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Selection of Regional Sustainable Development Project Using the Method of Multiple-criteria Optimization

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Abstract

The purpose of this article is to reveal the method of multiple-criteria optimization for the selection of regional sustainable development projects. Projects for regional sustainable development in the strategic planning are currently considered as an important instrument sustaining competitiveness and productive capabilities of the European economy and supporting developing areas, as an aim of the Europe 2020 strategy. Methodology. European countries implement national strategies by using the broad methodology of project management for reaching strategic aims. In such a context, it becomes necessary to provide a generalized method of projects' evaluation and their selection by the corresponding committees, proceeding from the best international practices and effective policy guidelines. Thus, the aim of this paper is to provide multiple-criteria method for the selection of the optimal regional development project out of the number of competing alternatives. Results. This paper reveals the decision-making process behind the expert selection of the most competitive project, based on a set of following criteria: social, economic, ecological and budgetary efficiency. Our method is as follows: we are considering all the available components of efficiency through the lens of integral factor. For each component we propose a set of local indicators that describe its degree of efficiency in comparable values. The projects of Dnipropetrovsk regional state administration of Ukraine are considered as main case of this study. To analyze them we use the methodology of multiple-criteria evaluation of regional sustainable development projects. As a result of this process it becomes possible to choose the optimal project for regional development out of wide array of projects being filed by the applicants. Value/originality. Value and originality of the multiple-criteria optimization method is the capability to provide the selection of regional sustainable development project on the base of clear criteria which precludes the possibility of corruption and unfounded decisions being taken by the authorities during the process of the planning the economic activities. As current method of decision-making is based on quantitative

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assessments of projects' value, government and local government representatives are guided by a common vision and subjective impressions on the application. The advantages of the proposed method are methodological simplicity, flexibility and universality, which are crucial in the multiple-criteria decision-making in public administration. One of the advantages of this method is that it allows providing a justification for the results and conclusions of the selection process.

Key-words: Multiple-criteria Optimization, Components of the Efficiency, Regional Sustainable Development Project, Evaluation, Selection, Ukraine.
JEL Classification: A13, B16, C18, C30, H76

1. Introduction

As the project approach becomes increasingly popular within the managerial practice, it becomes more important to guarantee the fair selection of the regional development projects. Such selection is based on the integrated strategic vision, coherent synergy, revealing priorities behind the process of decision-making. Managerial practice defines regional development projects as initiatives aimed at qualitative changes in the state of territorial communities and regions, creation of favourable conditions for economic development, improvement of inhabitants' well-being with the as well as the preservation of ecosystem (Matveieva, 2017). Such initiatives are provided due to the improvement of the quality of human capital and the capacity of institutions, the wider use of new knowledge and skills, optimization of algorithms and practices of the work, the expansion of material, technical, and financial capacity, as well as the expanded usage of the existing potential of communities in all their diversity. Therefore, it is important to guarantee, that the development project, designed to become an efficient, goal-oriented instrument, could solve a problem set in a complex way. And it must be oriented towards the precisely formulated and achievable goals and results that are clearly tied to the priorities and objectives of the sustainable development strategy and the relevant programs.

In order to achieve such results, Ukraine has initiated the practice of competitive selection of investment projects that could be financed from the regional budget and the state budget funds received from the European Union. According to the integrated approach, the projects submitted for expert evaluation should focus on obtaining qualitative, socially relevant and significant changes. They are also meant to use a wide range of tools for the solution of local problems and provide a long-lasting socio-economic effect after the end of their implementation.

Accordingly, the complex approach involves an evaluation of a large-scale regional development project not solely proceeding from the the indicators of commercial or social efficiency, but also based on the anticipated socio-economic and environmental impacts, taken synchronously. Such impacts determine the macroeconomic interests of the region and state as a whole, because the

level of state‘s development depends directly on the activity and efficiency of local, points of growth, which were created and are currently working as the successful regional development projects. Therefore, Therefore, main goal of the complex approach is the projected maximization of tax revenues in both local and state budget, along with the contribution to the gross regional product and gross domestic product.

Thus, the managerial task of the adequate selection of regional development projects for obtaining budget support essentially remains the multicriterial process. That is why it requires a special integrated approach based on the usage of multiple-criteria optimization. The aim of our research is to develop a methodology for selection of an optimal regional development project based on the usage of multiple-criteria optimization method.

To achieve this goal, we are solving the following tasks:

- Identification of the main components of the regional development projects’ efficiency and determination of their limits;
- suggestion of an appropriate set of indicators, characterizing the level of efficiency for each component;
- development of an indicators’ scale of value, determining the efficiency of the regional development project;
- drafting a methodology for multiple-criteria assessment and a further selection of projects, its application to the projects of Dnipropetrovsk regional state administration of Ukraine within the framework of the strategy of regional sustainable development.

2. Literature Review and Methodological Approach

Attention to the problem of multiple-criteria optimization was first drawn by V. Pareto in the mathematic study of economic processes. Later, the interest in the multitude of criteria optimization for the evaluation of different processes began to increase. Currently the multiple-criteria optimization usage has become a mainstream approach not only in the economic and technical sciences but also within the domain of administration management. In particular, this method is relevant for the selection of projects for regional development.

The analysis of recent publications shows that the problem of multiple-criteria optimization attracts the attention of scientists both in theoretical (Ginevičius, Gedvilaitė, Stasiukynas & Čepel, 2018; Shchepotyev, 2012; Hromko, 2015; Balcerzak, 2016; Tesliuk, 2018) and applied (links to

works missing) aspects. Some authors emphasize the difficulties of choosing investment projects from among others in situations of increased risk and uncertainty (Dolinsky, 2013; Kotsyuba, 2017). To solve this problem other scholars suggest using fuzzy logic tools or fuzzy (Dolinsky, 2013). Another approach, used to choose from the several variants in the situation of risk and uncertainty is model of the optimal investment solution, which is based on combination of local criteria (Kotsyuba, 2017).

Separate studies are devoted to the analysis of the multiple-criteria task of optimization of the portfolio of investment projects, where the criteria is the importance of such indicators of investment projects as the net present value, the internal rate of return, and the payback period of investments is crucial (Stadnyk, 2012). Several scientific works consider the problem of selecting the projects based on theother approaches. For example, Rudenko and Andriyevskaya (2016) proposed the approach to the projects' evaluation and selection in the context of uncertainty and lack of information, proceeding from the probability theory. Osaulenko (2016) shows the method to optimize the portfolio of regional investment projects by combining them into clusters. Author proposes to group the projects, which are close to certain criteria and adjust the depth of the hierarchical cluster tree (Osaulenko, 2016).

Lintner (1975) suggested the methodology for assessing risk assets and selecting risky investments for the budgets. Later it was complemented with the alternative criteria for decision-making, such as justice, economic development and external environmental impacts (Berechman, Yan & Xiaoyu, 2018). In 2018, Cayir & Dursun analyzed the case within a sustainable energy sphere through the prism of a multifunctional approach to decision-making, based on investment planning. In 2017, Zhong & Kuby developed a multi-purpose optimization model for allocating affordable investment to observe the transport industry case. Cristóbal (2011) considered the decision-making process behind the process of projects' selection, using the method of multiple criteria analysis. Dickinson, Thornton and Graves (2001) explored the optimization of interconnected projects throughout several isolated periods. In addition, certain scholars have been developing and improving methods of projects' selection, using financial analysis tools (Roychaudhuri, Kazantzi, Foo, Tan & Bandyopadhyay, 2017).

In this article, we take a group of multiple-criteria optimization methods that focus on constructing an integral index as a basis.

As the analysis of the abovementioned scholarly works testifies, that most of the methodological recommendations for project selection are quite difficult to implement in practice. This is why in many cases selection committees continue relying on method of expert evaluations,

which is ill famous for the factor of subjectivity. Another significant downside – insufficiently high level of the validity on the criterion of complex socio-ecological and economic efficiency. Consequently, there is still a need for a further development of a universal model for the selection of regional development projects, and we are looking to contribute to this field by suggesting a model, based on the indicator of integral efficiency.

3. Research Design and Results

During past years, the regional development projects in the Ukrainian economy are considered as an effective instrument for implementing economic policy in the regions. They allow solving a complex set of problems to encourage social, ecologic, economic and institutional development of territories. The emergence of such projects, meeting the requirements of the efficiency criteria, makes it possible to formulate the strategic goals of the region in the production of goods and services offered by both enterprises and local authorities.

During the implementation of measures for local and regional development, one can face certain external effects, which could be either positive or negative for the community. An example of such a positive effect can be the utilization of various types of waste, which benefits not only sellers but also consumers of services. Conversely, a profitable chemical plant, a 'city-forming' enterprise, a major regional taxpayer polluting the atmosphere, triggers an external negative environmental effect of production.

From a managerial position, it is important to predict the potential impact of the project on the social, ecological and economic situation in the region at the stage of project planning.

Solving this complex and multilevel managerial task requires using system analysis, a discipline dealing with decision-making in situations where the choice of alternative requires procession of complex information from difference sources. Therefore, it could useful as a methodology for the analysis and integrated assessment of the investment project. It should include the justification of the project's goals (key indicators), indicators characterizing the factors and conditions for its provision (parameters of changes in the main elements of production and costs of the project implementation), the sequence and the main stages of the analysis, evaluation criteria and targeted orientation of results and effects.

Tasks, proceeding from the project's goals determine methods and instruments of project management. The systemic model allows defining methods and instruments for effective decision-making at all levels of project management.

The key feature of the systematic approach in its application to the project management is using of both quantitative (mathematical relations) and qualitative methods for measurement and evaluation of parameters.

It is especially advantageous to use the methods of multiple-criteria optimization, because the implementation of a regional development project could lead to the change in the entire social, ecological and economic system of the region. Such methods are used for the solution of complex problems when the goal of the system can be accomplished only by synergetic achievement of several tasks. As a rule, for the solution of multiple tasks, most of the requirements for improving the values of the indicators are contradictory, which means an antagonism of the goals. In this context, the main task is to set a universal rule that suggests a single compromise solution for accomplishment of all goals.

Existing multiple-criteria optimization methods are divided into several groups. The main group includes approaches, identifying the degree of importance of each indicator relating to the achievement of the appointment of the system. This determines designing some generalized indicator for the description of the criterion in relation to it. That allows narrowing down of a multiple-criteria to a one-criteria task, the methods of dealing with which are well-known and relatively easy.

After that, it is convenient to divide the assessment of the efficiency of the regional development project to the commercial and socio-economic aspects (this dimension can be called 'regional efficiency'). That efficiency should include four components – economic, social, budgetary and environmental ones. Indicators for assessing the economic, social, budgetary and environmental components of the project's efficiency could be selected on the basis of two criteria:

- The importance for the assessment of the socio-economic state of the region;
- The possibility of accurate quantification of the project at the pre-investment stage.

If the change of the indicator in the project is measured in physical units (for example, the number of jobs created), then it is represented in the increasing of indicator value in the assessment of efficiency (the ratio of the number of jobs created to the economically active population). Thus, an increment for each indicator of social and economic efficiency is determined and integrated indicators can be calculated.

This method allows evaluation of the efficiency of projects and comparing them with each other through the components of socio-economic (regional) efficiency.

In Ukraine, in the conditions of considerable post-crisis limitation of investment resources, the budget component of a regional development project can be determined at the level, which is not

higher than the established threshold. But this can lead to the impossibility of its full implementation. In this case, in order to justify exceeding the budget limit for improving the results of the project, the applicant must increase the other components of socio-economic efficiency. The restriction can be imposed on two components at the same time. For example, if the selection of projects anticipates restrictions on the budget and economic components of the efficiency, then it does not actually matter how much they go beyond the threshold. In this case the advantage will be given to the project with the highest value of the social component (Korniievskyi, 2014).

In order to determine the general efficiency of a regional development project, while taking into account all its components, it is advisable to identify a single integral indicator that aggregates all the components simultaneously.

Each component of a regional development project includes a set of indicators that characterize the level of their efficiency. Since the analysed indicators differ significantly from each other both quantitatively and qualitatively, it is advisable to use their normalized (not absolute) values (from 0 to 1), taking into account the direction of optimization.

The second step is the development of a system of indicators for assessing the efficiency of regional development projects. The outline of that system could be made, proceeding from certain requirements. The most important are the following:

1. The process for gaining information for project's quality assessment should be a part of the process of project management.

2. The process of gaining information for the formation and calculation of indicators should not be complicated, time-consuming and costly.

3. The number of indicators should correspond to the scale of the project. The scale aims to apply only those indicators that are really needed: small projects do not require a large number of indicators; for larger projects, the number of indicators, on the contrary, may be larger.

4. Applicable indicators should be quantitative and measurable.

5. Applicable indicators should be useful for project management, process improvement and solution of problems.

6. Indicators are intended to evaluate only those aspects of management that can be influenced (controlled).

7. The procedure should be focused on the result of the project (quality and utility effect), as key selection value. It should not aim to change or adjust indicators in order to simplify the evaluation procedure with a view to grant it to the pre-assigned vector (recognition of the project as 'prospective winner' or 'failure' by the preliminary subjective assessment).

As noted, in order to assess the efficiency of a regional development project, a system of indicators should be built, taking into account four basic components: economic, social, budgetary and environmental (Figure 1).

The proposed stages of the evaluation of regional development projects are as follows (Korniievskyi, 2017):

1. Conducting an analysis for the formation of indicators' values of regional projects' efficiency.

2. Rationing the values of indicators using their normalized values.

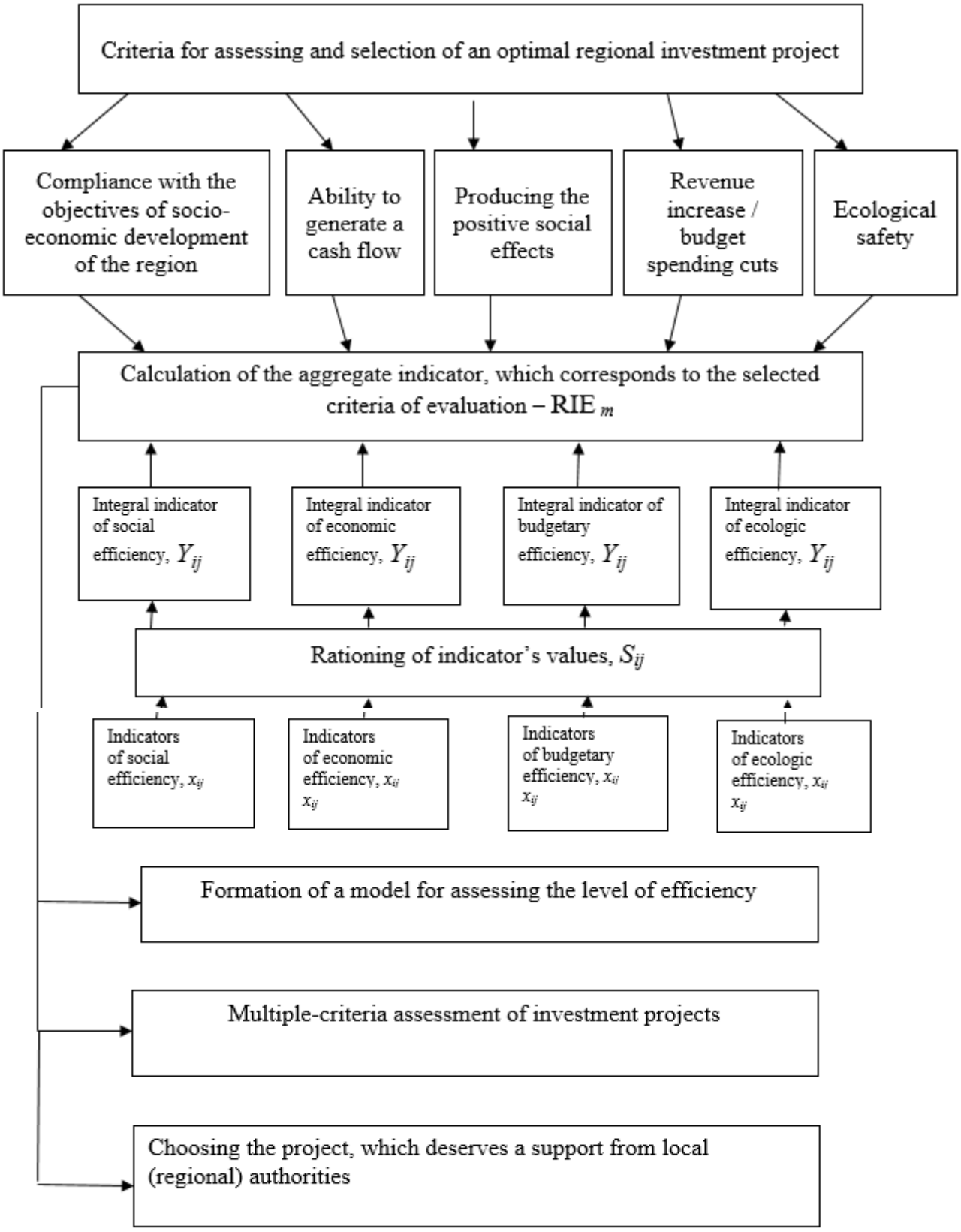
3. Formation of integral indicators, similar by the content, but not equivalent by the social, economic or ecologic importance.

4. Building a model for assessing the efficiency of regional projects using the aggregate RIEm (Regional Investment Efficiency) indicator.

5. Estimation values of integrated indicators of projects' efficiency (Korniievskyi, Trofimenko, 2017).

6. Choosing the most appropriate project.

Figure 1 - Method of Multiple-criteria Assessment of Regional Development Projects



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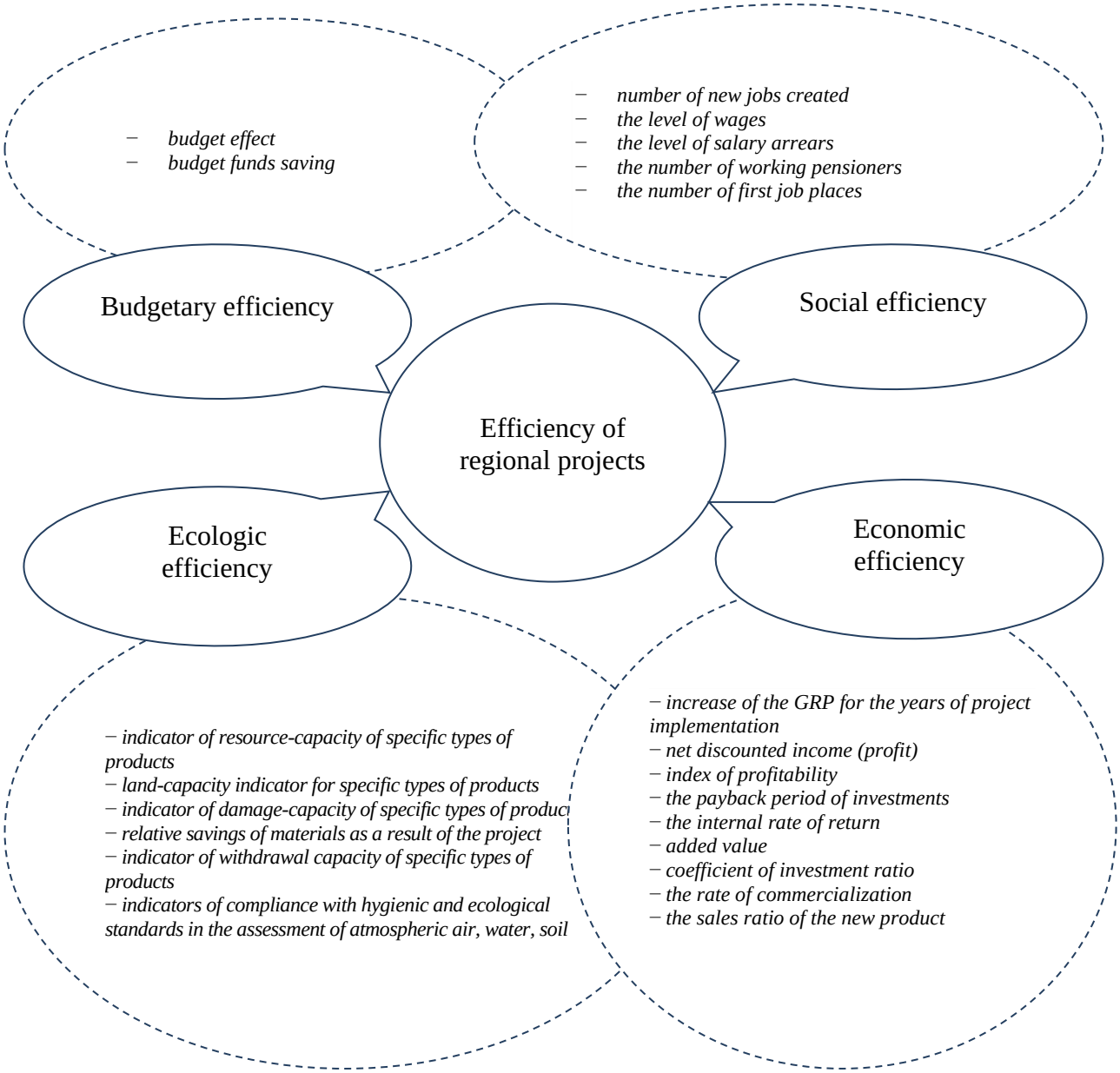
The components of projects' efficiency in itself are indicators of social, economic, budgetary and environmental effects – measurements of the efficiency of the project, which should be in line with the objectives of regional development and fit regional strategy (*Figure 2*).

Figure 2 - Components of the Efficiency of Regional Projects: Social, Economic, Budgetary and Environmental Blocks



The list of project evaluation indicators that could be used for selecting an optimal regional development project is given in *Table 1*.

Table 1 - Indicators of the Regional Development Project's Efficiency

Project's efficiency indicator	Classification of the variable	Symbol
1	*2*	*3*
Social efficiency Y_{1j} (Y_{ij} – *the value of the i-th output unified integral index of j-th project*)		
number of new jobs created	Stimulant	x_{11}
level of wages	Stimulant	x_{21}
level of wage arrears	Dis-stimulant	x_{31}
number of working pensioners	Stimulant	x_{41}
level of provision of first jobs	Stimulant	x_{51}
Economic efficiency Y_{2j}		
increase of GRP for the years of project implementation	Stimulant *the total cost of manufactured goods*	x_{12}
net discounted income (profit)	Stimulant *the ratio of cash and discount rate*	x_{22}
profitability index	Stimulant *the ratio of net discountable income and the cost of capital with one-time expenditures*	x_{32}
investment payback period	Dis-stimulant *period of investment recovering*	x_{42}
internal rate of return	Stimulant *rate of return, which equates the expected net cash flows to the initial cost*	x_{52}
added value	Stimulant *salaries, depreciation of working capital, gross profit, indirect taxes and other expenses*	x_{62}
ratio of investment	Stimulant *the ratio of private and public investment in the project*	x_{72}
rate of commercialization	Stimulant *the ratio of the number of project products that reached the market to the total project's output*	x_{82}
sales ratio of the new product	Stimulant *the ratio of income from the sale of a new product to the total income*	x_{92}
Budgetary efficiency		
budget effect	Stimulant *excess of budget revenues over expenses*	x_{13}
budget funds saving	Stimulant *the difference in resource consumption of old and new objects and the cost of resource*	x_{23}
1	*2*	*3*
Ecologic efficiency		
indicator of resource-capacity of specified types of products	Dis-stimulant *quantity of resources / volume of production*	x_{14}
the indicator of land-capacity of specified types of products	Dis-stimulant *production area / volume of production*	x_{24}
the indicator of damage-capacity of specific types of products	Dis-stimulant *loss / volume of production*	x_{34}
relative savings of materials as a result of the project	Stimulant	x_{44}
indicator of withdrawal capacity of specified types of products	Dis-stimulant *volume of waste / volume of production*	x_{54}
indicators of compliance with hygienic and ecological standards in the assessment of atmospheric air, water, soil	Dis-stimulant *the size of exceeding the maximum permissible emissions and concentrations from the norm*	x_{64}

Source: *own compilation*

Normalization of the indicators towards ‘maximum’ is provided for the stimulants, which growth contributes to the increase of the project’s efficiency. It could be calculated according to the following formula (1):

$$S_{ij} = (x_{ij} - x_{ij\ min})/(x_{ij\ max} - x_{ij\ min}), \quad (1)$$

where S_{ij} – normalized i-th indicator in j-th aggregate;

x_{ij} – the value of the i-th indicator in the j-th aggregate;

$x_{ij\ min}$ – the minimum value of the i-th indicator in the j-th aggregate;

$x_{ij\ max}$ – the maximum value of the i-th indicator in the j-th aggregate.

Normalization of key indicators towards ‘minimum’ is provided for those dis-stimulants, which growth negatively affects the project’s efficiency. It could be calculated by the formula (2):

$$S_{ij} = (x_{ij\ max} - x_{ij})/(x_{ij\ max} - x_{ij\ min}). \quad (2)$$

For the analysis and interpretation of the calculations where all the indicators are used simultaneously, the integral indicators of each block could be used. Each of these includes several basic indicators, similar by content and equivalent by importance. The value of integral indicators of the efficiency could be calculated as the sum of the normalized values of relevant key indicators which are part of them, using the following formula (3):

$$Y_{ij} = \sum_{l \in I_i} S_{lj}, \quad (3)$$

As the integral indicators include a different number of basic normalised indicators, this makes it impossible to use some unified scale. Consequently, for the unification of integral indicators, it seems necessary to average the main normalised indicators included in each of the integral indicators (4):

$$Y_{ij} = \frac{\sum_{l \in I_i} S_{lj}}{p_i} \times N', \quad (4)$$

Where Y_{ij} – the value of the i-th output unified integral index of j-th project;

S_{lj} – the normalized value of the l-th main indicator, which is included in the i-th output unified integral index (defined for j-th project);

I_i – the set of indexes of indicators included in the i-th integral index.

p_i – the number of key indicators that are part of the i-th output unified integral indicator;

N' – the scale of the numeric rating scale in which the zero value corresponds to the lowest efficiency of the project, and the maximum value of N' – to the highest, with N'=10.

The value of the integral indicators enables a quantitative assessment of the project's development and, based on the aggregated indicator, formation of the model of the project's development.

Since the investigation of each component does not allow comprehensive assessment of the level of project's efficiency, it is expedient to use an aggregate RIEm (Regional Investment Efficiency). It could allow a comprehensive assessment of each project, taking into account all of its components simultaneously (5):

$$\mathrm{RIE}_m = \sum_{i=1}^{z} w_i Y_{ij} , \qquad (5)$$

where RIE_m – is the aggregate indicator of the efficiency of m-th project;

w_i – weight coefficient of the i-th unified feature, taken into account while calculating the generalized indicator;

Y_{ij} – the value of the i-th integral index of the j-th object;

D_m – the set of indexes of the objects included in the m-th project;

z – the number of integral indicators.

The value of the regional investment efficiency (RIEst) is calculated as the sum of the maximum possible values of the integral indicators.

The value of the aggregate indicator of the project's efficiency is calculated as the ratio to the value of the aggregate indicator of the reference value and would be in the range from 0 to 1 (6):

$$0 \le HCI_m \le 1, \qquad (6)$$

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The level of efficiency of the project will be higher, the closer the value of the aggregate indicator to 1 is (7):

$$HCI_m \to 1. \qquad (7)$$

Similarly to the scale of the qualitative estimation of the integral index of the level of economic potential (Maslack, 2013), we could use the following percentage grading scale (Korniievskyi, 2017) for the estimation of the aggregate indicator and integral indicators of the efficiency of the regional development project (*Table 2*).

Table 2 - The Scale of Regional Development Project's Efficiency Indicators

Value of indicators from the maximum possible level, %	**Indicators of the efficiency of the regional development project**
Less then 20%	critical
21-45%	low
46-58%	acceptable
59-70%	sufficient
71-90%	high
91-100%	benchmark

The assessment of the integral indicators for measuring the level of the project's efficiency is carried out using the scale from Table. 2.

This methodological approach allows evaluating the efficiency of projects and comparing them through the components of socio-economic (regional) efficiency.

The value of the aggregate indicator contributes to formulating conclusions about choosing an optimal project (Trofimenko, 2015).

4. Implementation of the Methodology for the Optimal Regional Development Project Selection

Calculation of the aggregate efficiency indicators of regional development projects is applied to three selected projects on local economic development of Dnipropetrovsk Regional State Administration in 2019, which claimed to be implemented in 2020 – 2021 at the expense of the state budget funds received from the European Union:

1) Project No. 1 'Creation of innovate business incubator on the basis of the industrial park of Dnipro city', initiated by the Dnipropetrovsk Regional State Administration (RSA) in accordance

with the strategic goal ‘Promoting the development of innovation infrastructure and supporting innovation’ (declared beneficiary – Dnipropetrovsk region);

2) Project No. 2 ‘Creating an innovative platform for the promotion of the tourist potential of Dnipro city’ initiated by the Dnipropetrovsk RSA in accordance with the strategic goals ‘Increasing the awareness of the local community on the values of the territory and objects of the nature reserve fund with citizens’ involvement to their management’ and ‘Application of the objects of cultural heritage for intensifying tourist activity’ (beneficiary – Dnipropetrovsk region);

3) Project No. 3 ‘Construction of the industrial park ‘Pavlograd’, initiated by the Dnipropetrovsk RSA in accordance with the strategic objective ‘Increasing the competitiveness of the regions and strengthening their resource potential’ (beneficiary – Bohuslav village council of Pavlograd district of Dnipropetrovsk region).

Using the abovementioned approach, we could calculate and analyse the indicators of social, budgetary, economic and environmental efficiency of these projects. To simplify calculations and visualize the results obtained, we will present the output and calculated data (*Table 3*).

Table 3 - Calculation of Integral Indicator of the Efficiency for Dnipropetrovsk Regional Development Projects – 2019

Project’s efficiency indicator	**Symbol**	**Project No. 1 ‘Creation of innovate business incubator on the basis of the industrial park of Dnipro city’**	**Project No. 2 ‘Creating an innovative platform for the promotion of the tourist potential of Dnipro city’**	**Project No. 3 ‘Construction of the industrial park ‘Pavlograd’**
1	*2*	*3*	*4*	*5*
Social efficiency Y_{1j}				
number of new jobs created	x_{11}	15 (S_{11} =0.5)	10 (S_{11} =0)	20 (S_{11} =1)
level of wages	x_{21}	8000 –10000 (S_{21} =0.33)	4000 – 7000 (S_{21} =0)	9000 – 16000 (S_{21} =0.42)
level of wage arrears	x_{31}	0 (S_{31} =0)	0 (S_{31} =0)	0 (S_{31} =0)
number of working pensioners	x_{41}	2 (S_{41} =0)	5 (S_{41} =0.38)	10 (S_{31} =1)
level of provision of first jobs	x_{51}	10 (S_{51} =1)	8 (S_{51} =0)	9 (S_{51} =0,5)
Consolidated indicator of social efficiency	$\sum_{i=0}^{T}$	*0.37*	*0.08*	*0.58*
Economic efficiency Y_{2j}				
increase of GRP for the years of project implementation	x_{12}	2 (S_{12} =0.47)	0.2 (S_{12} =0)	4 (S_{12} =1)
net discounted income (profit)	x_{22}	0.5 (S_{22} =0)	0.6 (S_{22} =0,25)	0.9 (S_{22} =1)
profitability index	x_{32}	0.9 (S_{32} =1)	0.7 (S_{32} =0)	0.81 (S_{32} =0.12)

the investment payback period	x_{42}	3 (S_{42} =1)	3 (S_{42} =1)	4 (S_{42} =0)
internal rate of return	x_{52}	0.7 (S_{52} =1)	0.4 (S_{52} =0)	0.5 (S_{52} =0.33)
added value	x_{62}	0.6 (S_{62} =1)	0.3 (S_{62} =0)	0.5 (S_{62} =0.67)
ratio of investment	x_{72}	0.5 (S_{72} =1)	0 (S_{72} =0)	0.1 (S_{72} =0.2)
rate of commercialization	x_{82}	0.8 (S_{82} =1)	0.5 (S_{82} =0)	0.7 (S_{82} =0.67)
coefficient of the new product sales	x_{92}	0.6 (S_{92} =1)	0.5 (S_{92} =0)	0.6 (S_{92} =1)
Consolidated indicator of economic efficiency	$\sum_{i=0}^{T}$	*0.83*	*0.14*	*0.55*
Budgetary efficiency				
budget effect	x_{13}	0.2 (S_{13} =1)	0.2 (S_{13} =1)	0.1 (S_{13} =0)
budget funds saving	x_{23}	0.5 (S_{13} =1)	0.1 (S_{13} =0)	0.4 (S_{13} =0.75)
Consolidated indicator of budgetary efficiency	$\sum_{i=0}^{T}$	*1*	*0.5*	*0.38*
Ecologic efficiency				
indicator of resource-capacity of specified types of products	x_{14}	0.1 (S_{14} =1)	0.3 (S_{14} =0.7)	0.8 (S_{14} =0)
the indicator of land-capacity of specified types of products	x_{24}	0.1 (S_{24} =1)	0.2 (S_{24} =0.88)	0.9 (S_{24} =0)
the indicator of damage-capacity of specific types of products	x_{34}	0.4 (S_{34} =1)	0.1 (S_{34} =0.25)	0.5 (S_{34} =0)
relative savings of materials as a result of the project	x_{44}	0.5 (S_{44} =0.8)	0.6 (S_{44} =1)	0.1 (S_{44} =0)
indicator of withdrawal capacity of specified types of products	x_{54}	0.7 (S_{54} =1)	0.1 (S_{54} =0.25)	0.9 (S_{54} =0)
indicators of compliance with hygienic and ecological standards in the assessment of atmospheric air, water, soil	x_{64}	0.3 (S_{64}=0.5)	0.1 (S_{64} =1)	0.5 (S_{64} =0)
Consolidated indicator of ecologic efficiency	$\sum_{i=0}^{T}$	*0.88*	*0.68*	*0.00*
Integral (aggregated) indicator of a project's efficiency	$\sum_{i=0}^{T}$	*0.77*	*0.35*	*0.38*

Source: *own compilation*

As it could be seen from the Table 3, the project No. 1 'Creation of an innovative business incubator on the basis of the industrial park of the Dnipro city' has the highest (among others) value in an absolute measure with regards to the indicators of economic, budgetary and environmental efficiency. The project No 3 'Construction of the industrial park 'Pavlograd' outstrips the former only in terms of the indicator of social efficiency. Thus, its integral efficiency is 0.77 or 77 %, which corresponds to the criterion of 'high' efficiency of the project. Accordingly, the efficiency of projects

No. 2 ‘Creating an Innovative Platform for the Promotion of the Tourist Potential of Dnipro City’ and No 3 ‘Construction of the industrial park ‘Pavlograd’ is ‘low’ according to given methodology. Hence, out of three projects, No. 1 should be considered the winner by the selection committee.

Thus, according to the results of a comprehensive evaluation procedure, based on the abovementioned assessment methodology, the project No. 1 entitled ‘Creation of an innovative business incubator on the basis of the industrial park of Dnipro city’ has the most advantages in comparison with other similar projects (in terms of activity plan, sphere of influence and the potential beneficiaries). In particular, it outpaces other projects in such areas as economic feasibility, environmental value and the surplus value in their comparison with the planned cost of the idea implementation. Taken together, those aspects determine the expected efficiency of the project, which is higher than the efficiency of competitive projects. Judging by this criterion, the project No.1 must be selected by the selection commission.

5. Conclusion

1. Most of generally accepted methodological recommendations for the projects selection and conducting competitive procedures are complicated in terms of their practical implementation. Therefore, in most cases, the selection committees rely on the the method of expert evaluation. However, this practice has several significant downsidesm sych as certain subjectivity of decision-making and insufficiently high attention to the criteria of complex socio-ecological and economic efficiency.

2. To assess comprehensively the efficency of regional development projects, we proposed to divide it into a commercial and socio-economic aspects, which can be treated as a regional efficiency. It includes four components – economic, social, budgetary and ecological, each of which can be measured acording to a specific set of indicators.

3. Stages of evaluation of regional projects are as follows:

- Carrying out the analysis for the formation of the values of indicators of the regional development projects‘ efficiency;
- Normalization of indicators;
- Formation of integral indicators, which are similar by the content, but not equivalent by the degree of importance;
- Construction of a model for assessing the level of efficiency of regional development projects using the aggregate indicator RIEm (Regional Investment Efficiency);

- Evaluation of the integral indicators of the regional development projects‘ efficiency in accordance with the scale of the indicators‘ limits;
- Selection of the optimal regional development project.

4. Authors test the methodology for selecting the optimal regional development project on the cases of projects submitted from the Dnipropetrovsk region of Ukraine to the national contest for regional development projects that can be implemented at the expense of the state budget funds received from the European Union.

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