

# Implementation of megaprojects for the creation of tourist clusters in Russia based on the concept of energy efficiency and sustainable construction

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**Abstract.** The article deals with the application of sustainable construction concept within implementation of megaprojects of tourist clusters development using energy saving technologies. The concept of sustainable construction includes the elements of green construction, energy management as well as aspects of the economic efficiency of construction projects implementation. The methodical approach to the implementation of megaprojects for the creation of tourist clusters in Russia based on the concept of energy efficiency and sustainable construction is proved. The conceptual approach to the evaluation of the ecological, social and economic components of the integral indicator of the effectiveness of the megaproject for the development of the tourist cluster is provided. The algorithm for estimation of the efficiency of innovative solutions in green construction is considered.

## 1. Introduction

The aspects of sustainable development are extremely important in current economic conditions. Technologies of green construction are actively implemented in different countries and their further extension and development promotes resolving of crucial tasks: enrichment of real estate properties, minimization of negative influence on environment, providing the required safe level, resource conservation [1-4]. In general all the elements of the green construction system are presented in the figure 1 [5].

It should be noted that green construction technologies are implemented on the basis of various standards. These standards are progressed year-to-year along with the advent of new technologies and studies in the field of energy efficiency of buildings. The most widespread at the moment are the LEED (USA) [6-8] and BREEAM (UK) [9-11] standards, as well as the DGNB standard (Germany) [12, 13]. According to the results of year 2016 there are 79,000 projects under the LEED certificates, and 55,079 - under BREEAM certificates. In the modern scientific literature the issues of practical application of standards, as well as ways to approaches improving to green construction are considered.

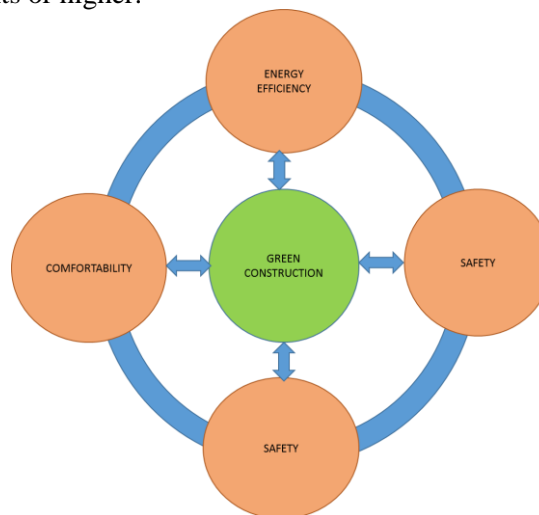
In Russia, until recently, there was no unified system for the certification of construction sites, and only in 2014 the GREEN ZOOM rating standard was developed and approved (for more information, see the website [www.greenzoom.ru](http://www.greenzoom.ru)), based on the provisions of LEED and BREEAM [14, 15]. When certification process according to the GREEN ZOOM project is held, the points are awarded for the following sections:



- Evaluation of the land plot and identification of opportunities for energy efficiency, water efficiency, environmental friendliness increasing;
- Location of the built-up territory and arrangement of transport support;
- Ecological sustainability of the built-up territory;
- Water efficiency;
- Energy efficiency and reduction of polluting emissions into the atmosphere
- Rational approach of building materials and waste management;
- Internal ecology of the building's environment;
- Innovations.

Following the results of eco-standard GREEN ZOOM certification, depending on the points awarded, the project receives one of the four certificates:

- Bronze: 35 points;
- Silver: 45 points;
- Gold: 55 points;
- Platinum: 70 points or higher.

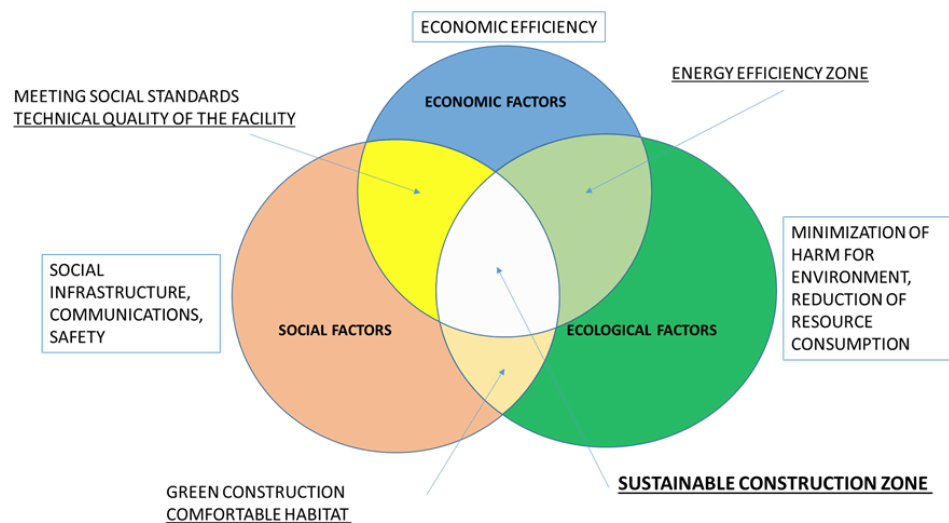


**Figure1.** Elements of the green construction system

It should be noted that there are a number of problems in extension of green building standards in Russia [16]:

- Higher construction costs compare to average market rates (on average, application of modern eco-friendly materials and alternative energy sources increases the cost of building construction by 8-15%);
- Shortcoming of the legislative and regulatory framework in Russia which governs the implementation and use of green construction concept;
- Low awareness level of the population and construction customers about the principles of green construction and, as a result, not to high demand of Russian consumers for eco-projects.

One of the possible problem solutions is implementation of the sustainable construction concept into the business of development companies (Figure 2). The concept of sustainable construction is broader than green construction [17, 18], and in addition to social and environmental factors, it also includes an element of economic efficiency. Thus, the modern object of green construction along with solving issues of comfort, safety, energy efficiency, environmental impact, must also take into account the interests of the investor, making the implementation of modern innovative technologies economically feasible.



**Figure 2.** Conceptual framework for sustainable construction

There is a task in the governmental level of Russia to develop tourism, which was reflected in the Federal Target Program 'Development of domestic and inbound tourism in the Russian Federation (2011-2018)'. The implementation of the program considers a cluster approach to the development of territories intended for tourist and recreational purposes. Regarding the specific characteristics of megaprojects for the creation of tourist clusters, including the need to minimize the impact on the ecosystem occurred and the sustainable development of the territories where construction sites are located, the implementation of the sustainable construction concept in this direction is extremely essential. The purpose of this article is to demonstrate a methodical approach to the implementation of megaprojects for the creation of tourist clusters in Russia based on the concept of sustainable construction.

## 2. Methodical principles

The methodical principles applied for this article are: high quality scientific analysis, methods of comparison and generalization made within the framework of the literature review; economic analysis and financial modeling of investment projects, economic and mathematical methods [19, 20] optimization models and methods of expert assessments in forming of an integrated efficiency index of construction megaprojects. The recommendations proposed within the framework of the article are based on the concept of sustainable construction, taking into account the specific characteristics of megaprojects, as well as specific of creating and operating of tourist clusters. Author practices in the field of megaproject development are also used in the article. [21].

The object of research is a tourist cluster, which is a group of geographically neighboring interacting companies, real estate objects of various purposes (hotels, public real estate, social and transport infrastructure facilities, etc.), public organizations and related government body authorities that form and serve tourist flows, using the recreational potential of the territory [22, 23].

The following main features of tourist clusters are distinguished:

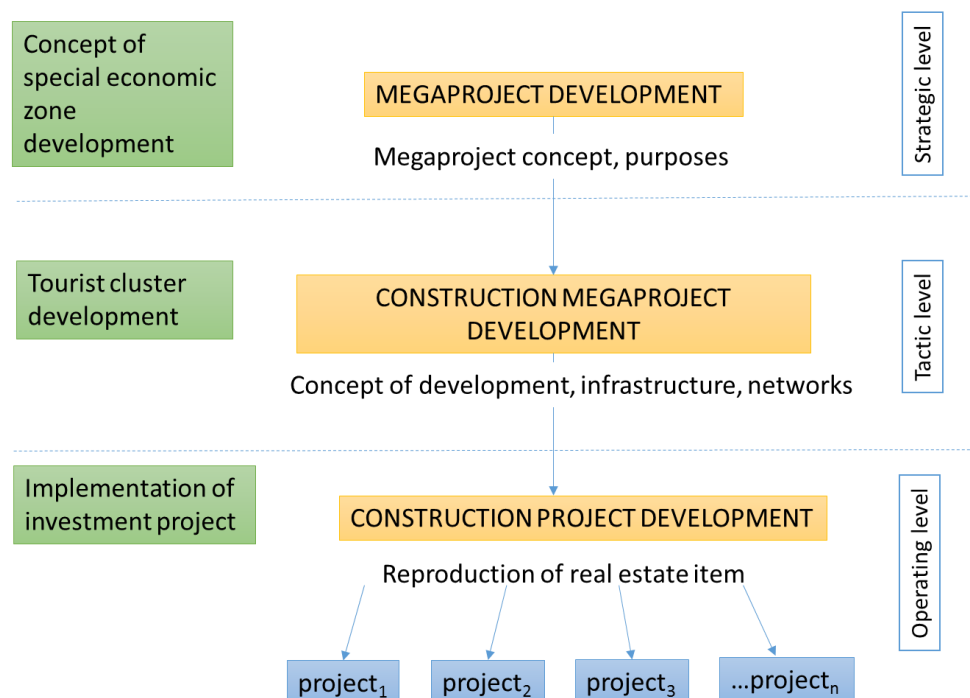
- The cluster evolves in a specific region and relies on its resource potential. The identity of the tourist cluster in one region will differ from another region identity of the cluster. From this perspective, clusters are unique economic entities;
- The cluster has the features of the project system, as it is the result of conscious organizational efforts of individuals considering cluster formation as a management project. This feature of clusters allows you to apply project management methods;

- For the formation of the cluster core and its further development, it is required to build an institutional structure where legislative initiatives are initiated and mechanisms are created to monitor the implementation of the adopted legislative acts.

An important precondition for developing of recommendations for the implementation of the concept of sustainable construction for megaprojects of tourist clusters is an integrated approach to the assessment of efficiency of investment decisions at all stages of the construction projects' life cycle.

### 3. Results

The three-level development model (strategic, tactical and operational) is proposed to be applied for implementation of construction megaprojects for the creation of tourist clusters. This model is shown in Figure 3.



**Figure 3.** The three-level development model of a megaproject for the creation of a tourist cluster

There are two basic features of efficiency distinguished within the megaproject: the megaproject's effectiveness through the state and society perspectives (hereinafter, state interests shall be understood to mean regional and local levels of government), as well as efficiency for private sector capital. Proceeding from the proposed model, efficiency from the state perspectives will be formed at the strategic and tactical levels, while the economic efficiency for a certain investor will be specified at the operational level.

Considering the concept of sustainable construction, the indicated efficiency indicators need to be clarified. It is proposed to understand the social and environmental efficiency of the project implementation as the state and public interests, while the economic efficiency should be considered from the position of a certain investor of the particular construction object.

The effectiveness of the megaproject implementation at the state and public level (G1 and G2, for the social and environmental constituents, respectively) is a function of a set of variables, like the efficiency for private capital (I). At the same time, both the state and private investors tend to maximize this effectiveness (1).

$$\left. \begin{aligned} G_1 &= f(a_1, a_2, a_3 \dots a_n) \rightarrow \max \\ G_2 &= f(b_1, b_2, b_3 \dots b_m) \rightarrow \max \\ I &= f(c_1, c_2, c_3 \dots c_l) \rightarrow \max \end{aligned} \right\} \quad (1)$$

$a_1 \dots a_n$  – set of factors determining social effectiveness;

$b_1 \dots b_m$  – set of factors determining ecological effectiveness;

$c_1 \dots c_l$  – set of factors determining economical effectiveness for investor.

In the context of the calculation of the integrated effectiveness indicator of the megaproject implementation, the value of each variable will be estimated considering its relative share (2-4). Also, the relative shares will be used to estimate the degree of influence of each three group of factors on the integral indicator (5).

$$G_1 = a_1 \times d_1 + a_2 \times d_2 + a_3 \times d_3 + \dots + a_n \times d_n \quad (2)$$

$$G_2 = b_1 \times d_1' + b_2 \times d_2' + b_3 \times d_3' + \dots + b_m \times d_m' \quad (3)$$

$$I = c_1 \times d_1'' + c_2 \times d_2'' + c_3 \times d_3'' + \dots + c_l \times d_l'' \quad (4)$$

$$(G_1 \times k_1 + G_2 \times k_2 + I \times k_3) \geq E_{\min} \quad (5)$$

$E_{\min}$  – the lowest possible estimation of integrated indicator of megaproject efficiency whereby the project can be taken into implementation (values of integrated indicator  $E$  are limited from 0 to 10);

$k_1, k_2, k_3$  – weight factors reflecting the significance of  $G_1, G_2$ , and  $I$ , respectively, when determining the integral efficiency index (determined expertly);

$d_1 \dots d_n$  – values of weight factors for the factors of integrated index of efficiency  $G_1$  (determined expertly).

$d_1' \dots d_m'$  – values of weight factors for the factors of integrated index of efficiency  $G_2$ .

$d_1'' \dots d_l''$  – values of weight factors for the factors of integrated index of efficiency  $I$ .

In order to plan development activities for the implementation of the construction megaproject, it is required to specify the key performance indicators (KPI) for a developer of individual projects within the global target program of development of the tourist cluster.

In general, the integral efficiency indicator of the development of a construction megaproject ( $Dev$ ) can be specified as follows:

$$Dev = f(C, T, Q) = f(r_1, r_2 \dots r_n) \quad (6)$$

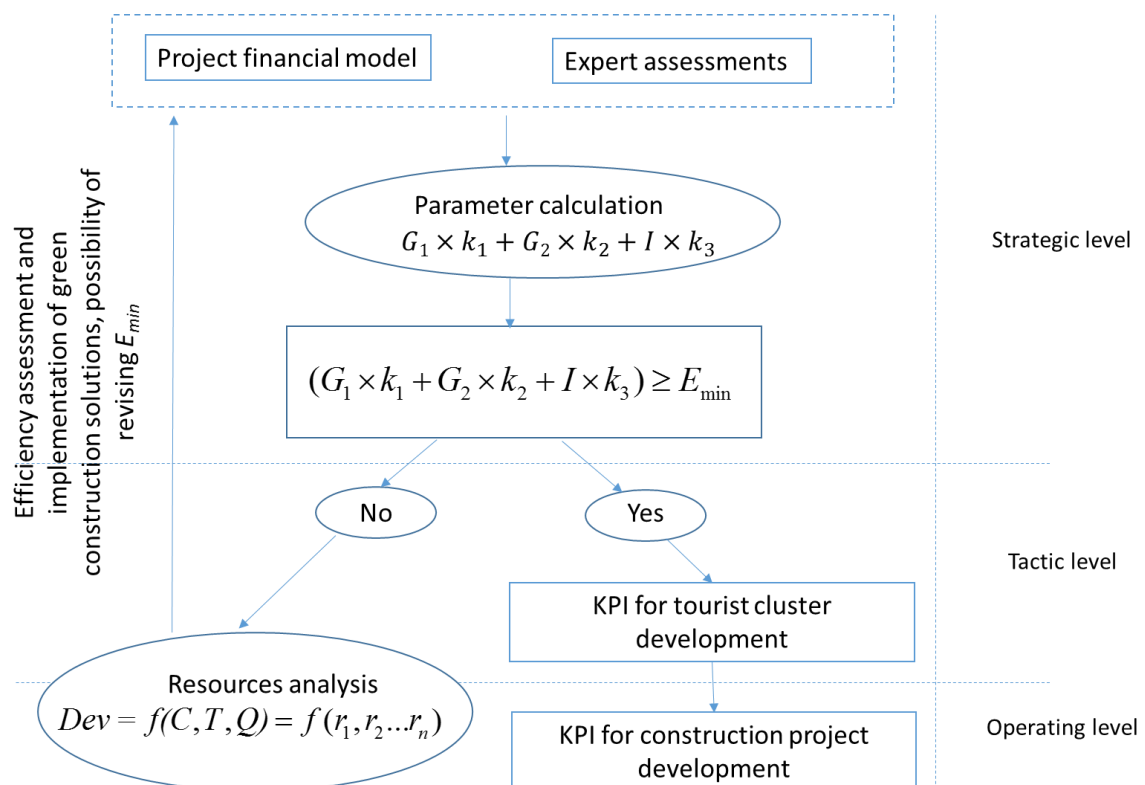
$C$  – costs for the implementation of the construction project;

$T$  – terms of the implementation;

$Q$  – quality features of megaprojects (compliance with specifications, customer requirements, etc.);

$r_1 \dots r_n$  – assessment of the quality and availability of resources for the implementation of the construction megaproject.

The algorithm of decision making about reasonability of implementation of megaproject for the tourist cluster, considering the market indicators of the project participants and the available resource base for construction, can be represented by coordination of actions (Figure 4).



**Figure 4.** Planning the implementation of the megaproject on three levels of management

Particularly, we should pay attention to the stage of effectiveness assessment and introduction of innovative technologies for green construction in order to implement the concept of sustainable construction. At this stage, the developer of the construction megaproject has 2 options:

- In the case of implementation of green construction complex of elements, it is possible to estimate the impact of the entire complex on the investment performance indicators of the project as a whole (firstly - according to the NPV indicator;
- For local solutions, it is proposed to estimate the economic effect of his solution implementation compare to traditional technology, taking into account possible additional investments and effects (direct and indirect) throughout the life cycle of the object on an annual basis.

#### 4. Conclusions

The methodical approach proposed in this article for the implementation of megaprojects for the creation of tourist clusters in Russia based on the concept of sustainable construction is the basis for arrangement and planning of development activities at the tactical and operational levels and allows estimate the effectiveness of solutions in the field of green construction.

At the same time, there are following issues that require further working out and clarification: organization of a factor space for specific examples of the implementation of megaprojects for the development of tourist clusters and the evaluation of the effectiveness of local technical innovations within the framework of the concept of sustainable construction.

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