



ECONOMIC AND ECOLOGICALLY CLEAN TECHNOLOGIES IN CONSTRUCTION AND ISSUES OF THEIR DEVELOPMENT

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Abstract. *This article analyzes the need to introduce economical and environmentally friendly technologies in the construction sector, their economic and environmental efficiency, as well as the reforms being carried out in this direction in Uzbekistan. The advantages of using “green technologies” in processes such as the production of building materials, the construction of buildings and structures, energy efficiency, waste reduction and recycling are shown. The article also analyzes existing problems, including financial, technical, regulatory, legal and personnel-related restrictions, and develops practical recommendations for their elimination.*

Keywords: *green construction, environmentally friendly technologies, energy efficiency, resource efficiency, sustainable development, building materials, waste-free production, renewable energy, carbon neutrality, innovative technologies.*

Introduction and relevance of the topic

In recent years, global environmental problems, climate change and depletion of natural resources have required new approaches in the construction sector. Given that buildings and structures consume up to 40% of energy, and more than 30% of waste comes from construction, this sector is one of the main sources of environmental pollution.

Documents such as the “Strategy for the Transition to a Green Economy” (2019–2030), “Concept for the Development of the Building Materials Industry” and “Carbon Neutral Development Strategy - 2050”, adopted at the initiative of the

President of the Republic of Uzbekistan, have created a legal basis for the introduction of an environmentally sustainable approach in this area.

If we analyze the construction sector from the perspective of compliance with the above legal framework and global and national strategies, the following are of particular importance:

Compatibility with global climate and national strategies:

The world community has set ambitious goals for climate change and reducing carbon emissions (Paris Agreement and other initiatives). Since the construction sector is responsible for a large part of the world's energy consumption and emissions (energy consumption of buildings, production of materials), this sector is of great importance in implementing the country's climate policy;

The strategy of Uzbekistan for the "transition to a green economy" and other national documents (energy efficiency, carbon neutrality goals) require the introduction of energy-efficient and environmentally friendly technologies in the construction sector.

Economic efficiency and energy independence:

Energy-efficient buildings and renewable energy (solar, PV, BESS, etc.) significantly reduce construction costs and operating costs. This economically contributes to a faster return on investment and macroeconomic stability;

Local production and the introduction of modern technologies can increase export potential and reduce dependence on imported raw materials.

Health and social and quality of life:

Buildings built with economical, well-insulated and environmentally friendly materials improve the indoor microclimate, improve the health and quality of life of the population. Such structures reduce social costs in the long term.

Green jobs and innovative development:

The development of green technologies increases the demand for new professions and services, as well as for training and scientific research. This allows for the formation of new sectors of the economy.

Waste reduction and resource efficiency:

A large part of construction waste, when mismanaged, causes serious damage to the environment. Recycling, modular principles and resource-saving technologies significantly reduce this burden.

International investment and certification incentives:

International financial institutions (WB, EBRD, ADB, etc.) direct investments to green projects and standards. If green certification is introduced at the national level, the possibility of external financing for projects will increase.

Technological innovation and competitiveness:

A construction sector that meets the requirements of the global market and international standards makes the country competitive. Innovative materials and digital management (BIM, IoT, AI) save resources and time, and increase quality.

The above factors together mean that the introduction of economical and environmentally friendly technologies in construction is not only an environmental obligation, but also a necessity based on economic, social and strategic interests. In the context of Uzbekistan, this direction is also of particular importance in terms of national strategies, attracting investment and improving the quality of life of the population.

Therefore, the use of economical and environmentally friendly technologies in construction is an important factor not only in increasing economic efficiency, but also in ensuring environmental safety, social responsibility and development in accordance with international standards.

Analysis of the current state of the construction industry. The construction sector of Uzbekistan accounts for about 6-7 percent of the country's gross domestic product (GDP) and has an average annual growth rate of 8-10 percent. In recent years,

large infrastructure projects, housing construction, tourism and the construction of industrial facilities have been developing rapidly.

However, along with this development, environmental pressure is also increasing. Factors such as excessive use of coal and cement in the production of building materials, insufficient introduction of energy-saving technologies, and poor waste recycling remain relevant as problems.

According to the latest data:

More than 70% of the energy used in construction is spent on heat generation;

Up to 60% of new housing is built without thermal insulation;

Only 10–15% of construction waste is recycled;

The “green certificate” system has not yet been fully implemented.

Existing problems in the construction sector can be divided into the following groups:

Technological problems - the production of energy-efficient building materials and the introduction of certified technologies are slow.

Financial problems - the use of “green technologies” initially requires high investment, which is an obstacle for the private sector.

Legal and regulatory constraints - environmental standards and the “green building code” have not been fully developed.

Human resource capacity - there is insufficient knowledge and skills in ecological design among engineers, architects and designers.

Weak monitoring system - environmental control mechanisms during the construction process do not work effectively.

Based on the above, it is appropriate to make the following proposals and recommendations to eliminate the problems arising in the industry:

Develop a green building code and introduce a national certification system based on international standards (LEED, BREEAM).

Expanding the mechanism of green loans and subsidies - financial incentives for energy-efficient projects.

Localizing the production of innovative materials (nanoinsulation, composite panels, roof systems integrated with solar panels).

Creating an infrastructure for recycling construction waste, introducing production systems based on the principle of "zero waste".

Expanding the directions of "Green Engineering" and "Sustainable Construction Technologies" in the vocational education system.

Creating ecological construction clusters based on public-private partnerships.

Real-time monitoring of resource consumption using digital technologies (BIM, IoT, AI).

Conclusion. The widespread introduction of economical and environmentally friendly technologies in construction plays an important role in Uzbekistan's sustainable development strategy. Success in this area will allow strengthening the country's energy independence, reducing the harmful impact on the environment, and adapting to international "green economy" standards.

The environmentally sustainable construction model will help establish Uzbekistan as a "green technology center" in the region, create new jobs, and increase investment attractiveness.

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