic goals on a global scale.

Discussion. The development of the global bioeconomy demonstrates significant potential in achieving sustainable development goals. However, the effectiveness of its implementation remains inconsistent due to varying approaches to the formulation and execution of strategies. In many countries, there is a tendency to develop documents that include numerous objectives without a clear hierarchy, leading to resource fragmentation and complicating coordination among participants. Instead of adopting an integrated approach to bioeconomy strategies, governments often focus on broad formulations and declarative statements, limiting the practical realization of these strategies. A key problem is the lack of clear action plans that include specific measures, deadlines, and designated responsible parties. As a result, many strategies remain at the conceptual level, without transitioning to the practical implementation phase.

At the same time, some countries with successful bioeconomy development plans highlight the importance of using a systemic approach that integrates economic, environmental, and social aspects. This approach enables synergy between policy priorities such as economic growth, social equality, and environmental stability. One

important factor is the disparity in the structure and level of detail of strategies among countries. For instance, more advanced plans include clearly defined implementation stages, designated responsible parties, and specific performance indicators, while others are limited to general intentions and approximate goals. This divergence in approaches complicates international coordination efforts in the bioeconomy sector.

Thus, the further success of bioeconomy projects depends on a systematic approach to strategy formulation, their detailed development, and integration into national and international development programs. Particular attention should be paid to ethical aspects that ensure a balanced approach to resource utilization while taking into account the interests of future generations.

Conclusions. The results of the study demonstrate that the bioeconomy is an innovative approach to transforming modern economic systems, harmoniously combining economic, environmental, and social components to achieve sustainable development. The foundational principles underlying the bioeconomy include improving resource efficiency, maintaining ecological balance, ensuring economic resilience, and promoting social equity. An analysis of contemporary bioeconomy strategies reveals that they often encompass a wide range of objectives lacking clear prioritization, which significantly complicates their implementation. To overcome this barrier, alignment between national policies and international standards is essential, along with the development of structured action plans that include detailed measures, established timelines, and specific responsible parties.

The role of the bioeconomy in Ukraine's post-war reconstruction processes is critical, as it holds significant potential for fostering economic development, environmental restoration, and social support. Integrating bioeconomic principles into reconstruction processes ensures the rational use of biological resources, stimulates the adoption of innovative technologies, and promotes job creation in regions that have suffered considerable losses. Additionally, the prospects for implementing the bioeconomy based on innovative biotechnologies were assessed. These technologies optimize the use of natural resources, reduce CO_2 emissions, and facilitate the production of environmentally friendly products. The study's findings confirm that the bioeconomy can become a key factor in restoring natural ecosystems and ensuring stable economic growth.

Author contributions. The authors contributed equally.

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