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Analysis of current trends in the greening of urbanized territories

The article deals with the main aspects of greening and improving the quality and comfort in urbanized areas. Ecological problems are important for cities around the world. In the process of urbanization many environmental problems arise, including air, water and land pollution, lack of green spaces, loss of biological diversity, etc. The purpose of this article is to study the environmental problems related to urbanized areas and residential development and to identify effective methods for their solution. In particular, this article will consider practical application of modern standards of Green building, modern aspects of the introduction of energy-efficient technologies and issues of creating the recreational areas in urban areas.

Keywords: *ecologization, environmental problems, comfort of urbanized areas, “Green” building, environmental certification system, environmental protection, residential real estate*

Urban areas ecologization, as one of the goals of introduction the concept of sustainable development, is becoming an increasingly relevant and popular trend in urban development. However, the examples of real management solutions show the lack of a holistic view of the balance of interests as a method of solving the environmental problems of the city [1]. Therefore, some urban planning decisions implemented in recent years indicate the absence of a strategic vision of environmental consequences, although they fully characterize the priorities of economic considerations beyond common sense.

Based on data presented in Table, we can conclude that today, the amount of investments directed to environmental protection and the rational use of natural resources in the Russian Federation is constantly increasing, however, the problem of greening urban areas and improving the comfort of urban space remains the topical issue and requires an integrated approach, along with existing ones narrowly focused strategies in the sectoral aspect [2]. National projects in the field of ecology have a number of advantages that can significantly affect the quality of urbanized territories, the comfort of life of the population and nature conservation. For example, the National project “Ecology”, which includes national goals and strategic objectives for the environmental development

in Russia until 2024. The project will be financed not only from the federal budget, but also from large companies (in general, the project budget is estimated at more than 4.0 trillion rubles). This National Project is a government initiative intended to improve the environmental situation in the country. The national project “Ecology” includes a wide range of activities aimed at improving the environmental situation in the country [3]. It includes measures to protect the environment, improve water and air quality, reduce emissions of harmful substances, as well as increase the efficiency of energy use, its global goal is to change the impact on the environment by 2024 in 6 main areas: waste; fresh air; water and water bodies; biodiversity and ecotourism; forests; best available techniques (BAT), which should undergo significant changes by 2024. The national project “Ecology” includes 11 Federal Projects. For example, according to the concept developed in the Project, it is planned to reduce the negative impact on the environment through the construction and operation of 5 facilities for the thermal treatment of municipal solid waste (4 in the Moscow region and 1 in the Republic of Tatarstan) [4]. Based on the prognosis, these measures will reduce the volume of MSW disposal by 8 % by the end of 2023 on the territory of the Russian Federation, achieve “zero disposal” in Kazan with the simultaneous generation of

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Investments in fixed assets aimed at protecting the environment and rational use of natural resources in the Russian Federation

Investments aimed at environmental protection	Years				
	2017	2018	2019	2020	2021
Atmospheric air	60,199	65,475	70,250	69,560	130,300
Water resources	66,496	62,750	71,805	91,275	92,511
Land resources	10,216	10,011	12,158	15,303	47,473
Total	154,042	157,651	175,029	195,962	299,408

► electricity of 2.7 billion kW. hour a year. It is especially worth noting the result of reducing the priority environmental risks associated with objects of accumulated environmental damage, due to the elimination of 48 objects in 23 constituent entities of the Russian Federation, which will allow restoring 0.53664 thousand hectares of land by the end of 2025, as well as improving the environmental living conditions of the population in the amount of 5.63 million people — by the end of 2025 [5].

Today, one of the most urgent problems is the assessment of the ecological situation of urbanized territories [6]. This problem arose in connection with the development of industrial production, the extraction of a large amount of non-renewable raw materials, the creation of powerful energy sources, which leads to a decrease in environmental performance [1]. The task of improving the energy efficiency of residential development is one of the most essential today. The results of the analysis of current global trends show that the specific energy consumption per unit of products and services produced in Russia is several times higher than in most European countries. In this context, the "Energy Strategy of the Russian Federation for the period up to 2035" acquires special significance, in which the issues of energy saving and energy efficiency are considered as one of the main ones [7].

The priorities of the state energy policy of the Russian Federation are¹:

- improvement of living conditions for the population (at least 5 million families annually);
- increasing the availability of power grid infrastructure, reliability and quality of power supply to consumers to a level comparable with the best foreign analogues;
- development of gasification of the constituent entities of the Russian Federation, taking into account the peculiarities of regional fuel and energy balances;
- improving the efficiency of district heating systems, taking into account the priority of increasing the level of cogeneration.

The main tasks for environmental protection and climate change counteraction for the branches of the fuel and energy complex (FEC) are:

1. Reduction of the negative impact of the activities of fuel and energy companies on the environment.
2. Reducing the negative impact of the activities of fuel and energy companies on the climate and their adaptation to climate change [8].

In accordance with the "Energy Strategy of the Russian Federation for the period up to 2035", in order to solve the above tasks, the following activities are envisaged, the effectiveness of which is confirmed by the analytical data presented in Fig. 1.

1. Transition in the branches of the fuel and energy complex to the principles of the best available technologies.
2. Creation of a national system for monitoring and reporting on greenhouse gas emissions, including from energy facilities.
3. Taking into account the risks of changing climatic and hydrometeorological conditions in conjunction with the traditional financial and economic parameters in the feasibility study of projects and their implementation.
4. Active participation in the formation of international environmental legislation and its harmonization with the norms of the legislation of the Russian Federation.

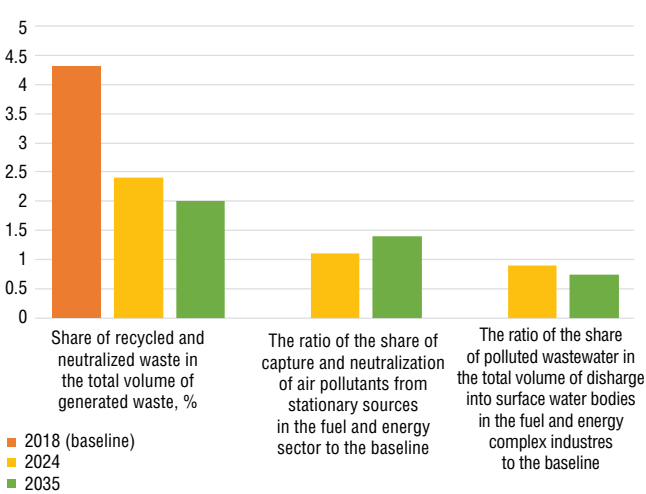


Fig. 1. Indicators of the implementation of the Energy Strategy of the Russian Federation for the period up to 2035

5. Stimulating the reduction of the generation of new and disposal of accumulated production wastes and ensuring their safe handling, carrying out land reclamation and other technical and organizational measures to compensate for damage caused to the environment, including an increase in the share of ash and slag waste involved in economic circulation.

6. Stimulation of scientific research and support for the development of promising technological solutions aimed at reducing the negative impact on the environment and minimizing environmental risks.

7. Implementation of state regulation of greenhouse gas emissions and other anthropogenic impact of the fuel and energy complex on the climate, taking into account the international obligations of the Russian Federation.

8. Implementation of the provisions of the Stockholm Convention on Persistent Organic Pollutants in the sectors of the fuel and energy complex (including the cleaning or disposal of equipment and waste containing persistent organic pollutants).

9. Ensuring openness and accessibility of environmental information, timely informing stakeholders about accidents, their environmental consequences and liquidation measures, strengthening interaction with public environmental organizations and movements.

Reducing the power consumption of residential buildings in cities and towns, industrial enterprises is a necessary condition for the greening of urbanized areas and the country's economy as a whole. By reducing the negative impact of the industries of the fuel and energy complex on the environment and adapting them to climate change, the Russian Federation will make a significant contribution to the transition to a low-carbon development of the world economy, to international efforts to preserve the environment and counteract climate change [9].

Green building is an industry that includes the construction of buildings and structures with minimal negative impact on the environment. The main objective of "green" construction is to reduce the level of consumption of resources (energy and material) throughout the entire life cycle of real estate [10].

At the same time, the main goal of "green" construction is to improve the quality of construction and the comfort of the internal

1 Draft Strategy for the development of the construction industry and housing and Communal services of the Russian Federation until 2030 with a forecast for the period up to 2035. URL: <https://www.minstroyrf.gov.ru/docs/18723>.

environment. This is achieved both by high-tech solutions (introduction of "green" technologies) and passive energy-efficient architecture solutions [11]. Reducing the negative impact on the environment and human health throughout the entire life cycle of a property can be achieved by:

- using of environmentally friendly building materials;
- efficient using of energy and water resources.

To assess the effectiveness of measures to reduce the harmful effects of buildings on the environment and human health in the world, there are many "green" standards, the main of which are Leadership in Energy and Environment Design (LEED) (USA), Building Research Establishment Environmental Assessment Method (BREEAM) (Great Britain), DGNB (Germany). Over the past few years, the BREEAM standard has been adopted in other countries, including Canada, Hong Kong and New Zealand.

Due to many political and economic problems, Russia is at the beginning of the path to the use of "green" technologies and ESG approaches, while the potential for their implementation by 2023 is estimated at 3 trillion rubles [12].

At the moment, more than a dozen different systems for environmental certification of real estate objects have been developed and are actively used in the Russian Federation: Corporate Olympic Green Standard; "Green standards", NP-SPZS 1.1.M–2011 "Low-rise construction"; CAP-SEC "Administrative buildings; STO NOSTROY 2.35.4–2011; GOST R 54964–2012; Eco Village; GREEN ZOOM; GREEN ZOOM City; "Green" standards. "Green" technologies of the living environment. Assessment of compliance with the requirements of "green" standards, General Provisions, etc.

One of the latest regulatory documents put into effect in this area is GOST R 70346–2022 "«Green» standard. «Green» residential building. Assessment method and criteria for design, construction and maintenance", developed with the participation of JSC DOM.RF.

This standard was developed in order to create comfortable and environmentally friendly living conditions for citizens in multi-apartment residential buildings [13].

The standard proposes specific criteria in the field of "green" building and housing and communal services for the construction and operation of "green" multi-family residential buildings, aimed at implementing the declaration "Transforming our world: the 2030 Agenda for Sustainable Development" and other foreign and Russian regulatory legal acts and documents, the action of which is aimed at creating a favorable environmental situation and combatting climate change.

Thus, GOST R 70346–2022 introduces quantitative and qualitative characteristics of the evaluation of residential real estate in Russia according to "green" criteria, throughout all stages of the life cycle. Green criteria for multi-apartment residential buildings is formed in 10 categories, taking into account the best world practices of BREEAM, LEED, DGNB (Fig. 2). According to the data given in the Unified Information System for Housing Construction, today multi-apartment residential buildings are already marked according to 6 of more than 30 mandatory criteria given in the GOST R 70346–2022 Standard (in total, GOST R for multi-apartment residential buildings includes 81 "green" criteria, of which: 37 mandatory and 44 voluntary).

Based on the assessment for each group of criteria in accordance with GOST 70346–2022, the building is awarded a certain rating value (according to the percentage of points scored out of the total, Fig. 3).

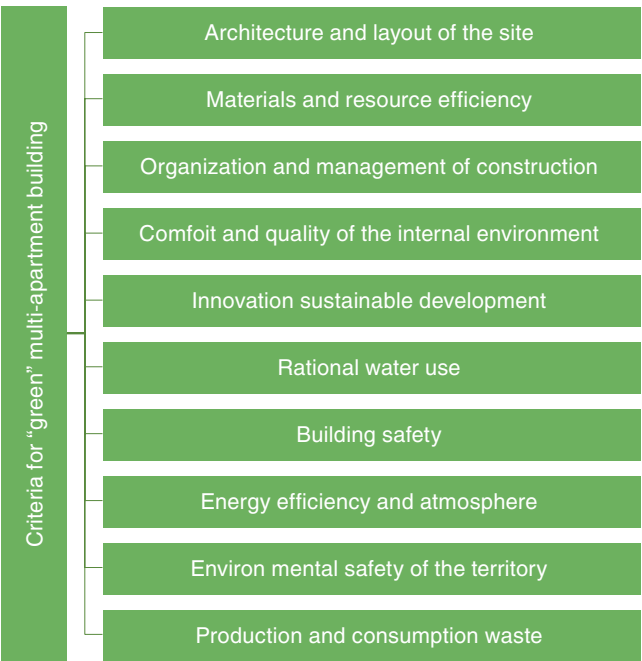


Fig. 2. Categories of evaluation criteria for "Green" real estate objects according to the GOST 70346–2022 Standard

To obtain a green certificate for multi-apartment residential buildings, it is necessary to meet the mandatory and part of the voluntary criteria. Voluntary criteria the developer chooses independently. Certification can be carried out at the design and construction stage.

The Russian Federation is just beginning to build its own system of "green" certification with an integrated approach to the relationship of resource saving, energy efficiency, environmental safety and comfortable living conditions [14]. The introduction of green building standards in our country is still quite difficult. This is caused, first of all, by the outdated normative and technical regulation of the construction complex. The emergence of new technologies, building materials and engineering equipment makes the task of harmonizing domestic and advanced foreign regulatory and technical regulation one of the priorities.

Green buildings aim to minimize their impact on the environment and promote sustainability, but they can face the following challenges.

1. Cost: Implementing green building practices can be expensive, particularly for retrofitting existing structures.
2. Lack of standards and regulations: There is a lack of universally accepted standards for green building, leading to confusion and inconsistencies in implementation.
3. Limited availability of green materials: Finding environmentally friendly materials can be difficult, especially in certain regions or for certain types of construction.

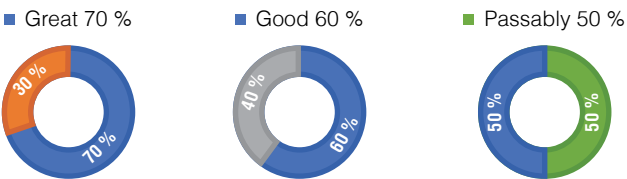


Fig. 3. Final rating values based on the results of the assessment

4. Resistance to change: Some contractors, architects, and building owners may be resistant to changing traditional building practices and incorporating new technologies.

5. Maintenance and upkeep: Maintaining green building systems and ensuring they continue to operate efficiently can require ongoing effort and investment.

6. Limited awareness: There is a limited understanding and awareness of green building practices and the benefits they can provide, which can limit adoption and investment.

To overcome these challenges, a combination of education, policy support, and investment in green building research and development is needed.

In conclusion, green infrastructure and eco-urbanization play a crucial role in creating sustainable and resilient cities. Green infrastructure provides a range of benefits, including mitigating the impacts of climate change, promoting public health, and improving the quality of life for city dwellers. Eco-urbanization involves the integration of green infrastructure into the fabric of the city, creating a more sustainable and resilient urban environment. The implementation of green infrastructure and eco-urbanization requires investment, political will, and public awareness, but the benefits of these initiatives are numerous and far-reaching. By promoting eco-urbanization and the development of green infrastructure, cities can become more sustainable, resilient, and livable for all of their residents.

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Анализ современных тенденций экологизации урбанизированных территорий

В статье рассмотрены основные аспекты экологизации и повышения качества и комфортности урбанизированных территорий. Экологическая проблематика является важным вопросом для городов всего мира. В процессе урбанизации сталкиваются со множеством экологических проблем, включая загрязнение воздуха, воды и земли, недостаток зеленых зон, утрату биологического разнообразия и т.д. Целью данной статьи является исследование экологических проблем, связанных с урбанизированными территориями и развитием жилой застройки, и выявление эффективных методов их решения. В частности, в рамках данной статьи будут рассмотрены практики применения современных стандартов «зеленого» строительства, современные аспекты внедрения энергоэффективных технологий и вопросы создания рекреационных зон на урбанизированных территориях.

Ключевые слова: экологизация, экологические проблемы, комфортность урбанизированных территорий, «зеленое» строительство, система экологической сертификации, охрана окружающей среды, объекты жилой недвижимости

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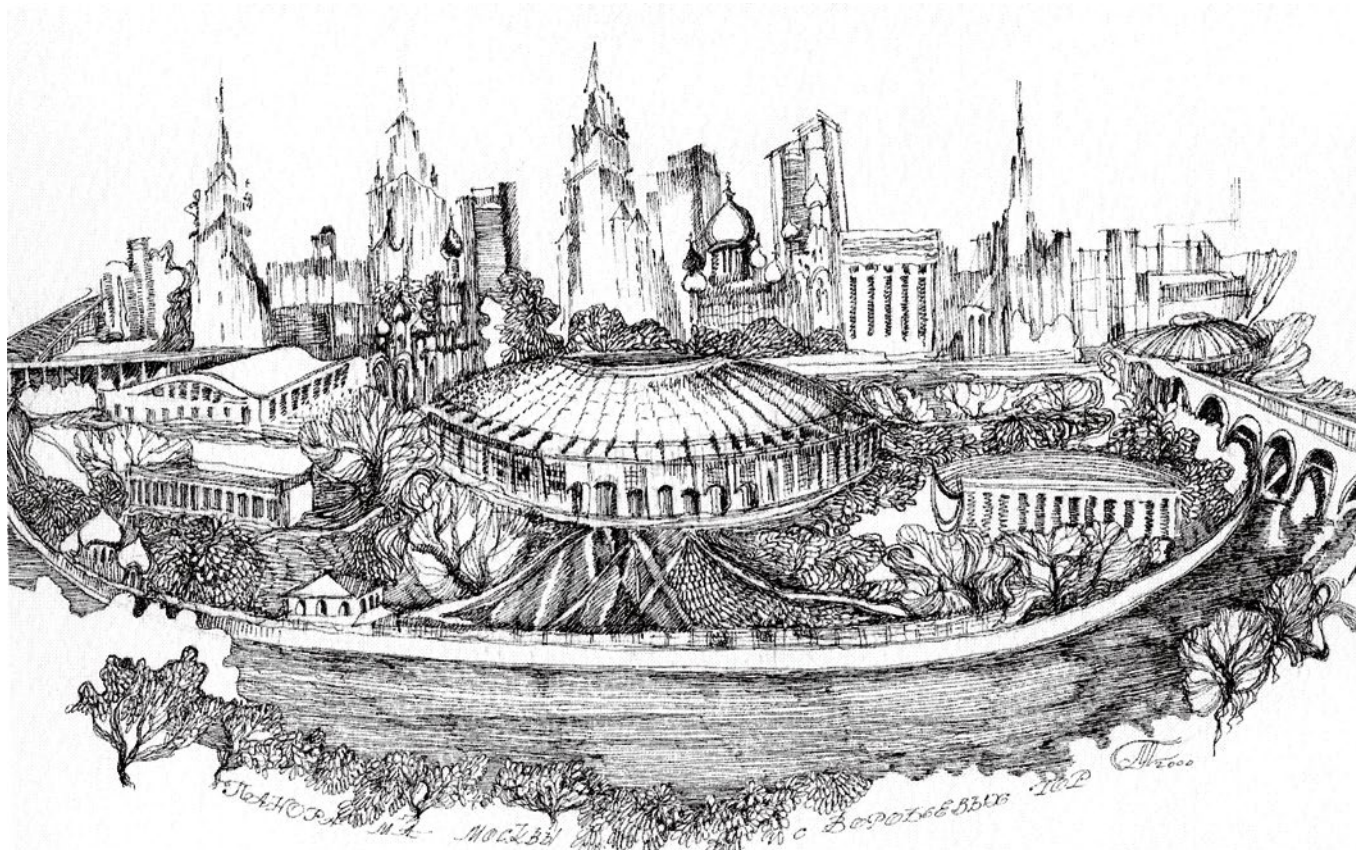
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