

Analysis of green building standards in Russia and the effectiveness of their use

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Abstract. Every year the negative impact of construction on the environment is becoming more and more evident. These are: degradation of vegetation cover, waste problem, atmospheric air pollution, as well as a number of other environmental problems. In order to reduce the impact of the construction industry on the ecological situation of cities and to control the impact of construction on the environment various systems of certification of buildings have been created. In this article an analysis of environmental standards, as well as an assessment of the implementation of "green" construction in Russia was made. Based on the findings a number of recommendations have been developed, the implementation of which would increase the number of "green" buildings in our country.

Keywords: ecology, construction, green construction, green buildings, environmental safety.

Introduction

The rapid urbanization of cities, the development of industry and the introduction of new technology in operation have a negative impact on the environment [1]. The construction industry, as one of the leading sectors of the economy in the Russian Federation, is constantly improving and developing, which leads to the introduction of modern construction technologies, as well as the use of the latest materials. Only in St. Petersburg by the end of 2019, 3.47 million m² of housing was commissioned [2]. However, only a few construction companies care about the environmental safety of the city.

The relevance of this work is that every year in urbanized cities there is a huge number of new implemented construction projects. Due to the high demand for the construction industry in the modern world, it is possible to identify a number of environmental problems directly related to construction. These include: problems arising during construction (depletion of mineral reserves, degradation of vegetation cover) and problems arising during operation (the problem of waste, atmospheric air pollution, violation of the hydrological regime of the city).

Environmental safety is the state of protection of the natural environment and vital human interests from the possible negative impact of economic and other activities, emergencies of natural and man-made nature and their consequences [3] One of the main directions of environmental safety is environmental control [4]. In order to reduce the impact of the construction industry on the ecological situation of cities and control the impact of construction on the environment various sys-

tems of certification of buildings have been created. Buildings certified under these systems are commonly referred to as "green", and the direction of construction involved in the design, construction and commissioning of "green" buildings - "green construction" (green buildings). For the first time this type of construction was applied in the U.S. in the early 70s [5]. This technology is not widespread, but in connection with the official support of environmental movements at the state level at the end of the 20th century construction of houses using environmentally friendly materials has become in high demand. However, in Russia this technology began to be used with a delay.

Purpose of the study – to establish the assessment of the implementation of "green" construction in Russia and the formation of a number of recommendations, the introduction of which would simplify the process of environmental certification and in the future would increase the number of "green" buildings in the country.

Materials and methods

In the course of this work, the environmental standards currently in force in Russia were studied and analyzed. Also, statistical information on the number of green buildings in the country was analyzed and summarized. Generalization and specification of the information received allowed to compile a number of measures, the implementation of which would increase the number of green buildings in Russia.

Results and discussion

All over the world there are various standards governing the "green" construction. At the moment in 24 countries there are 32 standards for assessing the impact of construction and reducing the negative impact on the environment [6]. For example, the Australian standard Green Star, the German standard DGNB and many others. However, when developing and implementing their own standards for assessing the quality of construction, most countries are guided by two international standards LEED and BREEAM.

Both BREEAM and LEED carry a lot of weight in the field of green building certification, but each certification system has its own strengths and weaknesses. Table 1 shows the advantages and disadvantages of each certification system.

Table 1

Advantages and disadvantages of LEED and BREEAM

	Advantages		Disadvantages	
	LEED	BREEAM	LEED	BREEAM
1	International promotion system	Ability to adapt the system of standards to the economic realities of different	Adapted only to U.S. economic realities	Weak marketing campaign

		countries		
2	Universal approach to many construction sites	Ability to assess buildings based on its individual characteristics	Relationship of functional purpose with the architectural forms of the object	High cost of obtaining a certificate
3	Based on international Ashrae technical standards	Provides high quality because it is based on British quality standards	High requirements for the execution of documents	Serious requirements that do not allow for deviations

As can be seen from Table 1, the LEED system is most often used to evaluate buildings in the U.S. and other foreign countries because of its adaptation to the economic realities of the United States. Due to the fact that LEED has a unified approach for the evaluation of different types of objects, it is very important to link the functional purpose with the architectural forms of the object, which makes it less flexible than BREEAM. However, due to this there is an opportunity to reduce costs for the developers themselves. BREEAM is a more flexible certification system, due to the possibility of individual assessment of buildings, but due to the weak marketing campaign and high requirements for the assessed objects of construction, it is not as popular as LEED.

In Russia, "green" construction is not regulated by any special regulations, resulting in difficulties even at the design stage of "green" houses. In addition, Russia does not yet have a sufficient number of specialists who would ensure the functioning of all kinds of ecosystems in new houses [7]. In 2009, in our country the "Green Building Council" was created, which at the beginning of its development was responsible for the regulation and evaluation of buildings designed and implemented in the Russian Federation under BREEAM and LEED standards. Subsequently this non-commercial partnership set out to create its own "green building" assessment system, based on the sections in the LEED standards.

As a result of the activities of this working group, in February 2010 the Federal Agency for Technical Regulation and Metrology registered the first Russian national voluntary certification system for real estate - "Green Standards".

Since April 2011 the second, improved version of the System of voluntary certification of real estate objects, "Green Standards" [8].

A comparison of the standards created by the "Green Building Council" and the sections in LEED is shown in Fig. 1.

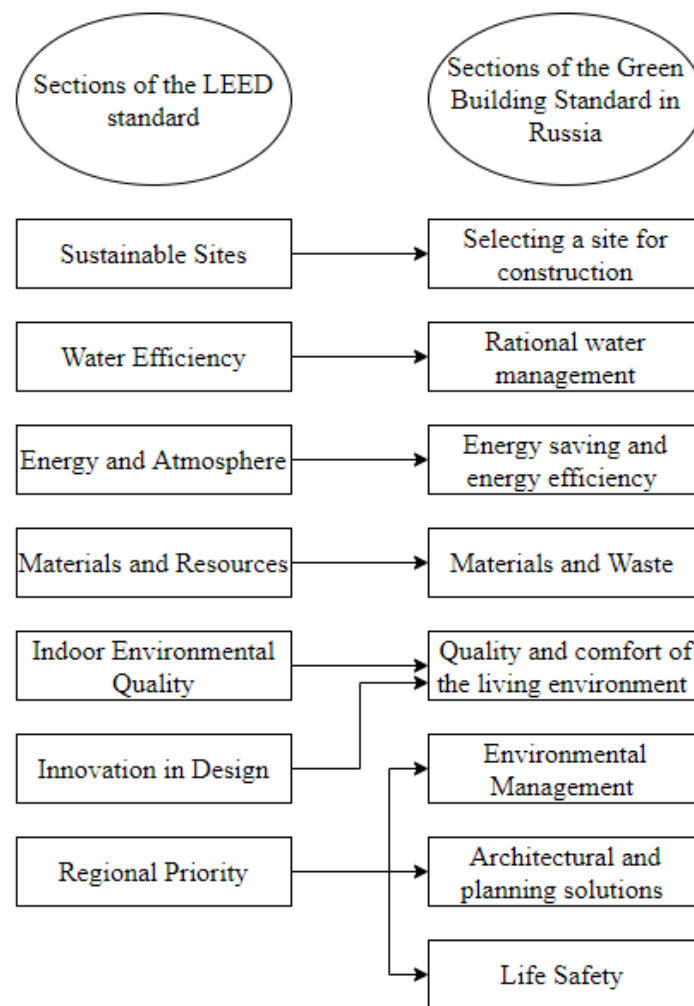


Figure 1. Composition of sections of the LEED and "green" standards

Certification for compliance of the property with the approved requirements of "Green Standards" is carried out by accredited organizations authorized to conduct certification within the System.

According to the results of the examination, the customer is issued a certificate of conformity, which, depending on the rating points can be "simple", "silver", "gold" and "platinum".

Availability of a certificate confirms that the building structure is the most comfortable for living working, uses environmentally friendly materials and advanced energy-efficient and other resource-saving technologies, and is provided with the most convenient and accessible infrastructure. All these factors increase the value of a square meter for the purposes of sale/lease, and therefore reduce the payback period of the facility and increase the attractiveness of investments for potential investors.

The system of voluntary environmental certification is shown in Figure 2 and Figure 3.

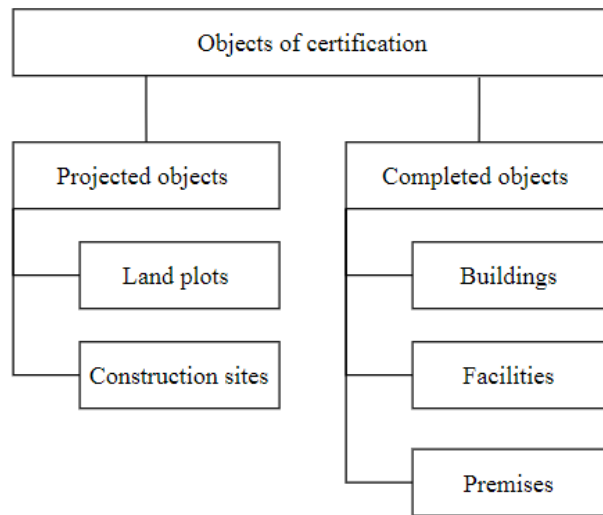


Figure 2. Objects subject to voluntary certification

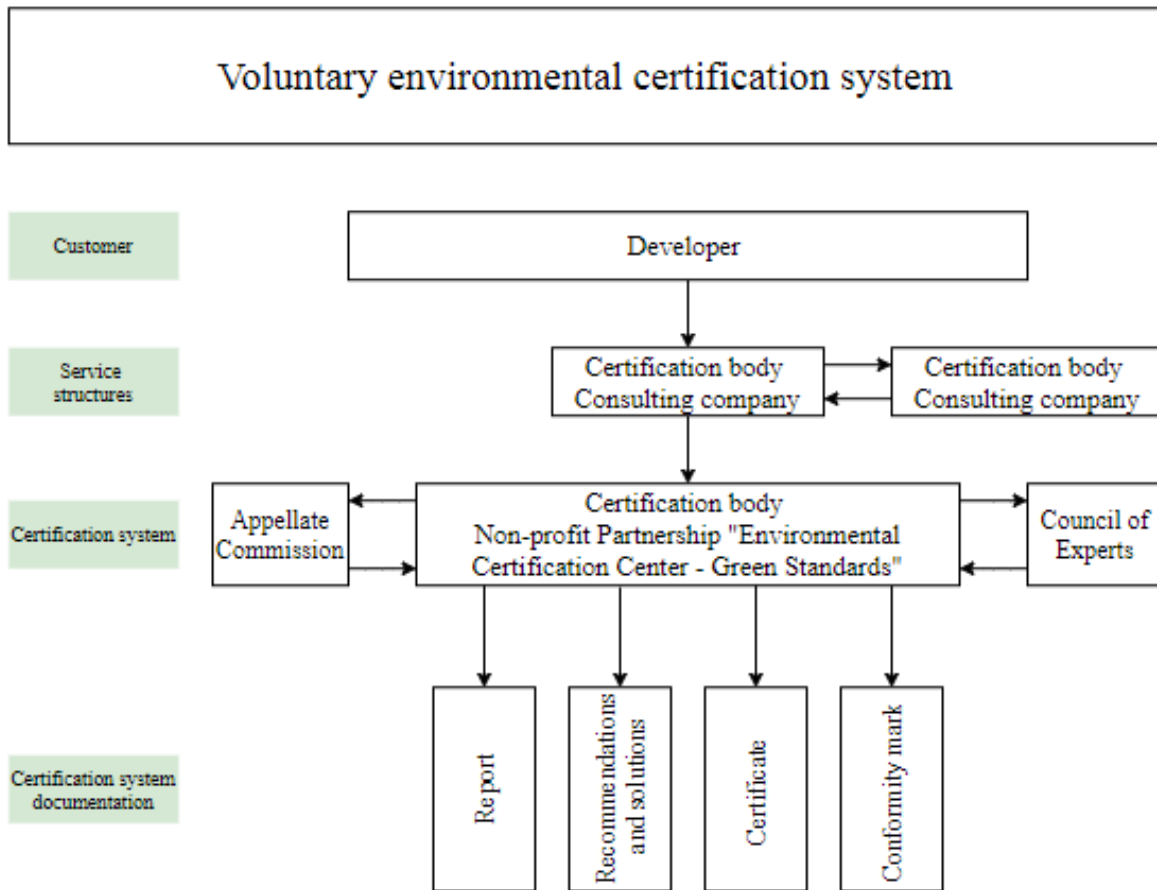


Figure 3. Structure of the certification system [9]

At the moment, the main document regulating this direction of construction in our country is GOST R 54964-2012 "Conformity Assessment. Environmental requirements for real estate objects". This state standard came into force in March 2013. National standard was compiled in accordance with the following list of international standards ISO:

- ISO 15392:2008 "Sustainability in Building Construction. General Principles."
- ISO/TO 21929-1:2006 "Sustainability in the construction of buildings. Sustainable indicators. Part 1. Basis for the development of indicators for buildings";
- ISO 21930:2007 "Sustainability in the construction of buildings. Environmental declaration of building products";
- ISO/TO 21931-1:2010 "Sustainability in the construction of buildings. Fundamentals of methods for evaluating the environmental performance of construction work. Part 1. Buildings".

Environmental requirements for real estate objects are defined by a set of the following 9 basic categories:

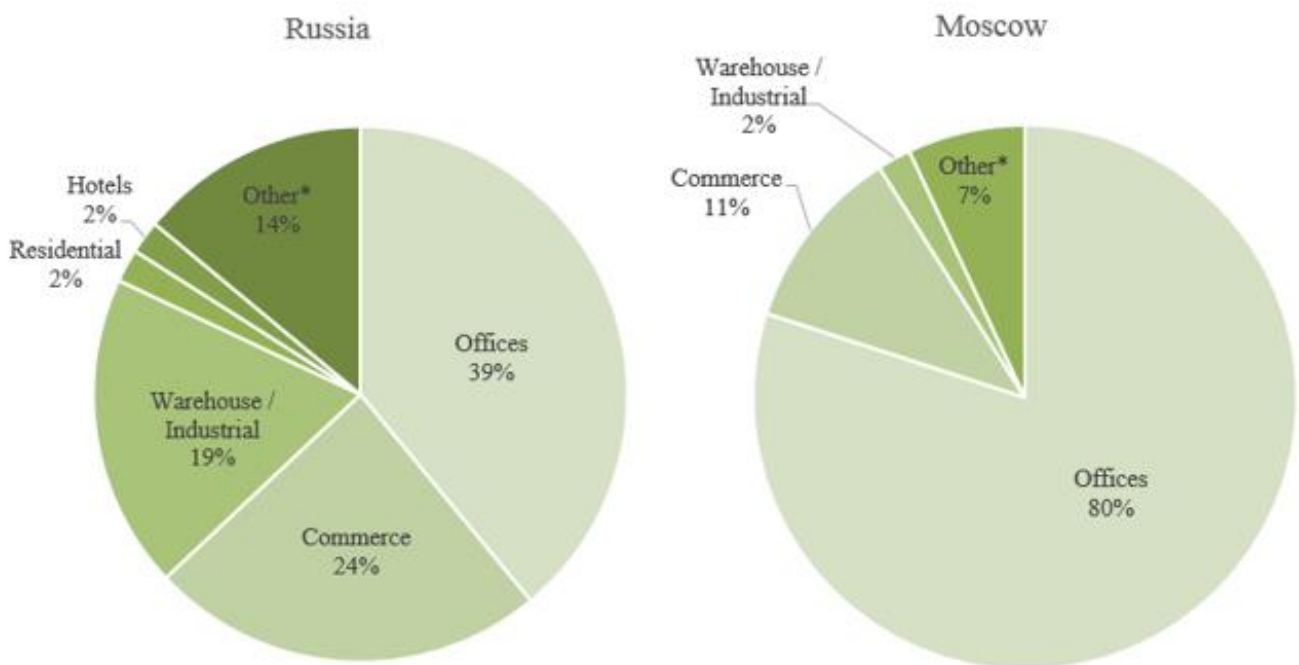
- environmental management;
- infrastructure and quality of the external environment;
- architectural quality and layout of the object;
- comfort and ecology of the internal environment;
- quality of sanitary protection and waste management;
- water management and storm water management;
- energy saving and energy efficiency;
- environmental protection during construction, operation and disposal of the facility;
- life safety [10].

Due to the fact that the requirements of national standard are recommendations, their compliance is often neglected. This is due to a number of difficulties faced by developers in our country. This is a relatively low price for electricity, and low or no motivation to introduce energy saving measures in domestic companies, the high cost of implementing innovative building and operating technologies, as well as the limited financial resources of companies.

However, even despite all the difficulties, there are projects in Russia that have been able to pass environmental certification. Many companies in Russia are now interested in obtaining international environmental quality certificates, as this is a huge step for a company to enter the international market. A big role in increasing the number of certified facilities in Russia was played by the Olympic Games in Sochi in 2014 and the World Cup, held in our country in 2018, because one of the prerequisites for these events was the presence of an international environmental certificate

for the sports facilities used. These include the reconstruction of the Luzhniki stadium in Moscow in 2017, which received the "Certified" status under the BREEAM system, and the educational and administrative building of the Russian International Olympic University in Sochi, which received the "Very Good" status under the BREEAM system, and some other construction projects. According to Knight Frank (a real estate and consulting agency for residential and non-commercial real estate), there will be a total of 177 green buildings in Russia in 2020. This number is incomparably low, especially considering that there are 120,000 "green" buildings in the world [11].

In the Russian market, most of the buildings with any of the environmental certificates belong to the segment of offices - 39% of the total number of "green" buildings. In second place is retail real estate - 24%. In third place in Russia are warehouse and industrial buildings - 19%. A similar structure is observed in Moscow, where offices are the absolute leaders with a share of 80% (Fig. 4) [12].



*The "Other" category includes sports facilities, data centers, technology parks, etc.

Figure 4. Structure of the number of green buildings by real estate segment [12]

It should be noted that all office buildings with one of the certificates under consideration are located in Moscow (83%) or St. Petersburg (17%). There are no such objects in the regions.

That is why we propose a number of measures whose introduction would simplify the process of environmental certification and in the future would increase the number of "green" buildings in Russia:

1. Introduction at the state level of mandatory regulations related to the design, construction and operation of "green" buildings.

2. Support for developers from the state. This item includes both financial aid to construction companies when designing and implementing "green" buildings, and economic protection for companies who decide to build environmentally friendly facilities.

3. Increasing the interest of buyers by informing them in the field of "green" construction. The implementation of this measure provides an opportunity to reduce costs for developers by increasing the price of environmentally friendly housing. However, the implementation of such a step is only possible if the buyers will agree to pay for environmentally friendly materials used during the construction of facilities, as well as additional costs arising during the operation of energy efficiency systems of the building (the use of motion detectors, detectors of fire [13], collecting rainwater and melt water for watering lawns and green spaces, the implementation of construction waste processing system, reducing heat loss [14], etc.).

4. Protecting the interests of investors and increasing the interest of shareholders.

Conclusion

Thus, in the course of this work an analysis of existing global and domestic environmental standards used to evaluate "green" buildings. As a result of comparing the number of implemented "green" facilities in Russia with the global indicators, it was concluded that it is necessary to introduce measures, the implementation of which would increase the number of environmentally safe facilities in our country. Such measures include: the creation of new regulations governing "green" construction, which would be mandatory; state support for construction companies, shareholders and investors; improving environmental literacy of the population in the field of "green" construction.

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