Modelling Management of Recreation and Tourist Resources (Samara Oblast Tourism Development Strategy)

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Abstract. The development of the theory of environmental tourism cannot do without solving the problem of optimizing the management of tourist flows. The authors argue that one of the possible solutions can be an approach based on the theory of the potential efficiency of complex systems. With the development of eco-tourism, conditions are created for a balanced preservation of the environment and natural resource potential, the level of social responsibility of business for the environmental content of economic activity increases. Using the example of assessing the recreational value of the natural resources of Samara Oblast, the authors discuss a matrix model with a breakdown of the “tourist community” by age, level of well-being and health status. On the territory of Samara Oblast there are all the prerequisites for the formation and development of eco-tourism. As a result of the study, the authors obtained some parameters of a steady state for drawing up certain schemes for ecotourism management (in particular, within the framework of the tourism development project in Samara Oblast). The authors came to the conclusion that the assessment of strategies for the recreational use of territories is carried out according to several indicators, therefore, the task of multi-criteria analysis inevitably arises. The authors believe that further improvement of this model should go in the direction of maximum consideration of the “diversity of the tourist community”.

1. Introduction

Environmental tourism (sustainable, responsible, or simply ecotourism) is one of the fastest growing trends within the world’s general touristic industry. The emergence of ecotourism and its development is explained by the desire to minimize various environmental impacts. The concept of "environment" acquires a certain meaning depending on the central subject of the system - an organism, a community, a person, a society, a civilization. The environment surrounding a person is an anthropocentric concept, showing that we are talking about the living conditions of a person or population, taking into account territorial characteristics.

Hector Ceballos-Lascurain offered one of the first of many definitions of ecotourism in 1987 stating that ‘we may define ecological tourism or ecotourism as the tourism that involves travelling to relatively undisturbed or uncontaminated natural areas with the specific object of studying, admiring and enjoying the scenery and its wild plants and animals’ [1]. H. Ceballos-Lascurain referred to ‘any existing cultural manifestations (both past and present) found in these areas’ as an essential part of the ecotourism resource [1]. This definition reflected the idea of harmony between recreation and ecology.
and gained great popularity. One of the variants of this definition introduces ecotourism as an active form of recreation based on the rational use of natural benefits. It involves the rejection of the cult of comfort, mass communications, accessibility and consumption of more and more numerous tourist goods (as opposed to, for example, tour-realism, which implies immersion in nature and culture while maintaining a high level of comfort). And in return, it instills a different system of values, which become the contemplation of nature, spiritual enrichment from communication with it, participation in the protection of natural heritage and support of the traditional culture of local communities. In our opinion, the most accurate definition of ecological tourism is formulated by the International Ecotourism Society: “responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education” [2]. Further existing literature on ecotourism definitions, one may find in the article [3].

All over the world, there has been a tendency to expand the share of environmentally clean nature in the list of tourist sites. People have ceased to be content with only 3S (Sea - Sun - Sand) and are gradually moving to another paradigm – 3L (Lore - Landscape - Leisure). Environmental tourism requires that the proposed visited object has uniqueness and unusualness, high ecological value and safety, brightness and memorability, connection with the historical past described in legends or myths. In addition, the object must be able to withstand a large flow of tourists, otherwise after a certain period of time it will begin to degrade and lose value.

The modern way of nature management in the world is one of the main reasons for the emergence of environmental problems of various levels, scale and nature. Awareness of this problem led humanity to the concept of “sustainable development”. But for this concept to turn from a political document of a utopian plan into a “working tool”, it is necessary to “fill” it purely methodically with both indices for assessing the current state of sustainable development of socio-ecological-economic systems (SEES) of various scales, and various indicators for assessing the natural resource potential of territories. At the same time, the main difficulty is the fact that when assessing environmental resources, one has to deal not with goods (for which rather well-developed methods of theories of labor costs and utility are usually used), but with natural resources that have not yet become a commodity (and, possibly, should not become one in the light of achieving sustainable development. All this leads to the need to develop specific methods of “off-market assessment” to obtain comparable monetary expressions of the value of natural resources and fully concerns the problems of managing tourist flows (in this case, we discuss the recreational value of natural resources of Samara Oblast).

Samara Oblast, the fifth largest region of the Volga region, occupies an area of 53.6 thousand km², which is 0.31% of the territory of Russia. The population of the region according to the State Statistics Committee of Russia is 3,154,164 people. (2021). The population density is 58.88 people / km² (2021), which is 7 times higher than the average for Russia. The urban population is 80.32% (2021), which also exceeds the national average. The Samara-Togliatti agglomeration is the third largest after the Moscow and St. Petersburg ones. Samara Oblast is an industrial and agricultural region with a high degree of urbanization; about a quarter of the production assets of the Volga Federal District are concentrated on its territory. Consequently, there are all the prerequisites for a high degree of anthropogenic pressure on the environment and negative impact on the inhabitants of the region. Therefore, one of the factors ensuring the sustainable development of the territory is environmental tourism. With the development of ecological tourism, conditions are created for a balanced preservation of the environment and natural resource potential, the level of social responsibility of business for the environmental content of economic activity increases. Samara Oblast has all the prerequisites for the formation and development of ecological tourism. In the structure of the specially protected areas there is a reserve and 2 national parks (Samarskaya Luka and part of the Buzuluk pine forest formed jointly with Orenburg Oblast), the State Landscape Reserve, 17 wildlife preserves, 11 key bird areas, 288 natural monuments, of which 13 are of federal significance, 175 - regional. The total area of protected areas in Samara Oblast is 2054.39 km², or 3.8% of the area of the region.
2. Materials and Methods
The development of the theory of environmental tourism can in no way bypass the problem of optimizing the management of tourist flows. One of the possible options for solving the problem of managing tourist flows can be an approach based on the theory of potential efficiency of complex systems, which was consistently developed by B.S. Fleischmann [4]. Below we indicate only the general form of the limiting law of potential efficiency, which in different situations can be "loaded" with different environmental and ecological-economic content.

The interaction of any system A with the environment B can be represented as a series of exchanges of a certain amount of consumable resources U for a certain amount of consumed resources V. Fleischmann calls such an exchange \((U; V)\) -exchange (an example is an increase in the phytomass of a plant community V upon application of mineral fertilizers U or health improvement of the overall health V as a result of some organized [for some payment U] touristic activities). Thus, system A is characterized by the parameters U and V and its goal \(A_0\) can be considered the most beneficial \((U; V)\) -exchange. Thus, the system strives to get more, while giving less (for each fixed U, the system strives to maximize V by changing its structure and behavior).

With a stochastic approach to modeling complex systems (now no one doubts the fact that the stochastic component of structure and behavior plays an important role for ecological and economic systems) it is advisable to talk about a certain probability \(P(U;V)\) of system A achieving its goal \(A_0\). A remarkable fact of the theory of potential efficiency of complex systems in their stochastic description is the possibility of expressing this theory in a unified form in terms of the probability \(P(U;V)\): for sufficiently large values of U and corresponding large values of V, the probability of an advantageous \((U; V)\) -exchange has the following asymptotic behavior

\[
P(U;V) = \begin{cases} 1, & \text{when } V < V_0, \\ 0, & \text{when } V > V_0, \end{cases}
\]

where \(V_0\) is the amount of the resource received by the system \(A_0\) that is optimal in terms of the given quality. Thus, it is not profitable for the system to obtain the value of the resource \(V > V_0\) (greed is no good policy here). The general asymptotic behavior of the probability \(P(U;V)\) is substantiated by a deep mathematical regularity underlying the behavior of all stochastic models of the potential efficiency of complex systems - the probabilities of large deviations (a rigorous proof is given in [4, pp. 202-210]).

In the language of \((U; V)\) -exchange, for off-market assessment of the recreational efficiency of natural resources, one can use some ideas of Western economists who suggested that an individual is able to give up a certain amount of material goods in order to avoid deterioration of the quality of the environment (U; in fact, he is ready to pay), or agree to this deterioration only on condition of receiving material compensation (V; receive compensation for losses). The quantitative expression of these values is called WTP (willingness to pay) and WTA (willingness to accept), respectively.

WTP is the willingness to pay to preserve a favorable ecological environment and not to carry out some economic activity in this territory that can lead to negative environmental changes. The preferences of people revealed as a result of surveys give a monetary indicator of the value of certain environmental objects. Willingness to pay depends directly on the income of the respondents.

WTA is a willingness to accept compensation for negative changes in the environment as a result of economic activity. In this case, we are talking about the readiness of the population to give up existing environmental benefits, to bear environmental damage, but receive some monetary compensation for this. Usually, the amount of money within the framework of the willingness to accept compensation is an order of magnitude or even higher than the amounts that citizens are willing to pay for the preservation of environmental benefits. This is explained by at least two main reasons:

- unwillingness to lose existing benefits, i.e., the assessment of damage (losses) is higher than the comparable gain in relation to some initial stock of assets (including environmental benefits);
- limited substitution of environmental benefits by others.
A number of methods can be used to estimate the main components of the overall economic assessment of environmental services from the use of recreational and tourist resources. So, under the most general assumptions, the “tourist community” at time \((t+1)\) will be characterized by a vector \(X\) at time \(t\) and a matrix \(P\) of probabilities of “transition” of “representatives of the tourist community” from one type to another per unit time (some sort of a Markov chain of the transport method or a table of the transition of species from one type of ecological-coenotic strategy to another):

\[
X(t + 1) = P \cdot X(t)
\]  

Consequently, the analysis of this model is reduced to the analysis of the maximum eigenvalue and the corresponding eigenvector of the matrix \(P\).

3. Results and Discussion

We used a similar approach when modeling the management of tourist flows (we emphasize that the example is illustrative, although it is focused on a specific program for the development of tourism in Samara Oblast; to obtain more accurate estimates, special additional research is needed). The “tourist community” can differ in a number of ways.

Let us list some features of "hard" and "soft" ecotourism [5].

«Hard» tourism
- Mass character;
- Short trips;
- Fast vehicles;
- Pre-agreed program;
- Motivation "from the outside";
- Lifestyle import;
- "Sightseeing";
- Comfort and passivity;
- Advance intellectual preparation for the trip is little;
- A tourist does not speak the language of the country and does not seek to learn it;
- A tourist comes to the country with a feeling that he’s merely a guest;
- Shopping is utilitarian (including postcards and souvenirs);
- After the trip, only the general information remains;
- Curiosity;
- Loudness.

«Soft» tourism
- Individual and family tours, trips with friends;
- Longer trips;
- Slow to moderately fast vehicles;
- Spontaneous decisions;
- Motivation "from within";
- Lifestyle according to the culture of the visited country;
- "Impression";
- Activity and diversity;
- Country - the purpose of the trip - is studied in advance;
- The language of the country is studied in advance - at least in the simplest level;
- A traveler learns about a new culture;
- Shopping is a keepsake for friends;
- After the trip, new knowledge remains as well as emotions and memories;
- A traveler draws from life or photographs himself;
o Tact;
o Calm, respectful tonality.

Let's conditionally divide the “tourist community” according to the following parameters (accordingly, the “types” of ecotourism are also different - “hard” or “soft”):

- by age (3 groups: young [Y - up to 25 years old], middle [M - 25-55 years old] and elderly [E - over 55 years old]);
- by the level of well-being (3 groups: poor [P - average monthly income per person - up to 15 thousand rubles], average [A - 20-40 thousand rubles] and wealthy [W - more than 50 thousand rubles]; a 10-fold excess of income is laid, although in fact it is much higher; the unemployment rate is taken into account);
- by health (3 groups: chronically ill [Chr], average [patients "by age"; Avr] and healthy [H]).

These "groups" can be supplemented by "breakdowns" according to other characteristics (for example, according to the sex structure of the vacationers, their regional affiliation, seasonality of rest, etc.). Naturally, the specifics of tourist recreation for each of these groups should be special (it is difficult to imagine that most young vacationers are ready to sing war songs to the accordion all night long, and the elderly are ready to spend the whole night in a disco). For each of these "partitions" we shall compose the matrices of transitions from one group to another. In particular, for the Russian Federation as a whole for 2010-2020, we have the following transition matrices (table 1):

| By Age | By the level of well-being | By Health |
|--------|---------------------------|-----------|
| Y      | M                         | E         | P    | A    | W    | Chr   | Avr   | H    |
| 0.83   | 0.63                      | 0.47      | 0.8  | 0.15 | 0.05 | Chr   | 0.75  | 0.10 | 0.05 |
| M      |                           |           | A    | 0.1  | 0.7  | 0.20  | Avr   | 0.60  | 0.20 | 0.10 |
| E      |                           |           | W    | 0    | 0.15 | 0.75  | H     | 0.30  | 0.60 | 0.05 |

We determined the probabilities of transition from one group to another based on the data of official statistics [13], some other sources, and expertly. As a first approximation, the dynamics of the "tourist community" is described by the linear equation (1) with the following stable states (eigenvectors, in %) according to the selected parameters:

\[
X_i (\text{age}) = \{ 43, 33, 24 \},
X_2 (\text{well-being}) = \{ 40, 35, 25 \},
X_3 (\text{health}) = \{ 27, 40, 33 \}.
\]

4. Conclusions

These ratios may well be used to draw up certain schemes for ecotourism management (in particular, within the framework of the tourism development project in Samara Oblast). We believe that it is interesting to compare the theoretical distributions (2) [once again - averaged over Russia as a whole] with the data obtained as a result of surveys of the “tourist community” of a particular territory (in particular, Samara Oblast). We believe that the task of multi-criteria analysis inevitably arises since the assessment of strategies for the recreational use of territories is carried out according to several indicators. In this connection, let us cite here Academician A.G. Aganbegyan [6, p. 4]: “From a formal
point of view, we cannot talk about developing an optimal strategy for achieving several goals at the same time. The problem of optimizing several goals at once is internally inconsistent. Therefore, the mathematical programming toolkit, widely developed in recent decades, adapted to solve the problems of optimal planning based on one or another objective function, has very limited application here.

The following model is synthesized for the selected three vector-indicators \( \{X\} \) by the methods of self-organization [7],

\[
Y_i = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_1 \cdot X_2 + a_5X_1 \cdot X_3 + a_6X_2 \cdot X_3
\]

(3)

where \( a \) are regression coefficients,

- \( Y_j \) - \( j=1 \) is the vector of economic efficiency, defined as the assessment of ecosystem services of specific territories according to the parameter “recreational and tourist resource” (see, for example, [8-10]);
- \( j=2 \) is the vector of the ecological state, which is estimated by some complex index [11].

Further improvement of this model can (and should) go in the direction of maximum consideration of the “diversity of the tourist community” (\( X, i=4 \) and further).

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