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MATHEMATICAL MODELS OF DEVELOPMENT OF THE RAILWAY TOURISM

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The profit of enterprises with tourist services is been fast growing [1].

A number of contemporary scientific publications are dedicated to the problems of studying and planning factors that influence tourists' preferences and their trips [2]. At the present moment, a lot of railways are being closed because of less volume of passenger transportation and, consequently, unprofitability [3]. That is why the problem of the future of the abandoned railways is of great importance. In the article [4] versions of the railways usage are investigated with the conclusion that one of the best ways out is their re-equipment into the «green zones».

The authors to construct a «railway tourism ring» in Ukraine on the narrow-gauge line according to the route: «Svalyava-Mukachevo-Irshava-Beregovo-Vinogradovo-Khust-Mizgirya». In [5] ten variants of the possible tourist routes are developed, as well as train structures and the potential number of tourists on the polygon of the narrow gauge railway. It is supposed that main conditions and restrictions as for organizing tourist activity should be studied.

The general scheme of the algorithm of the model realization for the variant B consists of the following:

1. To determine the initial values of the variables and the evaluation of the objective function.

$\bar{X}(0) = (x_1 = 0, x_2 = 0, \ldots, x_m = 0)$; $NPV_{1*}(\bar{X}) = NPV_{1\min}$; $\bar{X}_{opt} = \bar{X}(0)$.

2. To determine the initial values of the calculator of the variants CN_x =0. It is important that the binary representation of the number CN_x gives a variant of the tourist activity realization x; E {0, 1}, (I = 1, m).

3. To generate the number of the order of the variant CNx+1; in case CN_x +1 is more than N_x = M to finish the optimization procedure (p. 9).

4. To form a current vector of activity variants on the basis of CN_x. In it the value x_1 =1 testifies to the introduction of the route "i" into the current plan (for B1 the variants with one chosen route are used, numb ($\bar{x}$(i)=1).

5. To determine a calculator of the number of the realization variants for

every x1=1, according to the matrixes Zt, Zik E Zt.

6. To calculate the indices of the model.

7. To revise the restriction system. In case of non-correspondence to the requirements, move to p. 3.

8. To compare the previous value of the objective function $NPV_1(\bar{x})$ with the current $NPV_1(\bar{x})$. With $NPV_{1*}(\bar{X}) < NPV_1(\bar{X})$ to change $NPV_1(\bar{x})$ to remember $x_{opt} = \bar{x}$. Move to p.3.

9. Delivery of the results of the optimal planning $\{\bar{X}_{opt}; NPV_{1*}(\bar{X}_{opt})\}$.

The given algorithm scheme is used for calculating models of all the representations B1–B6.

Multi-criteria multi-stage planning.

The given planning models of the railway tourism regional development are formed provided there are definite conditions of interests of the united investment center. That is why the maximum values of the total income are represented as optimum criteria. The game principle of the guaranteed result is offered to be used as a method of conflict solution UH (K), which realize the demand of the equality of the infrastructure investors

$$F_C(V) = \max_V(\theta = \min_k(V_k / D_k)) = \theta_C, \quad (1)$$

where V – is a value of K-investor′s income, and D – the volume of their investment. The realization of the planning model with the criteria (1) permits to choose tourists routes and the trip frequencies which provide income corresponding to their contribution in the project of the railway tourism development.

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