

CONCEPTUALIZING OF SUSTAINABLE-ORIENTED CONSTRUCTION PROJECT MANAGEMENT METHODOLOGY

Tetiana Fesenko

*Department of Electronic Computers, Kharkiv National University of Radio Electronics
Kharkiv, Ukraine,
ORCID 0000-0001-9636-9598*

Abstract: *The integration of sustainability into construction project management is considered in correlation with the Sustainable Development Goals (SDGs). Conceptual guidelines for the development of a focused methodology for construction project management are outlined. It is taken into account that construction is a technologically specific activity carried out within the framework of industry norms, rules, and standards. On the other hand, the parameters of "sustainability" in the context of 17 SDGs and integration with economic, environmental, and social aspects are analyzed. A matrix of the integration of SDGs into ISO standards for sustainability in building construction, which allows identifying gaps and points in the development of sustainable-oriented construction project management methodology, is presented.*

Keywords: construction project management, sustainability, sustainable development

1. Introduction

Construction projects are increasingly faced with the need to act in accordance with the requirements of thrift economy use of non-renewable energy sources and even in turbulent conditions. This, in turn, puts on the agenda a methodological issue for the implementation of project actions at a higher level of sustainability. Many construction companies are already demonstrating the practice of implementing environmental technologies to create "green buildings". At the same time, investors / developers are looking for investments for facilities that not only meet environmental standards, but also other criteria for sustainable development. Compliance with the Sustainable Development Goals (SDGs) is not only the image of a socially responsible company, but also a crucial factor for business investment success [1]. At the same time, sustainable development is not limited to caring for the environment, but also to other areas. The "coordinate system" of sustainable development for 2016–2030 defined by the 17th SDGs.

There is a shift in the focus on achieving the results of the project with sustainability values in the project management methodology. Appropriate concepts for the integration of sustainability and its application in project management developed. The GPM Global P5 Standard for Sustainability in Project Management offers a kind of harmonization of the main results of the project (quality, cost, scope, time) with the factors of its environment (social, economic, environmental aspects), as well as processes, products and their relationships [2].

Incorporating sustainability in project management at three levels offered in [3]. At the project level, it envisaged to improve project management processes, increase the maturity of sustainable development integration processes. For the management level, it is necessary to acquire and improve sustainability competencies, develop a culture of sustainable development in the project team. The third level is the development of organizational maturity in sustainable project management. In [4] the authors consider the development of a conceptual platform for sustainable project management at the level of corporate policies and practices, resource management, life cycle orientation, stakeholder engagement, and organizational learning. The authors of [5] draw attention to the maturity of project management in the context of the ability to innovate and give an example of assessing the maturity of Chernobyl Nuclear Power Plant according to the IPMA

Delta model. In general, the transition to sustainable project management requires the development of relevant creative knowledge [6], the use of agile management [7], the development of soft skills [8].

It should be noted that the issues of integrating sustainability into construction project management require knowledge of the specifics of construction technology. After all, construction projects take place in different environmental conditions, and in remote high-altitude locations, and on the water and so on. Therefore, the context of sustainable management of construction projects is not limited to "Goal 9 – Industry, innovation and infrastructure" and "Goal 11 – Sustainable cities and communities" [9]. Humanitarianism, diversity and involvement of the client / beneficiary in decision-making are important for the management of construction projects in the parameters of sustainable development [10]. Research shows that the inclusion of people regardless of their gender, age, beliefs, orientation, race, nationality, level of physical preparation for project teams contributes to the adoption of better architectural and planning (for example, train stations [11], urban projects [12]), as well as organizational decisions. According to the content analysis of the interviews of project managers on construction engineering projects, the construction of sustainable project planning (SPP) should consist of three dimensions – management control, risk response and consensus in the work [13].

The "coordinate system" of SDGs allows us to apply the green logic system, which appreciates the quality of buildings and the comfort of their indoor environment, energy saving, energy efficiency, and participatory decision making. So far, there are no corresponding effective tools, despite the general interest of construction companies in applying sustainable-oriented approaches to management processes.

2. Concept Developing of the Methodological Basis for Sustainable Construction Project Management

The methodological basics for sustainable management of construction projects recognized by International Organization for Standardization (ISO). According to the ISO, "building project sustainability" defined as a construction project management system in which elements of the ecosystem and its functions integrated, which makes it possible to increase the service life of the facility for generations [14]. Integration of sustainability principles related to buildings and other construction works envisaged by following the general principles:

- 1) achieve objectives by making fair, responsible and transparent decisions;
- 2) constantly improvement the sustainability of construction throughout the life cycle;
- 3) search for a balance of environmental protection, economic efficiency and social needs;
- 4) assessment of the impact of local projects in the global perspective;
- 5) applying a holistic approach in assessing the sustainability of the construction project;
- 6) involvement of stakeholders for multifaceted formation of the context of a sustainable construction project;
- 7) assessment of the consequences of decisions in the short, medium and long term;
- 8) precaution and risk management and risk management (management of identified risks);
- 9) sustainability of construction project management is maintained at the institutional level;
- 10) accessibility and transparency of information in decision-making processes in the sustainability of construction project management.

The above principles are considered as a basis for developing a system of criteria for assessing the sustainability of construction project management. The matrix of characteristics for assessing the contribution of the construction object to sustainable development is presented in the areas of protection and aspects of a building that affect these areas [15]. The following areas have been identified: ecosystem, natural resources, health and well-being, social equity, cultural heritage,

economic prosperity, economic capital. The standard ISO [15] proposes such characteristics of a building object in terms of sustainability as emissions to air; use of non- renewable resources; fresh water consumption; waste generation; change of land use; access to services; accessibility; indoor conditions and air quality; adaptability; costs; maintainability; safety; serviceability; aesthetic quality.

ISO standards [14] – [16] correlate with the achievement of SDGs (Table I). The lack of connection with Goals 1, 2, 16 and 17 seems quite logical. Instead, the lack of a connection to Goals 4 and 5 is debatable. Sustainability in building requires special knowledge, and therefore special educational approaches. Thus, the relationship of SDGs with ISO standards (Table I) can be considered as a certain layer of methodology for sustainable management of construction projects. "Relationships that need to be established" can be the object of further research and development of standards and methodologies for sustainable construction project management.

TABLE I. Mapping the Integration of SDGs into ISO Standards for Sustainability in Building Construction

Sustainable Development Goals (SDGs)	ISO/TR 15392 [14]	ISO 21929-1 [15]	ISO/TR 21932 [16]
Goal 1: No poverty (End poverty in all its forms everywhere)	—	—	—
Goal 2: Zero hunger (End hunger, achieve food security and improved nutrition and promote sustainable agriculture)	—	—	—
Goal 3: Good health and well-being (Ensure healthy lives and promote well-being for all at all ages)	X	x	X
Goal 4: Quality education (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all)	x	x	x
Goal 5: Gender equality (Achieve gender equality and empower all women and girls)	x	x	x
Goal 6: Clean water and sanitation (Ensure availability and sustainable management of water and sanitation for all)	x	x	X
Goal 7: Affordable and clean energy (Ensure access to affordable, reliable, sustainable and modern energy for all)	x	x	X
Goal 8: Decent work and economic growth (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)	X	x	X
Goal 9: Industry, innovation and infrastructure (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation)	X	X	x
Goal 10: Reduced inequalities (Reduce inequality within and among countries)	X	x	X
Goal 11: Sustainable cities and communities (Make cities and human settlements inclusive, safe, resilient and sustainable)	X	X	X
Goal 12: Responsible consumption and production (Ensure sustainable consumption and production patterns)	X	X	x
Goal 13: Climate action (Take urgent action to combat climate change and its impacts)	X	x	X

Sustainable Development Goals (SDGs)	ISO/TR 15392 [14]	ISO 21929-1 [15]	ISO/TR 21932 [16]
Goal 14: Life below water (Conserve and sustainably use the oceans, seas and marine resources for sustainable development)	X	X	X
Goal 15: Life on land (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss).	X	x	X
Goal 16: Peace, justice and strong institutions (Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels)	–	–	–
Goal 17: Partnerships for the goals (Strengthen the means of implementation and revitalize the global partnership for sustainable development)	–	–	–

– no correlation

X – correlation of ISO standard with SDG

x – requires correlation

Sustainable construction project management is a crosscutting goal and it is based on core visions. The first measurement, construction is a technologically specific activity carried out within the regulatory framework (international, national, local). The use of cost-effective practices / technologies and Building Information Modeling (BIM) in construction projects is becoming a mandatory component. The second measure of sustainability includes economic, environmental, and social aspects. The relationship/combination of "technological specifics of construction" and "sustainability" regulated at the level of ISO standards [14] – [16]. "The GPM Global P5 Standard for Sustainability in Project Management" (GPM P5) proposes the integration of project management approaches for sustainable development [2]. In addition, elements of sustainable development are contained in project management standards such as "Projects in a Control Environment" (PRINCE2), "Managing Successful Programs" (MSP), "A Guidebook of Project and Program Management for Enterprise Innovation" (P2M), "A Guide to the Project Management Body of Knowledge" (PMBOK). However, only PMBOK offers an extension for construction projects – PMBOK Construction [17].

3. Conclusion

The considerations explained in this contribution indicate the need to develop a methodology of sustainable-oriented construction project management. The role and importance of integration of sustainable development parameters for construction project management are outlined. The correlations between 17 SDGs and ISO standards for sustainability building (ISO / TR 15392, ISO 21929-1, ISO / TR 21932) are presented. This approach allows identifying gaps and points in the development of sustainable-oriented construction project management methodology.

It is established that the existing studies of sustainable-oriented construction project management have not yet presented the development of methodological procedures for extrapolating project management processes (PMBOK Construction) on the context of GPM P5, ISO and SDGs.

The proposed focus on the conceptualization of sustainable-oriented construction project management methodology requires special in-depth scientific and practical understanding. The development of a model for assessing the sustainability of construction project management seems promising. The assessment tool can be presented in the form of a matrix of sustainability characteristics, which deepens the integration of SDGs in the "body of knowledge" PMBOK Construction. The mathematical model and methods of its application can be useful in decision-

making in construction projects for the reconstruction of Ukrainian cities destroyed by the Russian invasion. Infrastructure of Ukrainian cities needs to be rebuilt taking into account the new safety vision (with underground shelters), "green" technologies, as well as European standards of quality of life.

4. Acknowledgements

This work was supported by the University of Lodz, as part of a scholarship for scientists from Ukraine.

5. References

- [1] Green transformation in the real estate market, 2022. [Online]. Available: <https://www.propertynews.pl/wydania-specjalne/artykul/zielona-transformacja-na-ryнку-nieruchomosci-zobacz-raport-propertynews-pl,98397.html>. Accessed: May 14, 2022 (in Polish).
- [2] The GPM P5™ Standard for Sustainability in Project Management. GPM Global. Version 2.0, 2019.
- [3] G. Silvius, R. Schipper, J. Planko, J. Brink and A. Köhler, "Sustainability in Project Management". Great Britan, 2012.
- [4] S. Armenia, R. Dangelico, F. Nonino and A. Pompei, "Sustainable Project Management: A Conceptualization-Oriented Review and a Framework Proposal for Future Studies". Sustainability, vol. 11, pp. 2664, 2019. doi: 10.3390/su11092664.
- [5] S. Bushuyev and R. Wagner, "IPMA Delta and IPMA Organisational Competence Baseline (OCB): New approaches in the field of project management maturity", International Journal of Managing Projects in Business, vol. 7(2), pp. 302–310, 2014.
- [6] A. Voitushenko and S. Bushuyev, "Development of project managers' creative potential: Determination of components and results of research", Advances in Intelligent Systems and Computing, 1080 AISC, pp. 283–292, 2020.
- [7] V. Obradović, M. Todorović and S. Bushuyev, "Sustainability and Agility in Project Management: Contradictory or Complementary?", 2018 IEEE 13th International Scientific and Technical Conference on Computer Sciences and Information Technologies. CSIT 2018 – Proceedings. vol. 2, pp. 160–164, 2018. doi: 10.1109/STC- CSIT.2018.8526666.
- [8] L. Fuentes-Ardeo and J. R. Otegi-Olaso, "Sustainable project management versus responsible project management: evolution or complement", EURO PM IRC 2021 Dortmund International Research Conference, pp. 22–28, 2021.
- [9] G. Fesenko, V. Korzhenko, T. Fesenko, T. Bilousko and H. Fesenko, "Gender Diversity" as a constant in Sustainable Development Program Management". 2021 IEEE 16th International Conference on Computer Sciences and Information Technologies (CSIT), pp. 371-374, 2021. doi: 10.1109/CSIT52700.2021.9648756.
- [10] T. Fesenko, A. Shahov, G. Fesenko, N. Bibik and V. Tupchenko, "Modeling of customer-oriented construction project management using the gender logic systems". Eastern-European Journal of Enterprise Technologies, vol. 1, № 3(91), pp. 50–59, 2018. doi: 10.15587/1729-4061.2018.123124.

- [11] T.G. Fesenko, G.G. Fesenko, D.M. Minaev and A.V. Yakunin, "Project scope modelling of architectural and spatial accessibility of railway stations", Bulletin of the National Technical University "KhPI". Strategic Management, Portfolio, Program and Project Management Series, № 2 (1278). pp. 59–68, 2018. doi: 10.20998/2413-3000.2018.1278.9. (in Ukrainian).
- [12] T. Fesenko, G. Fesenko and N. Bibik, "The safe city: developing of GIS tools for gender-oriented monitoring (on the example Kharkiv city, Ukraine)", Eastern-European Journal of Enterprise Technologies, № 3/2(87). pp. 25–33, 2017. doi: 10.15587/1729-4061.2017.103054.
- [13] M. Yu, F. Zhu, X. Yang, L. Wang and X. Sun, "Integrating Sustainability into Construction Engineering Projects: Perspective of Sustainable Project Planning", Sustainability, vol. 10, 784, 2018. doi: 10.3390/su10030784.
- [14] International standard ISO 15392: 2019. Sustainability in buildings and civil engineering works – General principles, Geneva, 2019.
- [15] International standard ISO 21929-1. Sustainability in building construction – Sustainability indicators – Part 1: Framework for the development of indicators and a core set of indicators for buildings, 2011.
- [16] International standard ISO/TR 21932: 2013. Sustainability in buildings and civil engineering works – A review of terminology, 2013.
- [17] A Guide to the project management body of knowledge Construction (PMBOK® Guide). USA: Project Management Institute, 2016.