

EVALUATION OF PUBLIC PROJECTS IN THE LIGHT OF SUSTAINABILITY

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Abstract

The Sustainable Development Goals (SDGs) represent a global standard of sustainable development priorities and goals at economic, social, and environmental levels. Public projects contribute to the implementation of the SDGs because their priority is to generate economic and social benefits for society and to preserve the environment. Objective answers about project alternatives can only be obtained by evaluating them from several perspectives and using several indicators rather than a single dominant one, i.e., by applying multi-criteria evaluation methods. The research problem stems from the diversity of impacts of public projects, the complexity of their identification, and the need for their comprehensive evaluation. Research aim: After having analysed the specific characteristics of public projects, to develop a methodology for evaluating them in the light of the SDGs and to empirically test this methodology. Research methods: synthesis of theoretical insights, situation modelling, logical analysis, case study, and multi-criteria evaluation method SAW (Simple Additive Weighting).

The main outcome of the research is the development of a methodology for the evaluation of public projects in relation to the implementation of the SDGs, which includes four main steps: analysing the objectives and expected outcomes of the projects under evaluation; identifying the impact of the project on the implementation of the SDGs; determining the significance of the impact of the project on the implementation of the SDGs; and combining the evaluation indicators into a single aggregated indicator. Based on the developed methodology, an empirical study was conducted to evaluate 10 investment ideas of one municipality and to select the most efficient investment option in terms of sustainability.

Keywords: *public projects, sustainable development goals (SDGs), multi-criteria evaluation methods.*

JEL codes: *H43, H54.*

Introduction

The state's objective is to create public wealth, meet the needs of society, and improve the efficiency of public services – education, employment, poverty reduction, and social exclusion. Countries invest in the public sector: investments are used to serve the public interest, solve public problems, provide public goods, and modernise public infrastructure. Public investment is an important tool for economic development and growth, put into practice through the design and implementation of public projects.

At the 70th session of the United Nations on 25 September 2015, the General Assembly adopted the Resolution “Transforming Our World: The 2030 Agenda for Sustainable Development”. The agenda outlines 17 Sustainable Development Goals (SDGs). The goals are based on the three pillars of sustainable development (environmental, social and economic), covering poverty, inequality,

food security, health, sustainable consumption and production, growth, employment, infrastructure, sustainable management of natural resources, climate action, gender equality, peaceful and inclusive society, and more.

When making an investment decision, it is important to evaluate the efficiency of projects. As public projects are intended to benefit society, it is appropriate to assess them in terms of sustainability. Sustainability is based on a number of conditions: it is about improving the quality of life and well-being, looking at what is happening now and what is likely to happen in future generations, achieving full equality and a rule of law, and living in a way that respects the ecosystem and protects nature. Sustainability is about creating the right conditions to meet people's diverse needs, focusing not only on the development of physical infrastructure, but also on the well-being of society and the surrounding

environment, in order to create a sustainable balance between social, economic, and ecological aspects (Agyeman, 2008). The concept of sustainability is very close to the evaluation of the efficiency of public investment projects: it means a sustainable, growing society, where various resources are used efficiently and sustainably; where health is protected by creating a safe, pleasant, and aesthetic environment; where natural diversity is valued and protected; and where everyone has equal rights to have their cultural needs met and to enjoy recreation and leisure, while respecting the basic interests of the environment.

Public projects are designed to implement sustainability strategies and, unlike business projects, they do not aim for profit and may not be financially viable, but they do aim for public goods and social benefits (Baranauskienė, 2015). The primary objective of public projects is to meet public needs from a social, economic, and environmental point of view, which is in line with the main goals of sustainable development.

Public investment projects are multi-faceted and must be fully evaluated and justified before an investment decision is taken.

Research problem: What methods and indicators can be used to measure the benefits (harms) generated by public projects in terms of sustainability?

Research object: evaluation of public projects.

Research aim: After having analysed the specific characteristics of public projects, to develop a methodology for evaluating them in the light of the SDGs and to empirically test this methodology.

Research objectives:

1. To provide an overview of methods for evaluating public projects;
2. To develop a methodology for evaluating public projects in line with the SDGs;
3. To empirically test the developed methodology by evaluating investment alternatives of one municipality.

Research methods. To achieve the research aim and research objectives, the following general research methods were applied: synthesis of theoretical insights, situation modelling, logical analysis, case study,

and multi-criteria evaluation method SAW (Simple Additive Weighting).

Given the correlation between the SDGs and the objectives of public projects, it can be noted that public projects are being developed to implement the SDGs. Usually, it is the cost-benefit analysis method that is used for the evaluation of public projects: it is used to assess the investment and operating costs and the benefits generated by the public project, which can be expressed in monetary units over the period of the evaluation of the project (Baranauskienė, 2015).

The theoretical principles of the cost-benefit analysis have been elaborated by D. W. Pearce et al. (2006); Nooij (2011); Florio et al. (2018); Koopmans, Mouter (2020); and Bardal (2020). It is a systematic, quantitative approach to the evaluation of investment projects that allows the identification and evaluation of the long-term financial and economic consequences of projects in terms of benefits and harms. The main aim of this analysis is to show the benefits (financial and socio-economic) of a project in relation to the investment and to evaluate the risks of implementing the project. The financial benefits can be expressed in terms of the increase in revenue generated by the project. The socio-economic benefits of a given project are manifested in the positive economic and social impact it has on an area, region, or country. These benefits can be expressed in terms of cost savings resulting from the implemented activities of the public investment project and/or indirectly in terms of income generated or increased through improvements in the social environment. The cost-benefit analysis includes a financial, economic, and risk assessment of the project. One of the main limitations of the cost-benefit analysis is that only benefits measured in monetary values can be included in the calculations, which leads to inaccurate evaluation results.

There are other methods used to evaluate public projects. The Hexagonal Model focuses on an integrated vision of sustainability; it is based on four different types of highly connected capital (government, customer, bank, professional organisations) (Mardani et al., 2015).

The Analytical Hierarchy Process consists of breaking down a complex decision-making process into a hierarchical structure. All project criteria and alternatives are compared in pairs. However, it is not convenient to use this method when there are many project criteria and alternatives (Saaty, Vargas, 2012). The Pareto Principle method is used to solve multi-criteria selection problems or to find the optimal solution among alternatives using automatic decision support systems; in particular, it selects a set of alternatives from an initial set of alternatives (Grierson, 2008, Filatov, 2012). Life Cycle Analysis is a forecasting tool used by individuals or companies in industrial settings. Life cycle analysts are interested in predicting future materials/costs on a regional or global scale, taking into account differences in economic growth and regulatory scenarios (Tomašević, 2010). Life Cycle Assessment (LCA) examines the environmental impacts of a product or service throughout its life cycle. Such an evaluation makes it possible to analyse the real environmental burdens arising from the various processes involved in the project: extraction of raw materials, production process, consumption, and waste disposal. The calculation of life cycle costs provides a realistic view of what the costs of a product or activity will be over the lifetime of the project (Oželienė, Drejeris, 2015). The Net Present Value approach helps to estimate the expected future returns by taking into account financial, social, and economic resources (Valiulė, Zonienė, 2018; Liesen et al., 2013)

V. Kazlauskienė (2015) presented a methodology for evaluating public projects by using social discount rates; L. Jasiukevičius and A. Vasiliauskaitė (2015) provided empirical evidence on the impact of the methodology of public investment projects on the measured values of intangible liabilities in Lithuania. Kerzner (2017) and Kasaija (2018) advocate a

systematic approach to planning and control in the design and evaluation of public projects. Volden (2019) and Aparicio (2016) link the evaluation of public projects to strategic objectives, expected benefits, and outcomes. Miranda et al. (2021) highlight the importance of evaluating the full impact of public projects and the efficient use of resources.

The literature analysis has shown that the methods used to evaluate public investment projects do not fully reflect the basic concept of public projects, do not help to evaluate all the benefits generated, and do not take into account the concept of sustainable development.

Methodology

The evaluation of public projects can be associated with a case study, which seeks to understand the totality of a phenomenon and its uniqueness in a particular setting and time, and its impact on a particular social group or environment. Case studies are not generalisable to a wider population (Baranauskienė, 2015), just as the results of the evaluation of one public investment project cannot be directly applied to another project. Every public investment project has some unique features and some universal features, i.e., it might be similar to another project. Similarities between projects can be used to evaluate projects without overlooking exceptional circumstances that may substantially change the results of the evaluation.

The evaluation of public projects with regard to the SDGs can be carried out by an expert/a panel of experts with knowledge and experience in the design, evaluation, and implementation of public projects, as well as knowledge of sustainability and the SDGs.

The steps involved in evaluating public projects in the light of the SDGs are detailed in Figure 1.

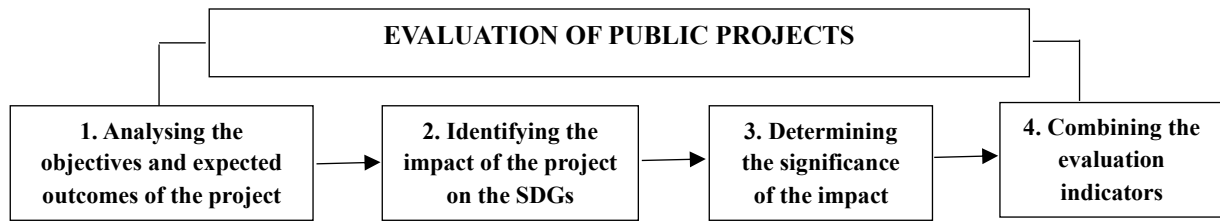


Figure 1. Steps for evaluating public projects in the light of the SDGs

In the first step, the objectives and expected outcomes of the project are detailed. The objectives and expected outcomes of the project are analysed in the light of the SDGs. Table 1 outlines the short titles of the SDGs.

Table 1. The short titles of the 17 SDGs

No poverty (SDG 1), Zero hunger (SDG 2), Good health and well-being (SDG 3), Quality education (SDG 4), Gender equality (SDG 5), Clean water and sanitation (SDG 6), Affordable and clean energy (SDG 7), Decent work and economic growth (SDG 8), Industry, innovation and infrastructure (SDG 9),	Reduced inequalities (SDG 10), Sustainable cities and communities (SDG 11), Responsible consumption and production (SDG 12), Climate action (SDG 13), Life below water (SDG 14), Life on land (SDG 15), Peace, justice, and strong institutions (SDG 16), Partnerships for the goals (SDG 17)
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As the aim of implementing public projects is to achieve a wide range of economic, environmental, and social benefits, one project can contribute to the implementation of several SDGs. It should be noted that in some cases, the impact on some SDGs may be positive, while on others, it may be negative. Therefore, after examining the objectives and expected outcomes of the project, the second step involves identifying

whether the impact of the project is positive (1), neutral (0), or negative (-1) for each of the SDGs on a scale of < 1, 0, -1.

In the third step, the significance of the impact of the project on the SDGs is determined using a 5-point scale (Figure 2). The significance for the SDGs is assessed by an expert/a panel of experts who have the necessary competence.

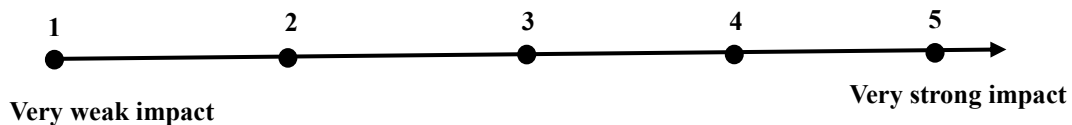


Figure 2. A scale for determining the significance of the impact of the project on the SDGs

In recent years, multi-criteria evaluation methods have been increasingly applied to the qualitative and quantitative evaluation of complex economic and social phenomena (Schieg, 2009; Eslami et al., 2022; Juričić et al., 2020; Henke et al., 2020; Broniewicz, Ogrodnik, 2020). Objective answers about investment alternatives can only be obtained by evaluating them from several perspectives and using several indicators rather than a single dominant one, i.e., by applying multi-

criteria evaluation methods. Multi-criteria evaluation methods can be used to evaluate public projects, as they provide the opportunity to quantify the benefits of the project in terms of a number of different quantitative and qualitative indicators, while maximising and minimising the indicators provide the opportunity to evaluate the benefits and harms generated by the public project.

It is the multi-criteria evaluation method Simple Additive Weighting (SAW) that has

been widely used in various economic calculations to combine different indicators of the projects under evaluation into a single comparable indicator. In the fourth step, the estimates of the impact of public projects on SDGs in terms of significance are combined using the SAW method:

$$S_j = \sum_{i=0}^m \omega_{ij} r_{ij} \quad (1)$$

here: S_j is the multi-criteria evaluation value of the j -th project; ω_{ij} is the weight of the i -th indicator of the j -th project; r_{ij} is the value of the i -th indicator for the j -th project.

The multi-criteria evaluation method SAW makes it possible to combine both the indicators being minimised and those being maximised, which allows for the evaluation of both the positive and negative impact of the project on the SDGs. The multi-criteria

evaluation method SAW is described in greater detail in research papers by Chen (2012); Puspa (2019); and Dobrovolskiene, Pozniak (2021).

It should be noted that the financial criterion has been eliminated in the methodology. This criterion is not essential for the evaluation of public projects, as public projects are not precisely aimed at generating financial benefits, but their main aim is to generate social and environmental benefits for society, which is rarely financially efficient.

Research results

The municipality has formulated ideas for possible projects, and, with limited funding resources, investment alternatives need to be chosen. The objectives and expected outcomes of public projects are detailed in Table 2.

Table 2. Summary of the analysis of the objectives and expected outcomes of public projects

No.	Project title	Main objectives, expected results
1	Street reconstruction	The aim of the project is to reconstruct a busy section of the street, increasing the attractiveness of the city for residents and businesspeople. Due to reduced congestion, a decrease in accident rates and less air pollution are expected.
2	Construction of a multi-purpose sports arena	Sports, creative, educational, and leisure activities are organised for community members of all ages. The project also aims to address the issue of youth employment by improving young people's health and reducing their engagement in harmful habits and criminal activities.
3	Building a pier on a river flowing through the city	The construction of the pier for recreational purposes will provide the opportunity to offer additional services for residents, create a new centre of attraction, and encourage the formation of new businesses. The natural biodiversity of the area may be damaged and additional pollution may be caused.
4	Construction of a cycle path	The construction of a cycle path will ensure safe cycling and promote active leisure activities.
5	Construction of a recreational area in the city square	The construction of the main centre of attraction will change the aesthetic and functional parameters of the area. It will meet the socialisation needs of the community members and create opportunities for starting new businesses. It could lead to a reduction in green spaces in the city.
6	Repairing the drainage system in one residential neighbourhood in the city	Restoring the effective functioning of the drainage system will result in more efficient communication as well as better, more aesthetic living conditions, and minimise health problems caused by flooded manholes.
7	Airport expansion	The airport expansion will increase the attractiveness of the city and opportunities for local residents. Tourists will generate additional income. There will be more noise and pollution.
8	Reconstruction of water supply and wastewater systems	The reconstruction of water supply and wastewater systems will improve sanitary conditions that affect the health of the residents, reduce pollution and save natural resources.

9	Development of an industrial district of the city	The development of public infrastructure in the industrial district will encourage the expansion of businesses and the creation of new jobs. Industrial development can lead to increased pollution.
10	Installation of a solar park for public purposes	The infrastructure created will ensure the use of electricity from renewable sources for public purposes.

The analysis of the objectives and expected outcomes of the projects suggests that the majority of the projects are not directly involved in the implementation of the SDGs, but contribute to the policy of the SDGs through indirect impacts.

The potential impact of the project on the SDGs is estimated on a scale of +1, 0, -1, taking into account the objectives of the project.

Table 3. The impact of the project on the SDGs identification

SDG	Project Number									
	1	2	3	4	5	6	7	8	9	10
SDG1	0	0	0	0	0	0	0	0	0	0
SDG2	0	0	0	0	0	0	0	0	0	0
SDG3	1	1	1	1	1	1	-1	1	-1	0
SDG4	0	1	0	0	0	0	0	0	0	0
SDG5	1	1	1	1	1	1	1	1	1	1
SDG6	0	0	0	0	0	1	0	1	0	0
SDG7	0	0	0	0	0	0	0	0	0	1
SDG8	1	0	1	0	1	0	1	0	1	1
SDG9	0	0	0	0	0	0	1	1	1	1
SDG10	0	0	0	0	0	0	0	0	0	0
SDG11	1	1	1	1	1	1	1	1	1	1
SDG12	0	0	0	0	0	0	0	0	0	0
SDG13	1	0	0	1	-1	0	-1	0	-1	1
SDG14	0	0	0	0	0	0	0	0	0	0
SDG15	0	0	-1	-1	0	0	-1	1	-1	0
SDG16	0	0	0	0	0	0	0	0	0	0
SDG17	0	0	0	0	0	0	0	0	0	0

The evaluation of the significance of the impact of public projects on the SDGs, where 1 means a very weak impact and 5 means a very strong impact, is shown in Table 4. SDGs that are not impacted by any of the projects have been eliminated from this table.

Table 4. The significance of the impact determination

SDG	Project Number									
	1	2	3	4	5	6	7	8	9	10
SDG3	3	3	1	3	1	2	-1	5	-2	0
SDG4	0	3	0	0	0	0	0	0	0	0
SDG5	1	1	1	1	1	1	1	1	1	1
SDG6	0	0	0	0	0	4	0	5	0	0
SDG7	0	0	0	0	0	0	0	0	0	5
SDG8	1	0	1	0	1	0	3	0	4	2
SDG9	0	0	0	0	0	0	3	1	5	0
SDG10										
SDG11	4	2	3	2	3	2	4	4	2	3
SDG13	2	0	0	2	-1	0	-3	0	-3	4
SDG15	0	0	-1	-1	0	0	-1	1	-2	0

By using the multi-criteria evaluation method SAW, the parameters of the evaluation of public projects are combined into a single comparable indicator, which makes it possible to select the most

efficient investment option in terms of sustainability. The aggregated indicators of the projects under evaluation are presented in Figure 3.

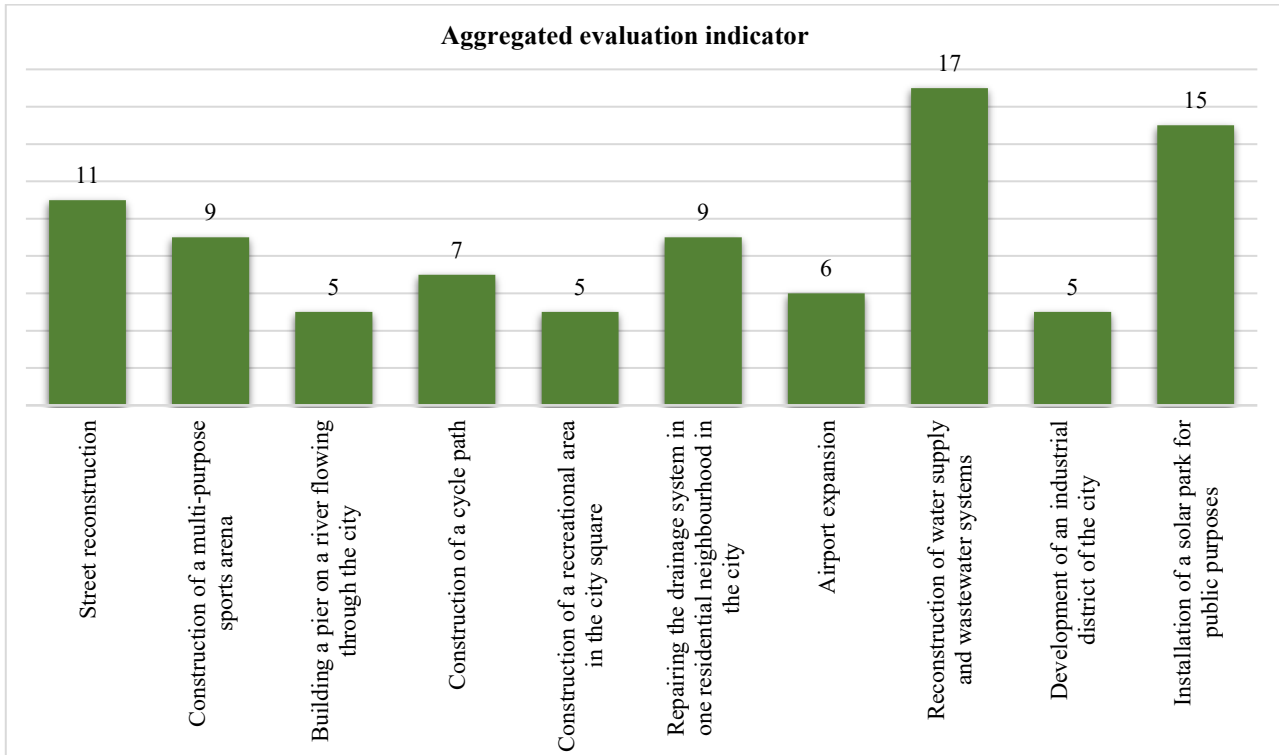


Figure 3. Aggregated indicators of public projects under evaluation

Having evaluated the investment ideas of one municipality in the light of the SDGs, it can be stated that Project No. 8 “Reconstruction of water supply and wastewater systems” has the highest positive impact on the achievement of the SDGs, with the highest aggregated evaluation indicator.

In conclusion, the methodology developed for the evaluation of public projects makes it possible to compare very different investment alternatives in terms of their positive and/or negative impact on the SDGs and to select the most efficient alternative in terms of sustainability.

Conclusions

The SDGs are a set of objectives for future development. It was developed by the United Nations to promote these objectives as international sustainable development goals. Lithuania has also made an active contribution to the implementation of these goals. The

SDGs are about reducing poverty, hunger, inequality and improving public health, gender equality, education, innovation, conservation of natural resources, climate action, and more.

Unlike private projects, public projects do not generate net revenue (or not enough revenue to be financially viable). Instead, they generate indirect economic, social, and environmental benefits for society. The main aim of these projects is to meet the needs of society. Public projects are designed and implemented to improve the socio-economic environment of the population and preserve nature. It can be stated that the implementation of public projects contributes to the implementation of the SDGs.

The methodology developed for evaluating public projects in relation to the implementation of the SDGs includes four main steps. The first step involves an analysis of the objectives and expected results of the projects under evaluation. In the second step, the impact of the project on the implementation of

the SDGs is identified, which can be positive, neutral, or negative. The third step involves an expert evaluation to determine the significance of the impact of the project on the implementation of the SDGs, using a ranking scale. In the fourth step, the multi-criteria evaluation method SAW is used to combine the evaluation indicators into a single aggregated indicator, which allows for a comparison of the alternatives under evaluation and for the selection of the one that most closely reflects the implementation of the SDGs.

While the financial criterion has been eliminated in the methodology for the evaluation of public projects, this criterion is not essential for the evaluation of public projects, as the objectives of these projects are focused on the creation of social and environmental benefits.

To test the methodology developed for the evaluation of public projects, an empirical study was conducted to evaluate 10 investment ideas of one municipality. The consistent evaluation of the projects following all the steps set out in the methodology resulted in an aggregated indicator that allowed for a comprehensive look at the investment options and the perspectives of each SDG, and the selection of the most efficient investment option in terms of sustainability.

The methodology developed for the evaluation of public projects in relation to the implementation of the SDGs can be easily applied in practice in state and municipal institutions to make efficient use of financial resources, i.e., the most efficient investment option in terms of sustainability can be chosen with limited financial resources.

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