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PRIORITY DIRECTIONS FOR FORMING ECOLOGICALLY ORIENTED MANAGEMENT IN CONSTRUCTION INDUSTRY ENTERPRISES

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Abstract. This article examines the theoretical and methodological foundations, practical necessity, and priority directions for the formation of ecologically oriented management in construction industry enterprises. In the context of the growing environmental impact of industrial and construction enterprises, the rational use of natural resources, waste reduction, environmental safety assurance, and improvement of economic efficiency are considered urgent issues. The study employs methods of systematic analysis, comparative analysis, grouping and classification, statistical analysis, PESTEL analysis, as well as ecological-economic approaches. The article analyzes the scientific views of foreign and CIS scholars regarding the concept of environmental management and highlights the specific features of implementing environmental management systems in enterprises, the significance of ISO 14001 and EMAS standards, and the possibilities of applying environmental audit, monitoring, and green technologies. In addition, based on the trends in waste volume growth in the Republic of Uzbekistan during 2015–2024, the necessity of improving environmental management mechanisms in the construction industry is substantiated.

Keywords: environmental management, construction industry, green technologies, sustainable development, ISO 14001, environmental audit, waste management, PESTEL analysis, resource efficiency, environmental culture.

Аннотация. В данной статье исследуются теоретико-методологические основы, практическая необходимость и приоритетные направления формирования экологически ориентированного управления на предприятиях строительной отрасли. В условиях усиления воздействия промышленных и строительных предприятий на окружающую среду рациональное использование природных ресурсов, сокращение объёмов отходов, обеспечение экологической безопасности и повышение экономической эффективности предприятий рассматриваются как актуальные задачи. В исследовании использованы методы системного анализа, сравнительного анализа, группировки и классификации, статистического анализа, PESTEL-анализа, а также эколого-экономические подходы. В статье проанализированы научные взгляды зарубежных и СНГ-учёных на концепцию экологического менеджмента, раскрыты особенности внедрения систем экологического управления на предприятиях, значение стандартов ISO 14001 и EMAS, а также возможности применения экологического аудита, мониторинга и зелёных технологий. Кроме того, на основе тенденций роста объёмов отходов в Республике Узбекистан за 2015–2024 годы обоснована необходимость совершенствования механизмов экологического управления в строительной отрасли.

Ключевые слова: экологический менеджмент, строительная отрасль, зелёные технологии, устойчивое развитие, ISO 14001, экологический аудит, управление отходами, PESTEL-анализ, ресурсоэффективность, экологическая культура.

Annotatsiya. Mazkur maqolada qurilish sanoati korxonalarida ekologik yo‘naltirilgan boshqaruvni shakllantirishning nazariy-metodologik asoslari, amaliy zarurati hamda ustuvor yo‘nalishlari tadqiq etilgan. Sanoat va qurilish korxonalarining atrof-muhitga ta‘siri kuchayib borayotgan sharoitda tabiiy resurslardan oqilona foydalanish, chiqindilar hajmini kamaytirish, ekologik xavfsizlikni ta‘minlash hamda korxonalar iqtisodiy samaradorligini oshirish dolzarb masala sifatida qaraladi. Tadqiqotda tizimli tahlil, qiyosiy tahlil, guruhlash va tasniflash, statistik tahlil, PESTEL-tahlil hamda ekologik-iqtisodiy yondashuv usullaridan foydalanilgan. Maqolada xorijiy va MDH olimlarining ekologik menejment konsepsiyasiga oid ilmiy qarashlari tahlil qilingan, korxonalarda ekologik boshqaruv tizimlarini joriy etishning o‘ziga xos jihatlari, ISO 14001 va EMAS standartlarining ahamiyati, shuningdek, ekologik audit, monitoring va “yashil” texnologiyalarni qo‘llash imkoniyatlari yoritilgan. Bundan tashqari, O‘zbekiston Respublikasida 2015–2024-yillar davomida chiqindilar hajmi o‘sishi tendensiyalari asosida qurilish sanoatida ekologik boshqaruv mexanizmlarini takomillashtirish zarurati asoslab berilgan.

Kalit so‘zlar: ekologik menejment, qurilish sanoati, yashil texnologiyalar, barqaror rivojlanish, ISO 14001, ekologik audit, chiqindilarni boshqarish, PESTEL-tahlil, resurs samaradorligi, ekologik madaniyat.

INTRODUCTION

Today, the rapid development of the industrial and construction sectors serves not only as an important factor of economic growth but also as a key driver for improving environmental sustainability mechanisms. In particular, the extensive use of natural resources, high levels of raw material and energy consumption, as well as the growth of industrial and construction waste generated by construction industry enterprises, increase the importance of enhancing environmental management systems. In this regard, the formation of ecologically oriented management in enterprise economics should be based on the principles of sustainable development. Particular attention should therefore be paid to harmonizing production activities with environmental protection requirements, minimizing environmental risks, recycling waste, improving energy efficiency, and ensuring the long-term competitiveness of enterprises.

In the context of Uzbekistan, the necessity of establishing environmental management systems in construction industry enterprises is determined by several important factors. First, urbanization processes and the scale of construction activities are expanding steadily throughout the country. Second, the volume of industrial and household waste is increasing, which requires the implementation of modern waste management approaches. Third, environmental requirements, international standards, and state policies aimed at transitioning toward a green economy encourage enterprises to strengthen their environmental responsibility and introduce innovative management mechanisms. Therefore, the formation of ecologically oriented management in construction industry enterprises represents an important prerequisite not only for ensuring environmental safety, but also for increasing economic efficiency and achieving sustainable development goals [1].

LITERATURE REVIEW

The concept of environmental management is interpreted differently in foreign, CIS, and local scientific literature. Western scholars primarily regard environmental management as a process aimed at regulating and minimizing the impact of human activity on the environment. Yang, Yang, and Peng define environmental management as a practice focused on reducing the environmental impact of enterprises, organizations, and products throughout their entire life cycle [2]. This approach interprets environmental management as a practical and results-oriented system directly connected with production processes. Carter and Ross, in turn, characterize environmental management not as the direct control of nature, but as the process of regulating interactions between humans and the environment [3]. This approach emphasizes that human activity constitutes the primary source of environmental challenges. Therefore, environmental management is associated with the rational organization of enterprise activities, the efficient use of resources, and the coordination of production processes in accordance with environmental requirements.

Mensah and Blankson propose a broader socio-economic approach to environmental management. In their view, environmental management represents a process through which organizations develop and implement priority measures for the preservation, protection, and sustainable development of natural resources and ecosystems in line with societal goals and values [4]. This definition presents environmental management not merely as a technical or ecological control mechanism, but also as an integrated management system that combines social responsibility, economic interests, and sustainable development principles. Baker, Cohanier, and Gibassier interpret environmental management systems as important instruments that support organizations in achieving sustainable development goals [5]. The international ISO 14001 standard also defines environmental management as a system aimed at regulating human activity, ensuring resource conservation, and preventing environmental pollution. This standard serves as an important methodological basis for the development of environmental policy in enterprises, the establishment of environmental objectives and indicators, and the organization of monitoring and audit processes.

CIS scholars have likewise made a significant contribution to the theory of environmental management. N.F. Reimers defines environmental management as a management process aimed at regulating the relationship between society and nature, ensuring environmental safety, and achieving sustainable development [6]. V.I. Danilov-Danilyan interprets environmental management as a form of managerial activity implemented through economic, legal, and organizational methods in the sphere of environmental protection and natural resource use [7]. A.P. Butorin considers environmental management to be a system of purposeful actions undertaken by state institutions, business entities, and society to ensure the rational use of natural resources and environmental protection [8]. G.A. Yablokov interprets environmental management as a decision-making and implementation system directed toward preserving ecological balance and biodiversity [9]. I.T. Balabanov, in turn, views environmental management as an integral component of an enterprise's overall management system and defines it as a process aimed at minimizing the environmental impact of production activities [10].

Summarizing the above-mentioned scientific approaches, environmental management in construction

industry enterprises can be defined as a systematic management process that integrates economic efficiency, environmental safety, resource efficiency, and sustainable development principles. This approach directs enterprise activities not only toward achieving production results, but also toward ensuring environmental responsibility, social sustainability, and long-term competitiveness.

RESEARCH METHODOLOGY

The research methodology was developed on the basis of a systematic and comprehensive approach to the formation of ecologically oriented management in construction industry enterprises. Within the framework of the study, environmental management is considered an integral component of enterprise economic activity. The method of systematic analysis was employed to examine the interrelationship among the economic, social, environmental, and institutional aspects of environmental management. The comparative analysis method was applied to evaluate foreign and national experience, as well as to compare environmental management standards and enterprise management approaches. In addition, the methods of grouping and classification made it possible to systematize the stages of environmental management, the factors influencing enterprise activity, and the priority directions for further development.

Statistical analysis was used to assess trends in waste generation volumes in the Republic of Uzbekistan during 2015–2024. PESTEL analysis was applied to identify the political, economic, social, technological, environmental, and legal factors influencing environmental management in construction industry enterprises. Furthermore, the ecological-economic approach enabled an analysis of the interrelationship among waste volumes, environmental expenditures, green technologies, environmental audit practices, and enterprise competitiveness [11].

ANALYSIS AND RESULTS

The introduction of an environmental management system in construction industry enterprises primarily requires its integration with the overall economic activity of the enterprise. Environmental protection measures can achieve the expected effectiveness only when they become an integral component of production and management processes. From this perspective, the key features of an environmental management system include integration with enterprise management, compliance with environmental standards and regulations, effective management of environmental costs, the implementation of green technologies, the enhancement of employees' environmental culture, cooperation with the public and stakeholders, as well as the establishment of continuous monitoring and control mechanisms (Figure 1).

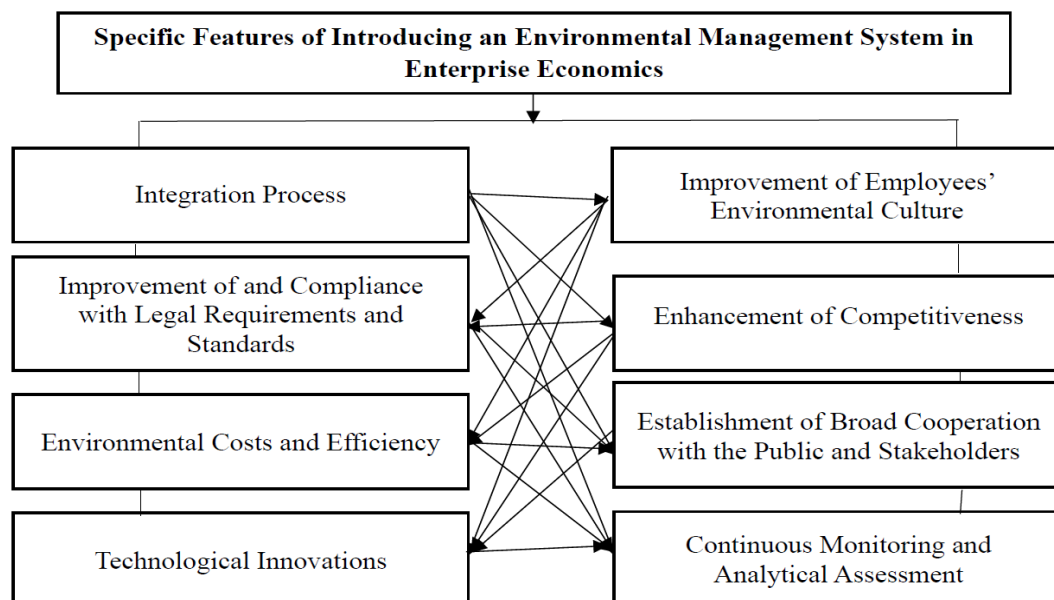


Figure 1. Specific Features of Introducing an Environmental Management System in Enterprise Economics

Ensuring that enterprise activities comply with national and international environmental requirements, as well as with systems such as ISO 14001 and EMAS, is of significant importance. The ISO 14001 standard provides a methodological framework for organizing environmental management systems based on the

stages of planning, implementation, monitoring, evaluation, and continuous improvement. EMAS, in turn, is aimed at enhancing environmental management and audit processes, ensuring the transparent disclosure of environmental indicators, and strengthening the environmental responsibility of enterprises (Table 1).

Table 1
Data on the Types of Waste Generated in the Republic of Uzbekistan

Indicators	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average Growth Coefficient
Household waste (tons)	6,793,927.5	6,914,990.7	7,034,389.5	7,151,204.1	7,282,954.5	7,425,238.8	7,568,399.1	7,724,414.7	10,124,798.1	14,793,318.5	1.07
Industrial waste (tons)	3,736,158.7	1,404,013.6	7,883,261.6	9,158,669.8	108,606,270.0	125,647,171.4	122,755,528.4	109,580,000.0	110,743,422.0	105,775,505.5	1.02
Construction waste (tons)	0	0	0	0	0	0	659,000	1,141,220	2,118,523	2,043,155	1.27
Medical waste (tons)	0	0	0	0	0	0	75,000	75,000	75,000	90,000	1.04

Introducing an environmental management system makes it possible to ensure the rational management of environmental costs and improve overall economic efficiency. Reducing waste volumes, ensuring the efficient use of natural resources, increasing energy efficiency, and implementing environmentally friendly technologies contribute to the optimization of production costs. In the long term, these measures strengthen the financial stability of enterprises and enhance their competitiveness in the market.

Changes in waste volumes in the Republic of Uzbekistan during 2015–2024 indicate the growing importance of improving environmental management mechanisms. Household waste amounted to 6.79 million tons in 2015 and reached 14.79 million tons in 2024. This growth is associated with urbanization processes, population growth, and the expansion of consumption. Industrial waste remained relatively stable during 2015–2018; however, a significant increase has been observed since 2019. In particular, industrial waste amounted to 108.6 million tons in 2019 and increased to 125.6 million tons in 2020. These indicators demonstrate the expansion of industrial production and emphasize the necessity of further developing waste minimization and resource-efficient technologies.

Construction waste began to be officially recorded from 2021 and exceeded 2 million tons by 2024. This trend highlights the importance of introducing environmental management systems in construction industry enterprises, as well as strengthening mechanisms related to the recycling of construction materials, waste sorting, and environmentally safe utilization processes [12] (Table 2).

Table 2
Main Features of Introducing an Environmental Management System in Construction Industry Enterprises

No	Feature	Content
1	Integration	Integration of environmental management with the overall economic activity of the enterprise
2	Compliance with standards	Fulfillment of ISO 14001, EMAS, and national environmental requirements
3	Management of environmental costs	Reduction of waste and efficient utilization of resources
4	Technological innovations	Introduction of green technologies, recycling systems, and energy-saving methods
5	Environmental culture	Improvement of employees' environmental awareness and responsibility
6	Cooperation with the public	Transparent exchange of information and cooperation with stakeholders
7	Monitoring and audit	Continuous assessment, control, and improvement of environmental performance

The development of environmental management in enterprises occurs through several interconnected stages. The first stage is compliance-oriented management, which is primarily aimed at meeting established environmental requirements. At this stage, enterprises are generally limited to complying with state environmental standards and carrying out waste treatment at the final stage of the production process. The second stage is preventive management, which focuses on pollution prevention, waste reduction, and the introduction of

internal environmental audit and environmental accounting systems. The third stage is strategic environmental management, characterized by the implementation of environmental marketing, external environmental audit, environmental certification, and product life cycle management. The fourth stage is sustainable development management, in which enterprises integrate environmental, economic, and social objectives into a unified strategic management system [13].

The analysis demonstrates that the formation of ecologically oriented management in construction industry enterprises includes several priority directions. The first direction involves environmental protection and the efficient use of natural resources. Since raw materials, water, energy, and land resources are extensively utilized in the construction industry, the implementation of resource-saving technologies represents a key prerequisite for effective environmental management.

The second priority direction is the introduction of green technologies. This includes the use of energy-efficient equipment, renewable energy sources, water-saving technologies, environmentally friendly construction materials, and low-waste production methods. The third direction is the improvement of waste management and recycling systems. Through the sorting, recycling, and secondary use of construction waste, enterprises can reduce operational costs and minimize environmental impact.

The fourth direction involves the formation of sustainable production and environmentally oriented product design. During the design of construction materials and products, attention should be paid to recyclability, energy efficiency, environmental safety, and environmental impact throughout the entire product life cycle. The fifth direction is the development of environmental culture within enterprises, which requires improving employees' environmental knowledge, organizing specialized training programs, and strengthening environmental responsibility as an important corporate value (Table 3).

Table 3

Classification of Enterprise Management Formation Depending on the Features of State Environmental Policy

Type of management	Enterprise activity	Features of state environmental policy
1. Compliance-oriented management (Passive enterprise)	Waste treatment, utilization, and disposal at the final stage of the production-technological cycle; implementation of measures aimed at reducing pollution; fulfilment of external environmental reporting requirements; establishment of environmental service units; adoption of emergency environmental measures.	State environmental control; establishment of effective environmental standards considering technological and financial capabilities; consideration of sector-specific production characteristics; advance notification regarding the tightening of environmental standards and mandatory enforcement measures.
2. Preventive management (Efficient enterprise)	Internal environmental audit; prevention of pollution through technological modernization and replacement of raw materials; waste minimization; reduction of product energy consumption and physical pollution levels; informing the public about environmentally significant decisions; establishment of environmental accounting systems; managerial responsibility for environmental compliance.	Legislative initiatives aimed at increasing the responsibility of managers and enterprises; integration into regional waste management systems; obligation to disclose environmentally significant information; development of energy-saving and environmental taxation programs.

<p>3. Strategic environmental management (Environmental management concept)</p>	<p>Development of environmental marketing; establishment of dialogue with the public and consumers; external environmental audit; implementation of environmental certification programs; disclosure of environmental information; creation of product life cycle and utilization systems; consideration of environmental requirements in investment projects.</p>	<p>Development of regulatory and legal frameworks; establishment of state environmental labeling programs; support for environmental initiatives; optimization of raw material and product flow management; development of local environmental management mechanisms.</p>
<p>4. Sustainable development management (Active enterprise)</p>	<p>Integration of sustainable development principles into enterprise missions; recognition of the enterprise's role in resource and energy flows; compliance with environmentally responsible and ethical business practices; adherence to international environmental efficiency standards; reflection of sustainable development principles in enterprise reporting; implementation of international environmental audits.</p>	<p>Dissemination of environmental information at the international level; harmonization of international environmental norms, standards, and taxation systems; support for international initiatives related to environmental safety, public health, climate policy, and sustainable development.</p>

Based on the PESTEL analysis, the factors influencing environmental management can be classified into several interconnected groups. Political factors are associated with the state policy aimed at transitioning toward a green economy, strengthening environmental control mechanisms, and introducing environmental standards and regulatory programs. Economic factors include environmental costs, state subsidies, green investments, environmental fines, and the economic efficiency achieved through the implementation of energy-saving technologies.

Social factors are related to increasing public attention to environmental issues, consumer trust in environmentally responsible enterprises, and the development of employees' environmental culture. Technological factors include the implementation of green technologies, waste recycling systems, digital environmental monitoring systems, and environmental audit tools. Environmental factors are associated with the depletion of natural resources, the growth of waste volumes, environmental pollution, and the intensification of environmental risks. Legal factors include environmental legislation, certification requirements, international standards such as ISO 14001 and EMAS, sanctions, and environmental reporting systems [14] (Table 4).

Table 4
Factors Influencing Environmental Management Based on PESTEL Analysis

Factors	Direction of impact
Political	Transition toward a green economy, strengthening environmental control, and implementation of state environmental programs
Economic	Environmental costs, subsidies, green investments, and environmental fines
Social	Public environmental pressure, environmental culture, and consumer demands
Technological	Green technologies, environmental monitoring systems, and recycling technologies
Environmental	Growth in waste volumes, scarcity of natural resources, and environmental risks
Legal	Environmental legislation, ISO 14001, EMAS, and certification requirements

The results of the discussion demonstrate that the effective development of environmental management in construction industry enterprises requires strong coherence between state environmental policy and enterprise strategy. In this regard, it is important for the state to expand environmental incentive mechanisms, while enterprises should integrate environmental responsibility into their overall production and development strategies [15].

CONCLUSION AND RECOMMENDATIONS

The formation of ecologically oriented management in construction industry enterprises is currently regarded as an important prerequisite for ensuring economic efficiency, environmental safety, and sustainable development. The results of the study demonstrate that environmental management should not be considered a separate element of enterprise activity, but rather an integral process closely interconnected with the overall management system of the enterprise, its production strategy, financial stability, and market competitiveness. The growing volume of waste in the Republic of Uzbekistan, particularly the increase in household, industrial, and construction waste, further emphasizes the necessity of improving environmental management mechanisms in construction industry enterprises. The introduction of an environmental management system enables enterprises to ensure the rational use of natural resources, reduce waste volumes, improve energy efficiency, optimize environmental costs, and strengthen their competitive position in the market.

The findings of the study also indicate the importance of gradually implementing ISO 14001-based environmental management systems in construction industry enterprises, strengthening environmental audit and continuous monitoring mechanisms, expanding economic incentive systems for waste recycling and utilization, and introducing green technologies together with energy-efficient production methods. In addition, special attention should be paid to improving employees' environmental culture through specialized training programs, developing effective systems for managing environmental costs and evaluating the efficiency of environmental investments, as well as strengthening coherence between state environmental policy and enterprise development strategies.

Overall, the formation of ecologically oriented management in construction industry enterprises represents a strategic management direction that harmoniously integrates environmental responsibility, economic interests, and social sustainability. This approach contributes to ensuring the long-term sustainability of enterprise activities, accelerating the transition toward a green economy, and supporting the development of environmentally safe and sustainable industry within the country.

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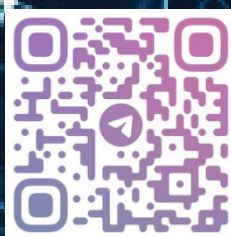
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