Factors of environmentally oriented development of management technologies in construction

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Abstract. The results of research to advance the study and practice of construction management in the context of greening and transition to a green economy are presented. The basic aim of the study: is exploration of development of management technologies space available to construction managers for the development of a fully interlinked system of indices of the controls as a model of environmentally sensitive and ecosystem-based management processes. Methods of system, logical and comparative analysis are used. The study provides an overview of the institutional environment and identified the factors dictating the necessity to transform technology of project management control in construction in accordance with the environmental regulations of development and the social needs of city-building activity. Has been reasserted the importance of increasing greening needs of the population, social and environmental responsibility of the construction business is shown. The author's concept is proposed and structured system of eco-engineering project as a role model for the development paradigm of technologies for governments in construction was introduced.

1. Introduction
The current stage of development of society is marked by a matter of priority for solution of social problems and their link to improve environmental living conditions. Mainstreaming of the green economic development objectives dictates the need to develop methods and tools for regulating the economic behavior of economic units, including those related to the construction sector. Taking account the significance of town-planning and building activities for upgrading the technological relevance of production facilities, undertaking the task of social affairs and housing problems, and developing the urban environment, it is imperative to ensure good conformity assessment of construction managerial practice to requirements of environmentally sustainable development. To generate further dynamism in promoting green building practice in Russia, management methods and tools, green technical and technological resources, a system of green certification and regulatory technical standard-setting toolkit must be integrate into one system.

The methodology for developing an environmentally consistent management model is based on a multidisciplinary approach, theoretical and practical research by scientists and professionals in various subject areas. Thus, in the field of environmental research the works of scientists Telichenko V. I.,
Benuzh A. A., Slesarev M. V. [1-3], Il’ichev V. A, Kolchunov V. I., Bakaeva N. V., Kobeleva S. A [4,5] should be emphasized. The research papers of Tetior A. N. are devoted to the problems of studying the linkage between greening of the economy and sustainable construction, development of eco-efficient environmental infrastructure [6]. Issue of developing eco-buildings housing market is investigated in the works Krygina A. M. [7,8]. The works of Bobylev S. N., Porfiriev B. N. [9 -11], Pakina A. A., Gorbanyov V. A. [12] are devoted to the study of various aspects of economic modeling in the context of sustainable development, the green economy prospects as a contemporary development paradigm.

Today, in Russia, the challenges of sustainable development of territories come to the forefront of socio-economic system transformations, and the "green" economy is a means of solving them [9,10]. According to the GGEI (Global Green Economy Index) published by the American consulting company Dual Citizen LLC, in 2016, Russia was ranked 51st out of 80 countries (32.59 points) in terms of perception and 74th (38.80 points) in terms of performance [13]. Experts noted low activity in the field of green innovations and investments. In 2018, the rating covered 50 more countries. Russia's position in the overall index did not improve – 105th place with an index of 0.41. the Leaders are Sweden and Switzerland (1st and 2nd place, the index – 0.76) [14].

For the transition to a green economy, it is necessary to implement institutional changes aimed at forming a management model in the context of sustainable development of territories, economic entities and projects. This means that the emphasis in the development of management methods and tools should be shifted from quantitative to qualitative criteria, giving priority to the state of the environment and society [12].

Environmentally oriented management in construction is aimed at integrating methods and tools that ensure the greening of the processes of creating construction products throughout the life cycle. The system should cover on the one hand all the main and supporting business processes, and on the other hand-production and technological processes, investment and architectural design, organizational interaction of participants in the process of implementing construction projects. The problems of forming an environmentally oriented management in construction are not considered in isolation, but in conjunction with the functional management system of the enterprise, the directions of restructuring the construction complex, General trends in organizational and technological development of interaction schemes of participants in construction activities [15-17].

2. Materials and methods
The modern environment of management technologies development in construction is formed under the influence of various factors. Among the defining activities should be the promotion of the "green" economy model as a tool for ensuring the practical implementation of the concept of sustainable development. Today, this is a paradigm of human development recognized by all countries in the twenty-first century. In the context of sustainable development, the world community and Russia have adopted strategic documents defining the vector of development of the economy as a whole, individual sectors and territories [9, 10].

The next important factor is the development of institutions and environmental construction tools. In the context of the studied issues, the concepts of ecological construction and "green" construction will be considered as identical. Significant institutional changes have taken place in the sphere of organization and regulatory support of construction. In the first decade of the XXI century in Russia non profit organizations were created: "Green Building Council in Russia" (2009); Association of manufacturers of quality housing "GreenStroy" (2010); partnership "The Center of Environmental Certification - Green Standards" (2010). The development of construction according to environmental standards was also facilitated by the creation of self-regulating organizations. In 2009, Association "EkoStroy" was established, which started creation of the National Eco-Building Cluster of the XXI century, which unites designers, manufacturers and builders in a single cooperative, whose activities are aimed at promoting the implementation of eco-building projects and the development of environmental certification. In 2015, ANO NIIURS was established to provide services to improve
energy efficiency and environmental friendliness of construction projects. In 2016, the Technical committee on standardization of Green Technologies of Life Environment and Green Innovative Products (TC 366) was established.

Due to increased environmental construction institutions activities, regulations (mandatory and voluntary) supporting the green construction technologies promotion in the urban development projects implementation have been devised and implemented. The certification system of information and technical documentation was created: the building materials’ certification system "Vitality Leaf" (2001); "Green Standards"(2010); "Ecological Passport"(2010); Rating System of Habitat Sustainability Assessment (2011-2014); NDT reference books (2015); green standards, green technologies of living environment criteria (2019). The latest standards streamline terminology, systematize technologies and set criteria, which allows further developing of the methodology of economic evaluation of green construction technologies – from the object and work to the environment. In 2014, the first standard adapted to Russian conditions was adopted – the GREEN ZOOM system.

Due to the development of the regulatory framework, the total number of certified buildings in Russia has also increased. Until 2018, these were mostly facilities certified using the British BREEAM, American LEED and German DGNB systems. The total number of such facilities for the period from 2010 to 2019 was 130, the total area-3011, 15 thousand sq. m. The most popular system is BREEAM-72%. A significant part of certified objects are office premises (39%), and in Moscow – 80% [18]. The total number of objects in Russia certified under the GREEN ZOOM system amounted to 40 in 2018, and increased to 48 in 2019. It strikes the attention that 71% are residential objects, and 21% are office objects [19, 20].

Another significant factor affecting the development of management technologies in construction is the increasing greening of the population's needs for construction products. This manifests itself in an increased interest not only in ecological housing, but also in a broader aspect – in the urban environment that provides security, comfort, a favorable environmental environment, the preservation of natural landscapes, historical and cultural monuments. The results of research by ANO NIIURS (2019) showed that 57.9% of respondents noted a mediocre and unsatisfactory environmental situation in their place of residence [20]. Moreover, 66.5% of respondents noted the importance of the environmental factor when deciding on the choice of housing. This even exceeds the significance of the factor—the cost per square meter-64.6% (Figure 1). The state of social infrastructure is considered a priority factor for 68% of respondents, the layout of an apartment or house as a factor of comfortable living-68.4% of respondents, 20.2% of respondents noted the importance of environmental certification of finishing materials, household chemicals, and the absence of ozone-depleting components when choosing materials. The results of the survey also revealed insufficient development of social infrastructure. The analysis of the formulated wishes to developers showed that citizens identified the following aspects: reducing the number of storeys as an important factor in improving the urban environment comfort; noise isolation of apartments and houses; creating a barrier-free environment; separate waste collection and awareness of citizens about its advantages; organizing yard spaces without cars; organizing Bicycle infrastructure; creating public spaces for all groups of the population; organizing playgrounds for walking animals and increasing the number and variety of green spaces [20].
Greening the needs for construction products encourages the development of social and environmental responsibility of the construction business as an initiative activity of construction companies, which is expressed in the adoption of additional increased social and environmental requirements for construction projects, works performed and construction objects [21]. It is the responsibility of business that will allow us to find a balance between economic interests, environmental and social priorities for the development of territories in the process of implementing construction projects. A compromise is achievable. On the one hand, it is based on improving the environmental friendliness, energy efficiency and comfort of objects and territories, which ensures an increase in the investment and marketing attractiveness of objects, and the profitability of investment projects. On the other hand, based on the development of regulatory and legislative support for "green" construction (mandatory and voluntary) and financial incentives for environmental construction.

Greening needs of the population promotes community involvement in the decision-making processes for construction and development of residential areas. Collaborative design is now becoming another significant factor in the development of organizational aspects of management technologies in construction.

Implementation of the model of environmentally oriented management in construction is impossible without training of professional personnel [22]. The modern paradigm of educational programs is the integration of education technologies for sustainable development into training programs for specialists at all levels, updating the methodology of the ecosystem approach based on the relationship of economic, environmental and social components in the process of solving professional tasks and performing labor functions. Thus, professional training should equip the specialist with knowledge and skills in the field of engineering, which provides for increasing the efficiency of the construction business based on the development of technologies for environmental support of construction at all stages and processes of the life cycle of construction products. Of course, the content of engineering will differ depending on the subject area and will require some specialization of employees.

3. Results and discussion
The identified factors of development of management technologies in construction determine the choice of a methodological basis for modeling the architecture of a system of environmentally oriented methods and tools for regulating construction activities. As such, the project approach should be used, focused on transforming the business processes of construction activities based on the development of ecoengineering of the project (Figure 2).
Ecoengineering as a form of improving the environmental efficiency of the construction business specializes in providing services, performing works of organizational and managerial, investment and project, production and technological nature, including personnel and financial support. The shift in focus in management to project-oriented activities reflects the current trend of management development. Production activities of enterprises are implemented in the process of implementing construction projects. Therefore, the functions of ecoengineering are closely intertwined with the functions of project management, planning and organization of production activities of the enterprise and meet the criteria. Of the gpms Global P5 standard for sustainable project management-social, environmental and financial responsibility [23].

4. Conclusion
Thus, the main factors of environmentally sustainable development of management technologies in construction are: activities promoting a green economy model internationally and in Russia; developing institutions and products suitable to the needs of the green building practices; greening the needs of the population requirements for construction services; enhancement of corporate environmental and social responsibility of the construction industry groups; co-participating design of urban areas; greening of vocational education and training of specialists in the field of eco-engineering.

Figure 2. Elements of the project's ecoengineering system
The formation of an up-to-date model for the development of management technologies in construction is based on an ecosystem-based approach that implements the sustainable development principles and project-oriented activities through the organization of an eco-engineering system. The scope of ecoengineering covers all subject areas of the construction project, ensuring that the project outcome responds to the social and environmental priorities of industries and land development.

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