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Sustainable Architecture: Energy Efficiency and Environmental Well-Being of the Urban Environment

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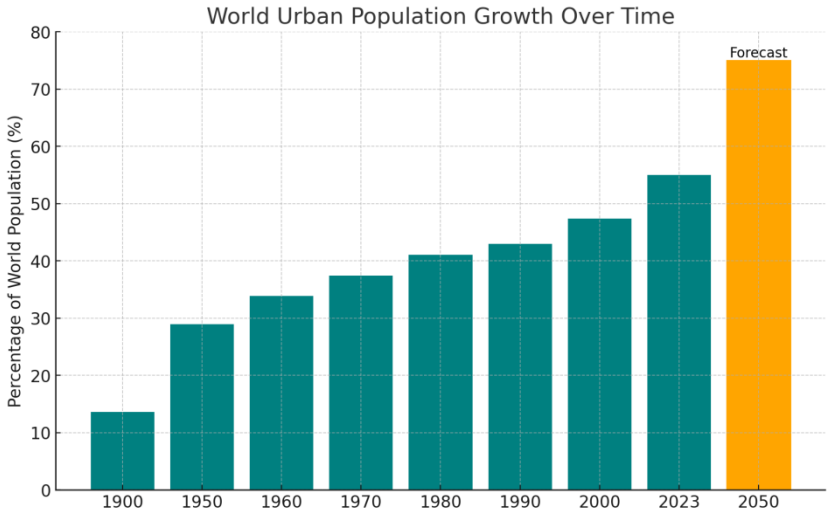
Abstract: The article examines approaches to sustainable development in architecture, energy efficiency in construction, green building and methods for ensuring environmental change in urban traffic and the relationship with the environment and maintenance of the development of urban housing stock.

Keywords: sustainable development in architecture, green architecture, green building, environmental infrastructure, energy efficiency, sustainable development, urban environment, residential and multifunctional complexes, efficient use of water, resource recycling, modern materials.

Urbanization processes have long influenced regions worldwide, with the share of the urban population continuing to rise. In fact, we live on a planet of large cities, in which the majority of the population is concentrated, so over the past hundred years, the growth of the population of large cities has been many times greater than the overall growth of the world's population. According to experts from UNEP (United Nations Environment Program), today about 55 percent of all the world's inhabitants live in cities, and according to forecasts, by 2050, 75 percent of the world's population will become city dwellers. Urbanization creates favorable conditions for the development of scientific and technological potential in large cities and agglomerations. This is expressed in the overall economic development and advancement of new technologies. However, the rapid increase in urban population not only opens up new opportunities but also exacerbates major urban issues, such as ecological and transport problems.



Sustainable development in architecture implies and provides for the creation of energy-efficient, environmentally friendly and cost-effective buildings and urban spaces that minimize the consumption of energy resources, contribute to a more rational use of urban spaces, reduce the load on transport infrastructure and, as a result, reduce the negative impact on the environment. This includes primarily the use of energy-efficient materials, technologies and construction methods, the use of renewable resources, reducing energy and water consumption, and creating comfortable and healthy spaces in which to live and work. The main goal of sustainable architecture is to achieve a balance between human needs and the capabilities of nature, ensuring the well-being of future generations. Sustainable architecture is often referred to as green architecture or ecological architecture, which attempts to minimize harmful impacts on ecosystems and communities.

According to calculations by WRI (World Resources Institute) specialists for 2020, the operation of commercial residential real estate is one of the significant consumers of energy resources with a total share of 17.5% of greenhouse gas emissions, while residential buildings account for 10.9%, and commercial 6.6%. This sector is comparable to such sectors of the world economy as: road construction, steel production, the agricultural sector and other production. Modern construction, as a high-tech sector of the economy, is currently

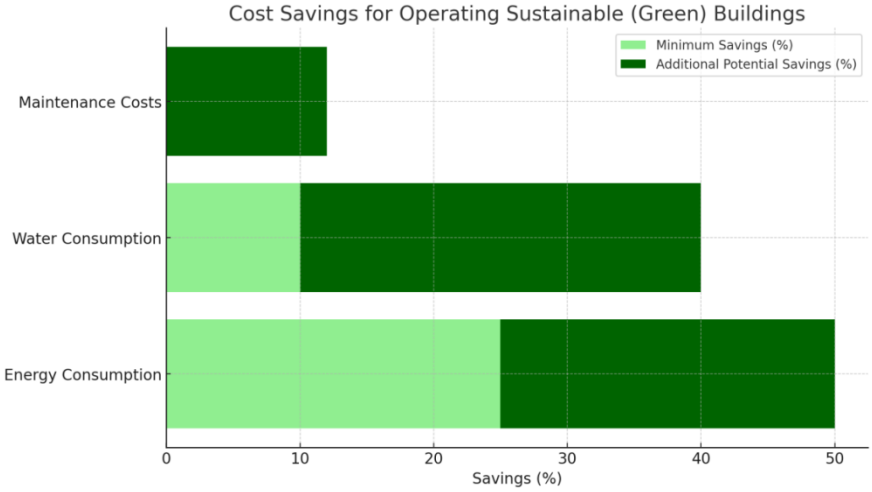
beginning to go beyond the simple construction of buildings and is changing course towards creating a comfortable, safe and energy-saving living environment: according to experts, the average annual growth rate of green construction can reach 14.3% until the year 2027. There is an increasing need to use environmentally friendly technologies in building design. Such technologies minimize the negative impact on the environment and human health, and also provide an increased level of comfort. They are based on the efficient and thoughtful use of technology, materials, energy, and space both inside a building and in its environment.

Sustainable Architecture Approach

The need to design buildings that can provide not only comfortable living, but also minimal impact on the environment has been steadily growing in recent years. Green building is always more expensive, but creates significant savings in the medium and long term on operating costs. Such buildings can save 25% to 50% in energy, 10% to 40% in water consumption, and reduce maintenance costs by approximately 12%. All of these factors combined can result in an estimated 19% reduction in operating costs and a 34% reduction in carbon emissions. Green building offers a range of approaches and technologies to create sustainable and healthy environments that are only becoming more important over time.

Leading countries in the world welcome and stimulate the development of sustainable architecture and are introducing special programs for standardizing energy efficiency classes of buildings, which makes it easier for construction market participants and material manufacturers to introduce new energy-efficient technologies and quality control programs for green buildings.

Cost savings for operating sustainable (green) buildings:



In the West, there are building energy efficiency standards such as BREEAM and LEED. Both standards are applied internationally and include a number of criteria for assessing buildings, such as energy savings, water savings, use of materials and indoor environmental quality.

LEED, developed by the U.S. Green Building Council, focuses on energy efficiency, innovation in building design and operation, and social aspects. BREEAM (Building Research Establishment Environmental Assessment Method) was developed and first implemented in the UK. This is one of the world's first systems for assessing the environmental friendliness and energy efficiency of buildings, created by the Building Research Establishment (BRE) in 1990. Since then, BREEAM has been used in many countries around the world, but its origins are in the UK.

In Russia, a national standard is used to assess the energy efficiency of buildings, based on energy efficiency classes from A (the highest level) to G (the lowest level). These classes are determined depending on the amount of energy consumption for heating, ventilation, hot water supply and lighting. The standard is aimed at reducing energy consumption and increasing the efficiency of use of energy resources in buildings.

- Energy efficiency involves reducing the dependence of buildings on energy produced from non-renewable sources. This includes installing solar panels and developing systems that promote natural light and ventilation.
- Efficient use of engineering resources, energy recovery is focused on reducing its consumption and optimizing consumption. This is accomplished through the use of modern engineering solutions, green roofs, the use of rainwater and modern plumbing systems, including low-flow faucets and drain systems.

- Recycling and reusing materials during the construction and operation of buildings helps reduce waste and ensures more efficient use of resources.
- Buildings that are harmoniously integrated into the environment take into account natural features and preserve their unique features. Compliance with the environment involves supporting natural landscapes, optimal insolation and creating favorable conditions for the surrounding nature.

Sustainable development in green building must meet people's needs and not harm future generations. This means creating an environment that provides high levels of comfort, safety and health for all its users, as well as minimizing negative impacts on the environment as a whole.

Ensuring the Environmental Well-Being of Urban Infrastructure Methods

Modern construction and urban development also require special attention to environmental and sustainability issues. This is important not only for preserving the environment, but also for creating comfortable living conditions for all city residents. Green methods and approaches to transport infrastructure contribute to the creation of a balanced environment in cities.

When developing urban systems and agglomerations, it is important to use sustainable design methods, which include designing infrastructure that minimizes environmental impact. Green infrastructure involves using natural processes to improve air quality and reduce the heat island effect. Infrastructural solutions need to be thought out comprehensively on the scale of the urban development strategy of the city, because solving transport problems of large cities is one of the key steps to achieve sustainable development in urban planning and architecture.

There are many great examples where sustainable building infrastructure includes green roofs, rain gardens, hot-weather glazing façades on the sunny side of the building, and permeable pavements. These approaches can be used to modernize existing infrastructure or be incorporated into new projects. Smart technologies improve the efficiency and sustainability of urban environments. Traffic lights are already reducing traffic jams and, as a result, emissions of pollutants and greenhouse gasses, and smart grids in many countries are helping to integrate renewable energy sources into the overall energy system.

Monitoring air quality, energy and water consumption helps monitor city infrastructure to ensure it performs at its best. Performance monitoring data can be used to identify areas that require modernization. Using natural solutions prevents negative impacts on the environment. For example, planting trees reduces air pollution, and the use of wetlands helps filter stormwater and restore natural ecosystems.

Conclusion

The main goal of sustainable architecture is to achieve a balance between human needs and the capabilities of nature, ensuring the efficient use of resources and the well-being of future generations. Many important steps have already been taken to achieve sustainable development in this direction and further decisions should be prepared comprehensively on the scale of urban development strategies, taking into account the socio-economic strategy, addressing transport challenges in long-term urban planning and architecture.

Sustainable architecture is an important tool for creating green and energy-efficient urban environments. Energy efficiency, reasonable use of resources, the use of modern environmentally friendly materials, as well as the harmonious development of urban spaces - all these are ways not only to reduce the negative impact on the environment, but also to create a comfortable space for living. It is important to create an environment that provides a high level of comfort, safety and health for all its users, while preserving natural resources and biodiversity. By implementing the above methods and approaches, cities can make infrastructure more comfortable and conducive to a sustainable future.

Reference:

[1]. UNEP (United Nations Environment Program) https://news.un.org/ru/story/2021/01/1393582)
[2]. Financial Benefits of Green Buildings – Are They Expensive?
[3]. WRI (World Resources Institute) (https://ourworldindata.org/ghg-emissions-by-sector)
[4]. The practice of green housing construction in Russia: problems and prospects, Innovation and investment (https://www.innovazia.ru)
[5]. Methods for ensuring the environmental well-being of urban infrastructure, International Center for Innovative Research (https://os-russia.com)
[6]. Practice of construction of multifunctional residential complexes in Russia and CIS countries. MP Group Architecture https://mpg-arch.com
[7]. Smart CRE (https://smart-cre.com)