Analysis of Tourism Infrastructure Development Projects in the Context of "Green Economy"

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Abstract:

The article examines the impact of economic and environmental factors on the implementation of tourism and recreation infrastructure development projects.

An approach to analysis of socioeconomic and environmental factors has been proposed, considering preferences of different stakeholders and a multiplicity of project performance indicators. Official statistical data and expert estimates have been used to represent the experience of tourism and recreation infrastructure development projects in the regions of the Russian Federation.

A methodology for analyzing the importance of socioeconomic and environmental factors, the preferences of project participants, for evaluating the effectiveness of tourism and recreation infrastructure development projects, aimed at achieving agreed objectives in the long term has been formulated.

Based on the research findings, it can be argued that the proposed approach aimed at identifying the largest possible number of project participants, formalizing their preferences and using multi-criteria analysis of options reduces the likelihood of making incorrect management decisions that would lead to negative socioeconomic and environmental effects in the long term and improves the quality of tourism and recreation infrastructure development project planning.

Keywords: Decision-making, "Green Economy", project, tourism, tourism cluster.

JEL code: Z32, Q56.

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1. Introduction

The early 21st century updated the problem of economy transition to sustainable development, which is understood as a development improving the quality of human life and not causing irreparable harm to various ecological systems, is such a development that meets the needs of the present time without threatening the ability of future generations to meet their needs. Many domestic and foreign researchers have noted a growing tendency of environmental factors to influence the processes of long-term socioeconomic development including the tourism sector (Costanza *et al.,* 1997a; 1997b; Medows *et al.,* 2004; Porfiryev, 2012; Vinogradova, 2015).

One of the lines of the tourism industry development is creation of tourism and recreation clusters. What is meant by a tourism and recreation cluster is a territorially localized system of enterprises whose primary activity is to provide tourism and hospitality services. A favorable environment and the ecological situation are one of the factors influencing the choice of a location for creating tourism and recreation cluster facilities. Moreover, economic activities in such territories often have additional restrictions, for example, if they are territories of national and natural parks or of health and recreation areas and resorts (for example, the national park "Curonian Spit" in the Kaliningrad Region). Therefore, when creating tourism and recreation infrastructure in a certain territory (cluster), two conflicting but not mutually exclusive goals are pursued:

1) maximum possible preservation of the existing ecological environment of a tourism cluster territory;
2) creating a comfortable tourism and recreation environment by developing architectural solutions to ensure visibility of the tourist destination, applying architectural planning and massing solutions considering climatic components and environmental restrictions, land improvements, developing an extensive service and entertainment infrastructure, creating a full-fledged engineering infrastructure, reconstruction and development of the transport infrastructure.

In terms of tourism and recreation infrastructure development projects, this leads to the need to take into consideration and to evaluate not only economic but also environmental factors (Faizova *et al.,* 2015).

Analysis of operational experience in the tourism and recreation infrastructure project implementation in environmentally constrained areas, a study of decision-makers' preferences and of the factors that influence design arrangements is an important task the results of which can be used to improve the decision-making procedures and the national tourism development planning in Russia. To solve this problem, it is necessary to use project analysis and decision-making methods that are applicable under the conditions of incompleteness and ambiguity of the initial data and a variety of criterial indicators.

2. Literature Review

A lot of publications have been dealing with the problems of assessing the effects and effectiveness of the tourism and recreation infrastructure (tourism cluster) development projects in environmentally constrained areas. A significant part of them is focused on analyzing the impact of various aspects of the "green economy" at the level of the country or a region (Botavina, 2016; Gusev, 2017; Semenova *et al.,* 2018), assessing the influence of environmental factors on the quality of life (Ryumina, 2016; Shakhovtsov *et al.,* 2017; Kolchanova and Kolchanova. 2016).

The analysis of publications on the problems of tourism and recreation infrastructure (tourist cluster) project evaluation allows the authors to identify the following approaches. Approaches to the evaluation of such projects as to a single-objective optimization problem include considering economic factors that affect the cash flows associated with a project. When using criteria based on discounted cash flows associated with a project, the economic effect under given economic and environmental constraints is one of the possible criteria and should be maximized. This criterion is normally an environmentally adjusted net present value (NPV) from a project implementation. The constraints include:

- restrictions on the area of economic and recreation activity territory;
- restrictions on electricity consumption;
- restrictions on water supply;
- restrictions on the height of buildings;
- restrictions on the building materials used;
- restrictions on the maximum amount of hazardous substance emissions into the atmosphere;
- restrictions on the maximum amount of hazardous substance discharges into the soil or water bodies;
- restrictions on the impact of economic and recreation activities on dunes.

Internal rate of return and discounted payback period is considered as integral economic constraints, while the recreation capacity of a territory (that is, the ability to receive a certain number of campers and to withstand certain anthropogenic loads without disturbing the state of ecological and natural equilibrium) is considered as an environmental constraint.

The other one of the possible economic criteria is aggregate expenditure for the tourism and recreation infrastructure development under given economic and environmental constraints. In this case, the economic benefit of a project is included in the constraint system. The value of this criterion should be minimized. This approach (using economic criteria based on discounted cash flows associated with the project) is convenient in analyzing a project from the standpoint of the commercial organization that is operating the project.

In approaches aimed at studying and assessing the ecological state of a natural territorial complex, such an indicator as natural complex digression is used. Digression (from Latin *digressio* – deviation) stands for deterioration in the condition (consistence, composition, productivity) of a community because of external or internal causes. Deterioration in the natural complex condition under the influence of recreation factors is called recreational digression. The digression index is used for an integrated, generalized estimation of a natural territorial complex condition. Some factors adversely impacting the environmental condition in the tourist cluster territory are shown in Figure 1. These factors act as disaggregated indicators of digression and are estimated by experts, usually on a point scale.

Figure 1. *Some digression factors of the natural complex of a tourism cluster area*
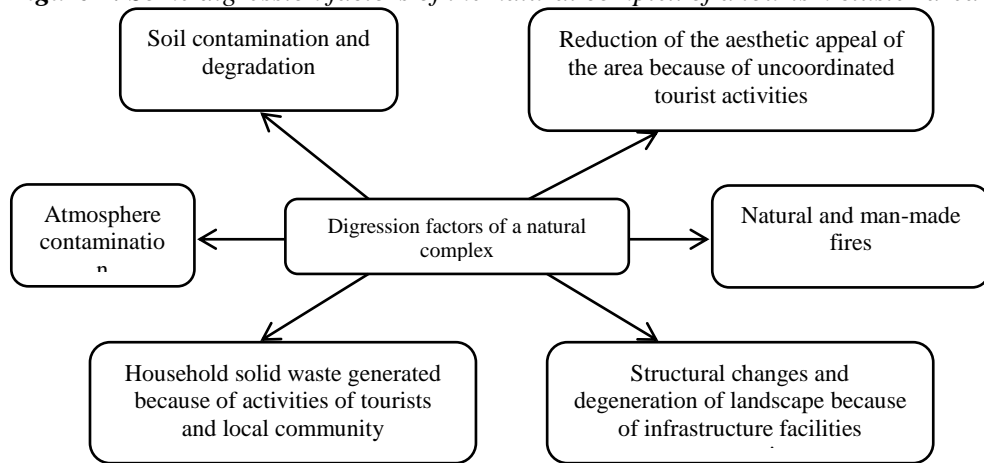
Source: *Compiled by the authors.*

A value of the integrated index of digression D can be calculated by the formula:

$$D = \sum_{i=1}^{n} a_i \cdot k_i \cdot p_i$$

where a_i is the value accounting for the impact of the i-th influencing factor on the natural complex (0 if the impact of a factor is not considered, 1 if the impact of a factor is taken into account);
p_i is the i-th disaggregated indicator (factor influencing the natural complex), in points;
k_i is a weighting coefficient that takes into account the impact of the i-th disaggregated indicator (influencing factor), $0 \le k_i \le 1$; $\Sigma k_i = 1$.

When developing a tourism and recreation infrastructure project, one should strive to reduce the value of recreational digression.

Project management methods for sustainable development are studied in the works of Silvius and Schipper (2014), Marcelino and others (2015), Martens and Carvalho (2016). An approach related to the assessment of the natural capital of a territory, which is a combination of natural resources and ecosystem services, and an analysis of its amount of change because of project implementation is of interest (Karlov *et al.,* 2011). A review of methods for estimating natural capital is given by Boardman and others (2001), Freeman (2003), Mendelsohn and Olmstead (2009). At the same time, several researchers (Akerman, 2003; Hadzhaev and Vasilevich, 2007; Missemer, 2018) note the complexity of quantitative economic assessment of ecosystem services, which requires specification of methodological approaches and more objective data on the condition of natural territorial complexes.

3. Results

The problem of ensuring the consistency of short-term and long-term goals in the tourism and recreation infrastructure (tourist cluster) development project implementation based on the principles of sustainable development is a systemic issue that includes political, economic, environmental, technological, energy, and other aspects (Klochkov and Ratner, 2013; Novoselov *et al.,* 2016). An interaction pattern of various factors developed by the authors is shown in Figure 2.

Figure 2. *Interaction between factors in tourism and recreation infrastructure development project implementation*
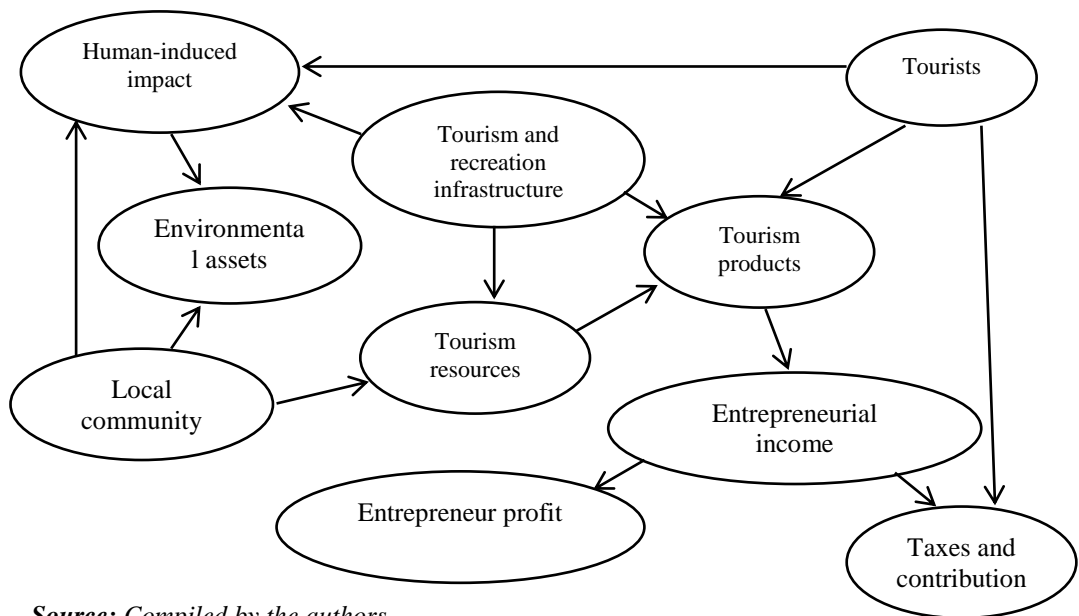
Source: *Compiled by the authors.*

It can be seen from Figure 2 that each of the subsystems has its own objectives (and the respective optimality criteria), therefore, choosing the objective of one of the subsystems (for example, the economic one) as the main criterion and considering such a problem as single-objective may lead to ignoring the objectives of the other subsystems, which would in turn lead to negative effects in the future.

A case study of project preparation and implementation in environmentally constrained areas allows the authors to define possible objectives of project participants, as shown in Table 1. The objectives expressing the explicit and implicit interests of project participants are largely conflicting, especially with a small planning time frame. Therefore, the problem of analyzing the effectiveness of tourism and recreation infrastructure development projects in an environmentally constrained territory requires the use of a methodology that would consider the interests of most project participants, thereby offering better substantiated procedures for the evaluation of such projects.

Table 1. Objectives of Project Participants

Project participants	Objectives of the project participants		
	Short-term	Mid-term	Long-term
Entrepreneurship	Increase in profits	Stable cash flows	
Government officials	Enhanced tax revenues to the regional budget Increase the local employment in the area		Sustainable development of the territory
Residents of the cluster territory	Increase in income through employment creation	Environmental safety	Sustainable development of the territory
	Tourism services availability		
Environment	Biodiversity conservation		

Source: Compiled by the authors.

Analysis of long-term goals and short-term interests of project participants should be the first stage of the proposed approach. Depending on the results obtained at the first stage, a method is selected at the second stage to formalize the project analysis problem. In the framework of the approach proposed by the authors, the problem is multicriteria. To assess the priority of objectives of individual subsystems and to analyze the preferences of decision-makers (DMs), one of the solution methods is a hierarchy analysis method (or analytical hierarchy) (Saaty, 1993; 2008). Selection of the best option in this case includes the following stages: the stage of structuring the factors influencing the decision making (a main objective, criteria, compared options), a sequential paired comparison of factors of the same type, calculation of the importance of factors, determination of the best option, and verification of the consistency of a DM's judgment. After finding the best option, a more detailed calculation of the cash flows for this option should be made.

As follows from the analysis of front-end engineering and the practice of tourism and recreation infrastructure development project implementation in environmentally constrained territories in a number of Russian regions (in particular, in the Kaliningrad and Moscow regions), the authors proposed the following outline for analyzing major project implementation options to select and evaluate by the hierarchy analysis method taking into account long-term prospects of business development and sustainable development of a local natural complex. The major options include:

1. Option 1 is aimed at expanding the tourist cluster territory, large-scale construction of tourism and recreation facilities, and an increase in the number of tourist visits to destinations. A great environmental damage is a disadvantage of the option.
2. Option 2 is aimed at the tourism and recreation infrastructure development project implementation without expansion of the tourist cluster territory.
3. Option 3 is refusal of a tourism and recreation infrastructure development project. This project option allows for preservation of the natural complex but does not contribute to the economic development of the area.

When choosing a project option for construction and further operation of an enterprise, such factors were in particular taken into consideration as: the cost and timing of the project, making profit in the short term, ensuring a stable positive cash flow originating from the enterprises in the tourism cluster, creation of new jobs in the region, an increase in the number of jobs in the region in the medium and long term, the amount of tax deductions and other payments to regional and local budgets, the comfort level of the ecological system to the local population, the environmental loading rate, the amount of allowance for implementation of environmental protection measures. To facilitate further analysis, the factors are structured and grouped, which results in, for example, such project option selection criteria:

- ✓ Criterion 1 – receipt of profit from project implementation (abbreviated as C1).
- ✓ Criterion 2 – creation of new "green" jobs for the local population (abbreviated as C2).
- ✓ Criterion 3 – reduction of environmental damage to the territory (abbreviated as C3).

To compare the criteria, a verbal numerical scale of relative preferability of Saaty's indicators was used (Table 2). A criteria comparison matrix example is shown in Table 3. Similarly, criteria comparison matrices are formed for each criterion.

Table 2. *Verbal Numerical Scale of Relative Indicator Preferability*

No.	Qualitative measurement of the preferability level	Quantitative measurement of the preferability level

1	Equal preferability	1
2	Moderate degree of preferability	3
3	Substantial degree of preferability	5
4	Significant degree of preferability	7
5	Very high degree of preferability	9

Source: *Saaty, 1993.*

Table 3. *Criterion Comparison Matrix*

Criterion	Profit from project implementation	Creation of new "green" jobs	Reduction of environmental impact
Profit from project implementation	1	1/5	1/3
Creation of new "green" jobs	5	1	3
Reduction of environmental impact	3	1/3	1

Source: *Compiled by the authors.*

4. Discussion

The main project implementation (or implementation refusal) scenarios are conditioned by a combination of the following factors: a projected amount of revenues from a project and the predicted natural complex digression value for the tourism cluster area. These factors are associated, in turn, with the tourist flow volume, the level of prices for services rendered to tourists, the amount of money transfers for the implementation of measures to reduce damage to the environment of the tourist cluster.

Scenario 1 provides for a large tourist flow volume and service delivery at an affordable price, which leads to a great recreational load and a large amount of recreational digression.

In the framework of Scenario 2, it is necessary to limit the tourist flow growth and to create more comfortable recreational facilities offered at a higher price.

Scenario 3 is a refusal of large-scale tourism and recreation infrastructure development projects to ensure preservation of the natural territorial complex.

To improve the quality of design solutions, more complete and specific initial data on the condition of the natural complex of tourist clusters in Russia are needed. A wider use of geographic information systems considering international best practices would particularly contribute to such data acquisition (Kim and Kim, 2017).

Studying international best practices in applying computational models to assess ecosystem services given the national park cases (Arsić *et al.,* 2018) and its applicability in Russia is of profound interest.

To ensure more adequate forecasts for project implementation to create a tourism and recreation infrastructure in environmentally constrained areas and a more correct estimate of the recreational digression value, an agent-based modeling approach to tourist behavior is of interest. An example uses of neuro agents to analyze and forecast in the hospitality and tourism sector was considered, in particular (Kozlov, 2017). Development of a simulation project model based on systematic and dynamic approach and/or multi-agent approach should be one a further research area.

5. Conclusions

The research findings on the problems of evaluating the tourism and recreation infrastructure development projects in environmentally constrained territories in the Russian Federation allow for the following conclusions:

1. Within the framework of the sustainable development concept based on "green technologies", environmental factors play an increasingly important role in the evaluation of tourism and recreation infrastructure development projects.
2. Considering a project as a single-objective problem with a major economic criterion (maximum profit or net present value) does not allow one to fully consider and assess the socioeconomic and environmental effects associated with the project. Such criteria are better suited to assessing the economic efficiency of a project on the part of a commercial organization. Inclusion of environmental factors in the system of constraints in the design model does not allow for correct estimation of changes in the natural system condition.
3. When evaluating tourism and recreation infrastructure development projects in environmentally constrained areas, it is necessary to analyze the objectives and identify the preferences of the widest possible range of project participants. Project participants should include not only decision-makers, business and government institutions, but also tourists and the local population.
4. Application of the approaches proposed by the authors to evaluate tourism and recreation infrastructure development projects in environmentally constrained areas that consider the multicriteria nature of the problem makes it possible to reduce the likelihood of making incorrect management decisions leading to adverse social, economic, and environmental effects in the long term.

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