Factors of the "green" construction development from the point of view of different stakeholder

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Abstract. The relevance of this article is determined by the fact, that much attention is paid to the ecological aspects of construction in the modern world. The cost efficiency of the project is not enough to justify its efficiency and to choose if for the realization. Investors, future owners and users of the object are interested in its environmental friendliness. The authors allocate three main elements, forming the system of "green" construction, including human, environment and construction object. These elements are connected with financial and non-financial criteria. This research proves, that financial criteria, such as cutting of construction cost, reducing costs for the object maintenance, exception of the liquidation expenses, for the environmental impacts, are most interesting for the stakeholders. The authors revealed other factors of the "green" construction development and conclude, that most of stakeholders usually underestimate them. Most of stakeholders needs additional stimulation to introduce "green" construction. The principles of the "green" construction development are formulated. Some measures for the stimulation of "green" construction for various stakeholder groups are proposed in article. The conclusions and proposals made by the authors can be useful for the implementation and development of "green construction".

1 Introduction

Nowdays the ecologization of construction act as the basis of the perspective city-planning activity, causing the necessity of change in the principles of the territories planning, of the creation of construction products and management of the industry development as well. "Green" or ecological construction is the approach to design, arrangement and maintenance of buildings with the purpose to reduce the negative environmental impact and to increase the citizens welfare.

The need of the decrease in the environmental damage from construction, introduction of energy efficient and resource-saving technologies are proclaimed in the Development Strategy of the construction industry and housing-and-communal services of the Russian Federation until 2030 with the forecast till 2035.

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The analysis of the project attractiveness includes the assessment of the environmental impacts of the construction project, which is without fail used for the justification of expediency of the project implementation.


Nevertheless, the uniform principles of management of the “green construction” development, recognized by all the participants of the investment-construction process are not formulated yet. The problem of the development of an ecologic-and-economic pattern of management of the “green” construction development, which will consider the interests and activity of all the stakeholders and participants of the construction sphere is still relevant.

2 Materials and methods

While working on this research the authors studied the standard-and-methodical documents in the field of construction, energy efficiency and ecology, the legislation of the Russian Federation and its subjects, statistical materials, results of the empirical research and expert evaluations, materials of industry conferences and forums, such as Russian construction week and STT-Expo were studied. The rating systems, estimating construction objects by the criteria of environmental friendliness, such as economical use of electric power and water, quality of the internal microclimate and construction materials, rational use of the earth, optimum choice of the land plot, volume of emissions of greenhouse gases in the atmosphere and the level of transport pollution were studied, including American LEED (the Leadership in Energy and Environmental Design [1], British BREEAM BRE Environmental Assessment [2] and German DGNB [3]. The methodical materials of the Russian representative office of the International committee on “green” buildings (Green Building Council) [4]; Council for ecological building (RuGBC) [5]; “Center of ecological certification – Green standards”; standards of National consolidation of builders (NOSTROY); Non-profit partnership “Council for Green Construction” were studied.

The methods of system approach, behavioural economy, the cognitive analysis, stakeholder theory, theory of the multiple choice and expert evaluations, economic-mathematical modeling and forecasting, statistics, innovatics and ecology, methods of the analysis and synthesis, the method of a poll [6] and statistic analysis were used within the research.

3 Results and discussion

The analysis of the numerous works, devoted to the matters of the development eco-friendly (so-called “green”) construction [7-11] as well as the fundamental environmental standards [1-3] allowed to allocate three main elements, forming the system of “green” construction (Figure 1).
As Figure 1 demonstrates, "green" construction possesses both economic (financial), and non-financial performance criteria. The criteria are considered in Table 1.

Table 1. Ecological, social and economic effects of the "green" construction development

<table>
<thead>
<tr>
<th>Input: Requirements of sustainable development, management, innovations</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources (land plots, construction materials)</td>
<td>Value, usefulness, satisfaction of requirements in buildings and constructions for dwelling and work</td>
</tr>
<tr>
<td>Waste, environmental damage. Change of the landscape</td>
<td>Wear, costs</td>
</tr>
<tr>
<td>Resources (land plots, construction materials)</td>
<td>Resources (land plots, construction materials)</td>
</tr>
</tbody>
</table>

Output:

<table>
<thead>
<tr>
<th>Construction objects</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence, waste, emissions. Change of the landscape</td>
<td>Value, usefulness, satisfaction of requirements in buildings and constructions for dwelling and work</td>
</tr>
</tbody>
</table>

Elements of "green" construction

Table 1. Ecological, social and economic effects of the "green" construction development

<table>
<thead>
<tr>
<th>Effects of &quot;green construction&quot;</th>
<th>Ecology</th>
</tr>
</thead>
<tbody>
<tr>
<td>smaller amount of solid waste;</td>
<td>preserving of the ecosystem and biological diversity;</td>
</tr>
<tr>
<td>improving of air and water</td>
<td>preserving of natural resources and their not exhaustion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Society</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>the best air quality;</td>
<td>the increased level of comfort and healthy habitat;</td>
</tr>
<tr>
<td>smaller load on the infrastructure;</td>
<td>higher quality of life</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>reduction of working costs;</td>
<td>increased value added;</td>
</tr>
<tr>
<td>support for local producers and economy;</td>
<td>raised efficiency of workers and their better satisfaction;</td>
</tr>
<tr>
<td>improved economic criteria of buildings lifecycle;</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1. Elements of "green" construction
Construction in the condition of lack of purely pecuniary benefits and the increase in the investment costs on ecologization.

Economic benefits of "green construction" include:
- the decrease in transactional costs in construction [13];
- the reduction of operating costs for the maintenance of real estate objects;
- the opportunity to avoid liquidation costs of environmental impacts;
- competitive advantage, international recognition [14].

At the same time it is necessary to consider that from the point of view of different stakeholders the value of "green" construction is not identical. That is represented in Figure 2 [6].

Fig. 2. Chart of the "green construction" value for various stakeholders

The main barriers to the implementation of the principles of "green" construction in Russia include:
- influence of commercial factors, first of all, short-term profits on the made decisions;
- high market price of technologies of economic and resource-saving construction;
- fragmentariness of the information on the realization of the principles of "green" construction in practice [15];
- fragmentariness and backwardness of the regulatory base of construction [16].

At the same time the subjects, forming the demand in the real estate market pay more attention to the quality, make higher demands to comfort and durability of the real estate.

The main incentives for the introduction in the activity of "green" construction for the organizations performing investment-and-construction activity are availability of demand and decrease in operating costs [17, 18].

The opinions on the matter of introduction of standards of "green" construction in Russia, revealed among stakeholders in the investment-and-construction activity are given further in Table 2.

Table 2. Opinions on the matter of introduction of standards of "green" construction in Russia, revealed among stakeholders in the investment-and-construction activity (according to [19])

<table>
<thead>
<tr>
<th>Factors of introduction of &quot;green&quot; construction</th>
<th>Developers of the real estate</th>
<th>Contractors</th>
<th>Designers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of the demand for objects of &quot;green&quot; construction</td>
<td>***</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Possibility of the economy on operating costs</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Availability of standards</td>
<td>***</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Possibility of the development of &quot;green&quot; construction in terms of environmental problems</td>
<td>***</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Possibility of the implementation of &quot;green&quot; construction in the conditions of a competitive environment</td>
<td>***</td>
<td>***</td>
<td>**</td>
</tr>
</tbody>
</table>
Ethical reasons

State regulation

Factors defining economic feasibility of the "green" construction development

Cost reduction

Increase in the building
capitalization

Competitive advantages

Economy of marketing
costs

Improvement of work
performance and
employees' efficiency

International recognition

Involvement of foreign
tenants

Measures of the state stimulation of the "green" construction development
within the activity of subjects of the investment
and construction sphere

Improvement of the regulatory framework

Harmonization of the Russian and international environmental standards

State programmes

Subsidizing of "green" construction

Development of national environmental standards

Privileges for buyers of the objects of "green" construction, conforming
to the environmental standards

Possibility of experience exchange

Simplification of the environmental assessment procedure

Financing of ecological programmes

It should be noted, that the participants of the investment and construction sphere
underestimate their role in the creation and development of national environmental standards.
Besides, they pay not enough attention to such measures of the state stimulation as the development of national standards, privileges to buyers of "green" objects, simplification of the environmental assessment procedure.

One of vital issues within the implementation of "green" construction is the lack of standard regulation on the use of environmental standards. Meanwhile, it is possible to propose some measures for the stimulation of "green" construction by the improvement of the legislation in the field of ecological ("green") construction:

1) Measures for the introduction of the ecological standard by the state and municipal authorities:
the requirement of obligatory certification during the issue of target subsidies to the budget of territorial subjects of the Russian Federation from the federal budget, to local budgets from the budget of the territorial subject of the Russian Federation and during the issue of other interbudgetary subsidies;

- certification of all or some real estate objects of a definite department;
- certification of objects depending on objective criteria;
- construction of facilities for the state and municipal needs;

2) Financial measures of stimulation of the "green" construction development [20]:
- direct budget financing;
- preferential crediting;
- compensation of percent on the credits;
- state guarantees;
- interest-free mortgage;

3) Tariff measures of stimulation of the "green" construction development:
- preferential connection to networks;
- reduced rates for energy;
- compensations for energy carriers;
- compensations for the developed energy;
- compensation of a difference in the energy price;
- reduced customs tariff;

4) Investment and administrative measures of stimulation of "green" construction:
- signing of the contract on reconstruction of the real estate object which is in the state-owned or municipal property with the subsequent transfer of an object (part of the object) to property to the person who performed reconstruction;
- preferences to the person when granting the land plots under construction (real estate objects for reconstruction) at the auction;
- privileges during coordination of construction projects for the persons realizing use of environmental standards in again constructed facilities of the real estate;
- signing of the contract on reconstruction of the real estate object which is in the state-owned or municipal property with the subsequent transfer of an object (a part of an object) to property to the person who performed reconstruction;
- preferences to the person when granting the land plots under construction (real estate objects for reconstruction) at the auction;
- preferences during coordination of construction for persons performing construction and reconstruction of real estate objects with the use of environmental standards;

5) Tax measures of stimulation of the "green" construction development:
- privileges on the property tax: remission of a tax or payment of a tax at the lowered rate;
- privileges on income tax: accelerated depreciation of property value, meeting the requirements of environmental standards;
- privileges on income tax: release from taxation of the received grants;
- investment tax credit;
- income tax: reduction of tax base on an income tax on an expense amount on construction of facilities, meeting environmental standards;
- income tax: release from taxation of the grants provided to natural persons on financing of "green" construction.

To be fair, we should note, that the state in Russia takes measures, directed to the stimulation of development of "green" construction in the recent years. First of all, it is shown in the state support of the projects, directed to the increase in power efficiency of real estate objects by the means of establishment of tax benefits, subsidies from the federal budget and E3S Web of Conferences 402, 07031 (2023) TransSiberia 2023

https://doi.org/10.1051/e3sconf/202340207031
4 Conclusion

Having analyzed the experience of "green construction", it is possible to formulate the following principles of the "green" construction development:

1) the principle of value (the "green" construction products have a certain value for each of stakeholders and for the environment),
2) the principle of the general ecologization (the concept of "green" extends to all the types of real estate objects),
3) the principle of innovation (the basic and necessary sign of every object and project of "green" construction is introduction of innovations of various types),
4) the principle of ecologization of lifecycle (the construction ecologization process which is characterized by the corresponding effects and costs covers the whole lifecycle of the investment-and-construction project and a real estate object),
5) the principle of differentiation of development of "green" construction (the level of "green" construction development depends on the regional and object specifics).
– the principle of innovation (the basic and necessary sign of every object and project of “green” construction is introduction of innovations of various types),
– the principle of ecologization of lifecycle (the construction ecologization process which is characterized by the corresponding effects and costs covers the whole lifecycle of the investment-construction project and a real estate object),
– the principle of differentiation of development of “green” construction (the level of “green” construction development depends on the regional and object specifics).

Development of the “green” ideas in the investment-construction sphere has to continue in the following directions:
– spread of knowledge and information, i.e. promoting of the need of the “green” construction development;
– education and training, i.e. competence-based preparation of the architectural- and construction personnel for the participation in the process;
– creation of mechanisms of the state stimulation of the “green” construction development by the means of various stimulating measures;
– development of the new “green” architecture, combining the ecological principles and aesthetic advantages with the innovation technologies;
– increase in the responsibility of self-regulatory organizations, such as special associations of participants of the investment-construction activity in the direction of introduction of the “green” ideas in the Russian construction practice.

The effective development of “green” construction is possible on the basis of the “green” financial system, which is used for the purpose of the decrease in the initial costs of construction, preferential crediting, insurance and taxation) [21].

Than the development of “green” construction requires the creation and application of a system of certification of ecological products, provided both by construction and by the industry of construction materials; change of the procedure of examination of investment-construction projects on the basis of estimation of its ecological effect; information-communication technologies (due to the growth of knowledge on the efficiency of “green” construction and the increase in the accuracy of information), staffing (both in respect of the certified appraisers and the developers of standards, and in respect of the workers, implementing the corresponding projects and technologies), as well as the creation of the ecological infrastructure in the cities. In terms, when the construction industry in Russia fights for the independence of external partners, the creation of own system of ecological certification will be also useful. And at last, the development of the technique of the assessment of environmental efficiency of construction projects has to play its positive role.

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