THE NATIONAL PROSPECTS FOR INCREASING INNOVATIVE APPROACHES TO IMPROVING BUILDING ENERGY EFFICIENCY

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Abstract: *This article explores the critical environmental challenges posed by increasing global energy consumption driven by population growth and economic development. It highlights the importance of energy conservation and efficiency improvements in mitigating issues such as ozone depletion, atmospheric pollution, and ecological imbalance. The discussion covers recent innovations in building materials and engineering systems designed to enhance energy efficiency, including ecological considerations and advanced technologies like insulation, efficient ventilation, and smart energy assessment methods. The article reviews Uzbekistan's national initiatives—such as compliance with the Paris Agreement, government regulations, and pilot projects on energy-efficient housing—including the construction of low-carbon rural houses with thermal insulation and renewable energy integrations like photovoltaic panels. The overall focus underscores the vital role of modern, energy-efficient construction practices in promoting sustainable development and reducing environmental impacts.*

Key word: *ozone layer, decay, atmosphere, acid, ecological , energy efficient, aerated concrete blocks, isitish for a year, statistical analytical calculations, energy consumption, environmental indicators, engineering systems, model modeling.*

НАЦИОНАЛЬНЫЕ ПЕРСПЕКТИВЫ ВНЕДРЕНИЯ ИННОВАЦИОННЫХ ПОДХОДОВ К ПОВЫШЕНИЮ ЭНЕРГОЭФФЕКТИВНОСТИ ЗДАНИЙ

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Аннотация: *В этой статье рассматриваются важнейшие экологические проблемы, возникающие в результате увеличения глобального потребления энергии, обусловленного ростом населения и экономическим развитием. В ней подчеркивается важность энергосбережения и повышения энергоэффективности для решения таких проблем, как разрушение озонового слоя, загрязнение атмосферы и*

экологический дисбаланс. Участники обсуждают последние инновации в области строительных материалов и инженерных систем, направленных на повышение энергоэффективности, включая экологические аспекты и передовые технологии, такие как изоляция, эффективная вентиляция и интеллектуальные методы оценки энергопотребления. В статье рассматриваются национальные инициативы Узбекистана, такие как соблюдение Парижского соглашения, постановления правительства и пилотные проекты по энергоэффективному жилищному строительству, включая строительство сельских домов с низким уровнем выбросов углерода, теплоизоляцией и использованием возобновляемых источников энергии, таких как фотоэлектрические панели. Общая направленность проекта подчеркивает жизненно важную роль современных, энергоэффективных методов строительства в содействии устойчивому развитию и снижению воздействия на окружающую среду.

Ключевые слова: *озоновый слой, разложение, атмосфера, кислота, экология, энергоэффективность, газобетонные блоки, износ за год, статистические аналитические расчеты, энергопотребление, экологические показатели, инженерные системы, модельное моделирование.*

As is known, the growth of the population on Earth and economic development lead to increased consumption of energy resources, higher demand and prices for them. At the same time, this situation results in the depletion of the ozone layer, pollution of the atmosphere with acidic residues, the formation of secondary chemical reactions in all layers of the biosphere, and the emergence of toxic substances; pollution of oceans, surface waters of land reservoirs, and groundwater; disruption of global and regional ecological balance, and other global environmental problems. Therefore, the importance of energy conservation and efficiency is continuously increasing. Countries are approaching work in this area with different strategies and methods. Some changes are ignored, while others are successfully implemented in production. Similar situations occurred in the past with energy-saving window profiles, which are now widely used in construction. Sometimes, these profiles are still installed in factory-made panels, which can lead to improper installation and, consequently, heat loss.

Interestingly, in recent years, the idea of considering ecological indicators in the process of evaluating building energy efficiency has been discussed. For example, many companies are replacing lead stabilizers in window profiles with safer materials. Materials used in construction play a crucial role in increasing energy efficiency. For instance, modern foam concrete blocks allow for the very precise joining of elements, which reduces heat loss through combined compounds. Additionally, a special adhesive has recently been introduced, which minimizes any heat loss during application. In many cases, this loss is reduced to zero.

Innovative changes often affect the engineering systems of buildings as well, primarily ventilation and heating systems. However, recently, lifts are also being evaluated for energy efficiency, as it has been proven that energy losses in such equipment can reach 15%. Experts recommend assessing lifts after installation in the building, rather than during manufacturing, to ensure data accuracy.

I would also like to emphasize that ideas related to energy efficiency are very popular. If we talk about the residential sector, modern apartments built on advanced technology are in high demand among buyers. Accordingly, integrated technologies aimed at improving energy efficiency are widely applied and are anticipated to become a priority in government construction policies.

An energy-efficient house is a building that combines minimal energy consumption with comfortable microclimate conditions. Such houses can save up to 90% of energy.

The annual heating requirement for an energy-efficient house can be less than 15 kVt per square meter. For example, the most common design of a private house today (reinforced concrete foundation, "warm floor" system without insulation, cement-plastered 1.5-brick walls, standard metal-plastic windows, roof insulation of 150 mm, and unventilated heating) consumes about

110-130 kVt/year per square meter for heating, including heat loss and ventilation.

Buildings constructed according to modern energy efficiency standards can save 40-70% of utility bills. Large amounts of energy and resources are also conserved. At the same time, the temperature, overall microclimate, and humidity levels of air are maintained at more favorable levels than usual, which can be controlled by the homeowner.

Today, the four most popular methods for evaluating building energy efficiency are as follows:

Short-term measurement method: This involves one or two readings of modernized engineering equipment during a single measurement session. The readings of other systems are analyzed based on general statistical data. Results compare the new and old models to determine the building's energy efficiency class.

Continuous measurement method: Here, the engineer takes regular readings of the modernized equipment's performance over a certain period. The readings of older systems are analyzed similarly, helping identify deficiencies and optimize system improvements.

Analysis of equipment readings inside the building: Usually a long-term process involving continuous recording of all equipment usage, allowing for analytical conclusions and issuance of an energy efficiency certificate.

Calculation and experimental method: A modern approach based on computer simulations and modeling of the building's energy profile; these analyses are typically performed for the entire building.

In our country, activities in this direction are also being carried out at a high level. For example, more than three years have passed since the signing of the Paris Agreement on climate change. This international document was signed almost simultaneously with the approval of a joint project between the Government of Uzbekistan, the State Energy Committee, and the Ministry of

Construction for promoting and constructing energy-efficient and low-carbon rural houses and settlements. Work in this area has been successfully ongoing since 2017, and the initial high-quality results have set a positive direction for the entire project.

In accordance with the Decree No. 5577 issued by the President on November 14, 2018, titled "On Improving State Regulation in the Construction Sector," all residential construction under the "Affordable Housing for Rural Population" state program must adhere to new prototype projects developed within the project to ensure energy efficiency. By 2019, their number increased to over 12,000, and these structures primarily feature additional thermal insulation made from mineral wool (basalt fiber) that retains heat in winter and stays cool in summer, reducing energy consumption by about 30%.

Additionally, within the framework of our project, trials of green mortgage schemes were conducted in five regions of the country (Samarqand, Surxondaryo, Fergana, Khorezm, and Bukhara) to attract private investments into construction. The one-story, three-room houses are notable not only for external wall insulation but also for the installation of photovoltaic panels with a capacity of 300 Watts, as well as solar-powered water heaters with a capacity of 200 liters.

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