УДК 004:338.48(477.8)
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METHODS FOR COMPREHENSIVE ASSESSMENT OF OPTIONS FOR THE STRATEGIC DEVELOPMENT OF THE TOURISM INDUSTRY

The methods of a complex evaluation of permissible variants of strategic of tourism development were analysed which are based on the formation of the corresponding parameter whose value in aggregate form displays the certain purposes of chosen strategy. It was found that among people who take the final decision was very popular the method of forming a parameter of complex criteria evaluation based on constructing a hierarchical structure (tree) of criteria. At each level of this hierarchy is the construction of parameter an aggregated evaluation of criteria of the previous level. The peculiarity of hierarchical structure is the aggregation in each node of tree only of two criteria or parameter of their evaluation, which is the main advantage of this method. The peculiarity of hierarchical structure is the aggregation in each node of tree only of two criteria or parameter of their evaluation, which is the main advantage of this method.

Keywords: the tourism industry, the strategy of development, the indicators of aggregated and complex evaluation of criteria, the expert evaluation, the method of linear clotting of criteria, the method of hierarchical structure of criteria, the system of decision making.

Introduction

To take into account several key goals of the strategic development of tourism in the Carpathian region [3, 4], we have to solve the multicriteria problem of search of the optimal variant of [9]. As a rule, the objectives of the strategic development of the tourism industry is mainly contradictory among themselves [5]. So, the achievement of financial and economic plans often leads to an increase of ecological danger to the environment. The high cost of increasing the level of life (social objectives) a significant impediment to the achievement of financial and economic goals etc. Therefore, the task of creating the optimal strategic development of tourism taking into account social, economic and environmental objectives belongs to the tasks багатокритеріальної optimization [9, 15]. There are several approaches to solving this class of problems, most of which are somehow connected with the formation of complex evaluation index of a valid choice, value of which in aggregate form reflects the specific objectives стратегі-economic development [5].

The purpose of the work consists in the analysis of methods of complex estimation of variants of strategy of technical development of the tourism industry in the region. To implement this goal, it is necessary to solve the following main tasks: identify the advantages and disadvantages of the method of linear agreed ртання selection criteria; to find out the features of the method for the hierarchical structure of criteria from Bora, realization of algorithm for its construction; provide examples of choosing optimal variants of strategic development of the tourism industry; to draw the appropriate conclusions.

1. The linear convolution of criteria for selection.

Let variants of strategic development of the tourism industry are measured at $\boldsymbol{m}$ criteria. Denote by $\tilde{X} = \{x_i, i = 1, m\}$ – value of $\boldsymbol{i}$-th criterion. The easiest way to get the value of the indicator of integrated assessment (F) variants of strategic development is linear convolution of criteria of selection of [2, 9], namely:

$$F = \sum_{i=1}^{m} \lambda_i x_i, \quad \sum_{i=1}^{m} \lambda_i = 1, \qquad (1)$$

where $\tilde{\Lambda} = \{\lambda_i, i = 1, m\}$ – weight (importance) of the ***i***-th criterion whose value is generally determined based on expert opinions [6]. The disadvantage of a linear convolution there is a danger of loss of effective variants of the Pareto set [14]. It is considered that option is effective (Pareto optimal)if there is no other option, which is not worse at all the criteria. We assume that any two variants of strategic development should be of at least one criterion.

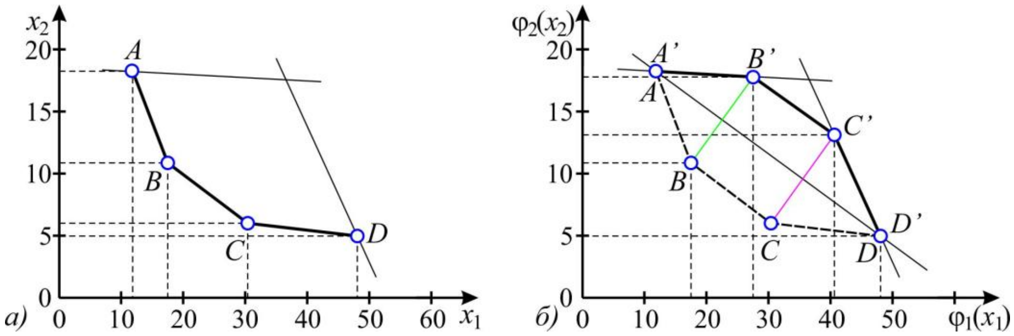

Fig. 1. A graphical representation of a linear convolution of criteria: a) the risk of loss of effective options; b) nonlinear transformation scales

Danger of loss of effective variants of the Pareto set is clearly illustrated by Fig. 1, and. Clear that whatever weighting coefficients λ_1 and λ_2 we have not taken into account, will still be selected or option ***A*** or option ***B***, but never will be selected options ***B*** and ***C***. To avoid this risk, you can apply a nonlinear transformation of the scales, which in the new space coordinates of the points effective options will be located as shown on Fig. 1, b). With this arrangement, points to any effective version of the strategic development there will always be the weighting coefficients □ 1 and □ 2, which will be selected this option. Note that the nonlinear conversion scales can be done in various ways [9]. However, this significantly complicated the work of the experts for definition of weight of the criteria in the new coordinate space [8], if they don't have enough good content interpretation. In this case, the weighting coefficients can be determined on the basis of expert information on the comparative efficiency of selected basic versions of the Pareto set [12].

Consider this technique of linear convolution of criteria for the selection of a specific example.

Example 1. Let you select four basic variants ***A, B, C, D*** (Fig. 2) strategic development of the tourism industry and experts found such comparative effectiveness: ***D*** > ***C*** > ***A*** > ***B***. Results of the estimation of variants of strategic development of the two criteria in the transformed space coordinates are given in table. 1.

Table. 1. Results of the estimation of variants of strategic development of the two criteria in the transformed coordinate space

Options	*A*	*B*	*C*	*D*
Criterion $\varphi_1(x_1)$	11,9	27,5	40,6	48,1
Criterion $\varphi_2(x_2)$	18,3	17,8	13,2	5,0

Obviously, the weighting coefficients λ_1 i λ_2 should be such that performed this sequence of inequalities:

$$\underbrace{48{,}1\lambda_1 + 5{,}0\lambda_2}_{F_D} > \underbrace{40{,}6\lambda_1 + 13{,}2\lambda_2}_{F_C} > \underbrace{11{,}9\lambda_1 + 18{,}3\lambda_2}_{F_A} > \underbrace{27{,}5\lambda_1 + 17{,}8\lambda_2}_{F_B}. \quad (2)$$

Having these irregularities, let's try to solve such a task of linear programming: calculate the maximum value of the objective function

$$\Sigma\varepsilon = |F_D - F_C| + |F_C - F_A| + |F_A - F_B| \to \max \quad (3)$$

subject to the following limitations

$$\begin{cases} F_D > F_C > F_A > F_B; \\ \lambda_1 + \lambda_2 = 1; \qquad \lambda_1, \lambda_2 \geq 0, \end{cases} \tag{4}$$

where: $F_A = 11,9\lambda_1 + 18,3\lambda_2$; $F_B = 27,5\lambda_1 + 17,8\lambda_2$; $F_C = 40,6\lambda_1 + 13,2\lambda_2$; $F_D = 48,1\lambda_1 + 5,0\lambda_2$.

As a result of its solutions, we obtain the following results of calculation of indicators of the comprehensive evaluation of variants of strategic development of the tourism industry (table. 2): the maximum value of the objective function is $\Sigma\varepsilon$ = 20,41; weighting coefficients – λ_1 = 0,521, λ_2 = 0,479. Under obtained values of the weighting coefficients, the values of indicators of the comprehensive evaluation of variants of strategic development will be as follows: F_A = 14,943, F_B = 22,851, F_C = 27,445, F_D = 27,445.

Table. 2. The results of calculation of indicators of integrated assessment options

Basic options	Criteria		Indicators of integrated assessment						Discrepancies	
	x_1	x_2		$\lambda_1 x_1$		$\lambda_2 x_2$		Σ		ε
D	48,1	5,0	F_D=	25,049	+	2,396	=	27,445		
C	40,6	13,2	F_C=	21,143	+	6,302	=	27,445	$\|F_D - F_C\|$	0,000
A	11,9	18,3	F_A=	6,197	+	8,746	=	14,943	$\|F_C - F_A\|$	12,502
B	27,5	17,8	F_B=	14,321	+	8,530	=	22,851	$\|F_A - F_B\|$	7,908
Weighting coefficients			$\lambda_{1,2}$=	0,521		0,479	=	1,000	$\Sigma\varepsilon$=	20,410

From this table that the indices of the FD and WWF identical to each other, this means that the ex-пертні assessment of options for the strategic development of two criteria are contradictory. However, VNA, reflecting the decision of a problem of linear programming, we obtained the values of weight коефіцієн tov, in which this contradiction reduced to a minimum. In other words, the system of inequalities (4) no solution, but we have found a solution with a minimum binding.

Note that such a conflict does not arise if the experts just named the best option from the set of feasible. Let it be a option B, that is, experts had established such comparative efficiency: B > A, B > C, B > D. Then we obtain the following problem of linear programming: calculate the maximum value of the objective function

$$\Sigma\varepsilon = |F_B - F_A| + |F_B - F_C| + |F_B - F_D| \rightarrow \max \tag{5}$$

subject to the following limitations

$$\begin{cases} F_B > F_A, F_B > F_C, F_B > F_D; \\ \lambda_1 + \lambda_2 = 1; \qquad \lambda_1, \lambda_2 \geq 0, \end{cases} \tag{6}$$

where: $F_A = 11,9\lambda_1 + 18,3\lambda_2$; $F_B = 27,5\lambda_1 + 17,8\lambda_2$; $F_C = 40,6\lambda_1 + 13,2\lambda_2$; $F_D = 48,1\lambda_1 + 5,0\lambda_2$.

As a result of its solutions using the "Solver", we get the following results of calculation of indicators of integrated assessment of options (tab. 3): the maximum value of the objective function is $\Sigma\varepsilon$ = 7,805; weighting coefficients – λ_1 = 0,262, λ_2 = 0,738. The values of indicators of the comprehensive evaluation of variants of strategic development will be as follows: F_A = 16,586, F_B = 20,341, F_C = 20,341, F_D = 16,291.

Table. 3. The results of calculation of indicators of integrated assessment options

Basic options	Criteria		Indicators of integrated assessment						Discrepancies	
	x_1	x_2		$\lambda_1 x_1$		$\lambda_2 x_2$		Σ		ε
B	27,5	17,8	F_B=	7,204	+	13,137	=	20,341		
A	11,9	18,3	F_A=	3,117	+	13,469	=	16,586	$\|F_B - F_A\|$	3,755
C	40,6	13,2	F_C=	10,636	+	9,705	=	20,341	$\|F_B - F_C\|$	0,000
D	48,1	5,0	F_D=	12,601	+	3,690	=	16,291	$\|F_B - F_D\|$	4,050
Weighting coefficients			$\lambda_{1,2}$=	0,262		0,738	=	1,000	$\Sigma\varepsilon$=	7,805

One drawback of the method of linear convolution of criteria of selection is enough ve-big load of experts, who are forced to give meaning to the weight coefficients for all criteria [11].

2. Method of hierarchical patterns of selection criteria

In its time the popularity received a method of forming metric complex-th of evaluation criteria on the basis of the construction of the hierarchical structure (tree) criteria for the selection of ru. This method investigated the scientists such as С.Д. Бешелєв [1], В.Н. Бурков [2], Е.П. Ільїна [7], М.М. Кітаєв [8], В.П. Корнієнко [9], В.Б. Кузьмін [10], Б.Г. Литвак [11], Л.А. Панкова [12], В.В. Подіновський [14]. The idea of the method is that all criteria are organized in a hierarchical structure [7]. At each level of the hierarchy is built aggregate assessment criteria of the previous level.

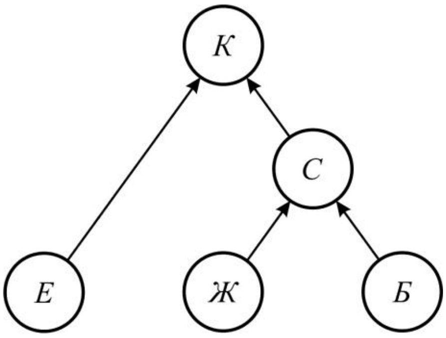

Fig. 2. The hierarchical structure of the criteria of a comprehensive assessment of options for the strategic development of the tourism industry

On Fig. 2 shows the hierarchical structure for the three evaluation criteria variants of strategic development of economic efficiency, the quality of life and environmental security (denote their respective letters *Е*, *Ж* і *Б*) [2, 13]. Normally you have to unite the criterion of assessment of level of life (*Ж*) with the criterion of ecological safety (*Б*) in one aggregated criterion of assessment of level of social (*С*) strategic development. Further, combining the criterion of social standards (*С*) according to the criterion of economic efficiency (*Е*), we obtain a criterion (index) of integrated assessment (J) socio-economic level of strategic development of the tourism industry, the extreme value of which can provide the analyzed option.

Feature of the hierarchical structure, shown in Fig. 2 is to aggregate in each tree node only two evaluation criteria, that an emergency advantage of this method over the other [15, 16]. The fact that the index of integrated assessment of options should reflect the important priorities of strategic development of the tourism industry. The formation of these priorities, and thus the formation of this index should be the first persons (Minister, his deputies, heads of regional or territorial departments), i.e. persons who make the final decisions [5]. Here they encounter a purely psychological problem. Usually the responsible person is able to effectively evaluate (compare) only a limited number of strategic development and best of all, if each step has to compare not more than two criteria.

Comparison of variants of strategic development of the two criteria is conveniently performed-you, feeding the results of their assessment in the form of a table (the matrix). Beforehand we proceed to the discrete scales of assessments for each criterion, namely, we will assess the strategic development of the tourism industry, using a five point scale: mission, the CAA-ka, fair, good, excellent, or in numerical estimates - one, two, three, four, five. In most of these scales відображатимемо aggregated and integrated the values of the indicators for the evaluation of the respective options. On Fig. 3 shows an example of coagulation criterion of "standard of living" (*Ж*) according to the criterion of "ecological security"(*Б*).

5	2	3	4	5	5
4	2	3	4	4	4
3	1	2	3	3	4
2	1	2	3	3	3
1	1	1	2	2	3
Б / Ж	**1**	**2**	**3**	**4**	**5**

Fig. 3. Matrix clotting criterion of "level of life" with the criterion of "ecological security"

As mentioned above, the matrix reflects the priority public variants of strategic development of the tourism industry [3, 4]. So when a critical condition in the field of ecology, and in poor level of life priority no none of the criteria. A satisfactory state of strategic development in the field of ecological safety, and in poor level of life priority is given to the indicator of living standards. If ecological security is a good assessment of the level of life is satisfactory, the social level is evaluated well. If Vice versa ("good" in terms of life and "satisfactory" for ecological safety), social ri-Wen is estimated fair. With the growing level of priority shifts to until disappear environmental safety. In particular, the social level with an estimation "perfectly" available til-Ki during the evaluation of "excellent" on the index of ecological safety, while the level of life can be measured even "good".

Having aggregated values of an indicator of social level (S) of the strategic development of the tourism industry, we can build a matrix clotting according to two criteria (C) and (E), which will result in the value of the index comprehensive assessment of its socio-economic level (To). Example of indicator values such evaluation are given in Fig. 4

5	3	3	4	5	5
4	2	3	4	4	5
3	2	2	3	3	4
2	1	2	3	3	4
1	1	1	2	2	3
C / E	**1**	**2**	**3**	**4**	**5**

Fig. 4. Matrix clotting criterion of "social level" according to the criterion of "economic efficiency"

Here you can also indicate a change in the system of priorities [3, 4]. When the state of crisis in the economy (E) and even poor condition at the social level (C) the priority to the show-nick assessment of the level of economic efficiency. Subject to satisfactory or good meaning of the evaluation index of social level priority shifts to the criterion of economic efficiency. If economic efficiency has good reviews and a satisfactory level of social coverage level, the value of the index of a comprehensive assessment of the socio-economic level (K) is satisfactory. Accordingly, the opposite occurs : (a score of "good" on the social level, and "satisfactory" in terms of economic efficiency) - is estimated as good. If the value of the criterion for assessment of the social level of "good" good value is an indicator of the level of economic efficiency with a rating of "satisfactory" and "good", and in assessing the "excellent" reaches the maximum value. Finally, when assessing the "excellent" in terms of economic efficiency indicator of a comprehensive assessment of the socio-economic level (To) reaches the value of "excellent" when the value of the criterion for assessment of the social level is even "good".

Limit the boundaries separating the bad state of strategic development of задовіль, satisfactory good good from non-you can also define differently. Above this, these boundaries can and should change over time. So, the status of the strategic development with the rating of "bad" corresponds to the present day and on the economic efficiency of the activity of the tourist Galu, and the level of life of its employees, or even clients, and at the level of ecological security of envi-ronment. The status of "satisfactory" may correspond to the average values of the respective indicators in the tourism sector and some other sectors of the economy. Status of "good" corresponds to the best value performance in many sectors of the economy, and "excellent" - the mean value of the state both within the country and in other countries and in their respective industries. With the growth of efficiency of the economy and the living standards of the population and the priorities may change. So, the status of "excellent" can match the best values of the corresponding parameters in the world.

Both matrixes, United in graphical scheme of integrated assessment of socio-economic level of strategic development of the tourism industry, are shown in Fig. 5. Having a tree convolution of criteria, you can evaluate any possible strategic option, and then choose the best option from the set of feasible. To do this, each version of the strategic development will describe a number of different criteria $\tilde{X}^{\Sigma} = \{x_{Ж}, x_{Б}, x_{Е}\}$, values which determine the level of assessment.

Consider the problem of choosing optimal variants of strategic development, which will ensure the transition from the status of the tourism industry with the rating of "bad" to a state with a rating of "satisfactory". To do this, we give the definition of the notion of intense variants of strategic development of [2, 6]. We assume that the version of the x_1 is called stressful if there is no other option x_2, which has a similar meaning aggregate, or the comprehensive evaluation, in which the value of each of the criteria is not higher than option x_1. For example, the option $\tilde{X}_1^{\Sigma}$ = {2, 2, 4}, that has a comprehensive assessment of K = 3, is not a tense, because the option is there $\tilde{X}_2^{\Sigma}$ = {2, 2, 3}, which has a similar indicator value of integrated assessment, at the same time, the value of each criterion does not exceed the values similar criteria options $\tilde{X}_1^{\Sigma}$. As for option $\tilde{X}_2^{\Sigma}$ such options are none, so he is busy. The purpose of intense options is that current versions of strategic development, which provide for the acquisition of the necessary value of the metric of integrated assessment, must be strained. Actually tense options is Pareto-optimal variants in the space of criteria are considered. So, when solving the problem of choosing optimal variants of strategic development of the tourism industry, which will provide for the transition from the status of "bad" to a condition satisfactory, we can confine the analysis of only a major options.

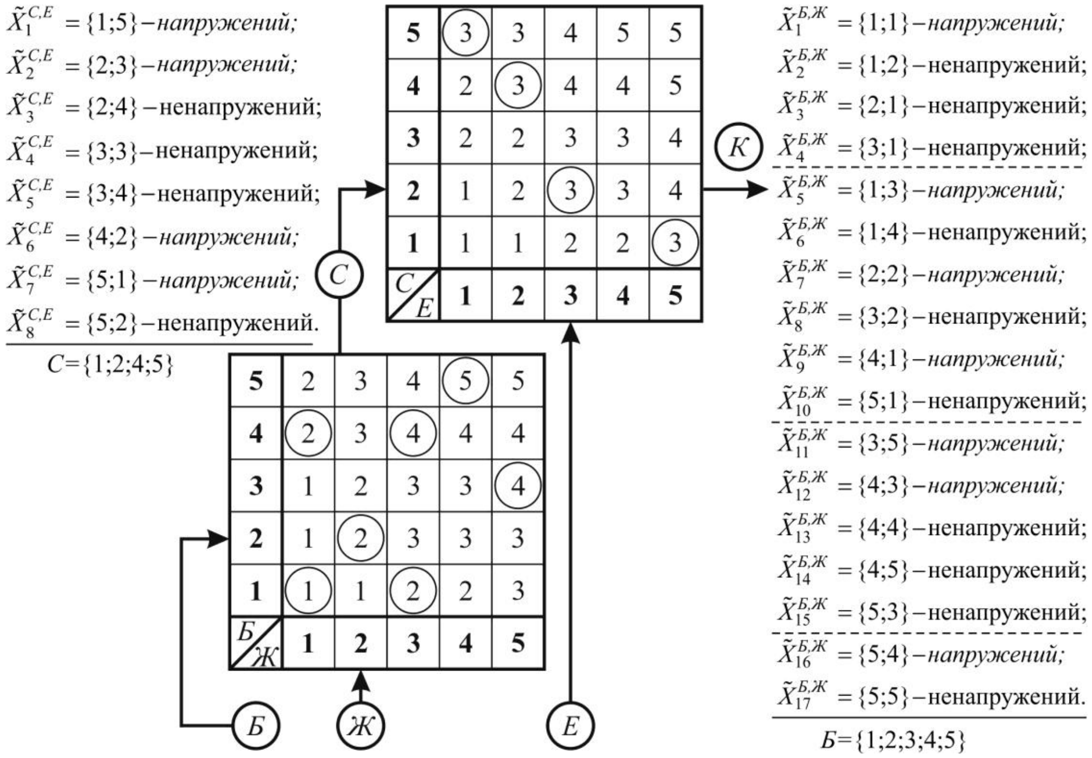

Fig. 5. The scheme of complex assessment of the socio-economic level of strategic development of the tourism industry

We describe the algorithm of searching all the tense variants of strategic development.

Let task of transition from state $\tilde{X}_0^{\Sigma}$ = {2, 2, 2} the value of integrated assessment of "bad" in the state of $\tilde{X}_1^{\Sigma}$ = {3, 3, 3} with a value of "satisfactory". First, consider matrix convolution of criteria for assessment of the social level of (C) and the level of economic efficiency (E). Celebrate all of the elements of the matrix C/E, which have the value of the indicator 3 (satisfactory, Fig. 5) and which are tense, i.e. only those that are left and below them. with a value of "satisfactory". First, consider matrix convolution of criteria for assessment of the social level of (C) and the level of economic efficiency (E). Celebrate all of the elements of the matrix C/E, which have the value of the indicator 3 (satisfactory, Fig. 5) and which are tense, i.e. only those that are left and below them. Only 8 such options, among which there are four tense, namely: $\tilde{X}_1^{C,E} = \{1;5\}$, $\tilde{X}_2^{C,E} = \{2;3\}$, $\tilde{X}_6^{C,E} = \{4;2\}$ i $\tilde{X}_7^{C,E} = \{5;1\}$. On Fig. 5 in the matrix C/o noted circle the value of integrated indicators to be achieved for each of the four above States strategic development.

Economic efficiency (e) is the original criterion of assessment of the state of strategic development, while the social level of (C) - aggregate assessment. Therefore we consider matrix convolution of criteria (*Б*) and (*Ж*), on the basis of which you want to specify all tense options that the aggregate indicator for the assessment of (C) give the following values: {1; 2; 4; 5}. For example, a value of 1 ("critical") in terms of "With" may be obtained in four ways: $\tilde{X}_1^{Б,Ж} = \{1;1\}$, $\tilde{X}_2^{Б,Ж} = \{1;2\}$, $\tilde{X}_3^{Б,Ж} = \{2;1\}$ i $\tilde{X}_4^{Б,Ж} = \{3;1\}$, a value of 2 six ways: $\tilde{X}_5^{Б,Ж} = \{1;3\}$, ..., $\tilde{X}_{10}^{Б,Ж} = \{5;1\}$, value 4 - in five ways: $\tilde{X}_{11}^{Б,Ж} = \{3;5\}$, ..., $\tilde{X}_{15}^{Б,Ж} = \{5;3\}$, and the value 5, we get only two ways: $\tilde{X}_{16}^{Б,Ж} = \{5;4\}$ i $\tilde{X}_{17}^{Б,Ж} = \{5;5\}$.

Among all 17 analyzed variants of strategic development of only 7 of them-пружеными, namely: option $\tilde{X}_1^{Б,Ж} = \{1;1\}$ corresponds to the conservation of the existing situation in the field of ecological safety (*Б*) and the standard of living (Ж); option $\tilde{X}_5^{Б,Ж} = \{1;3\}$ corresponds to some improvement in the standard of living; option $\tilde{X}_7^{Б,Ж} = \{2;2\}$ indicates the absence of the priorities of any criterion; option $\tilde{X}_9^{Б,Ж} = \{4;1\}$ responsible improve the level of environmental safety; option $\tilde{X}_{11}^{Б,Ж} = \{3;5\}$ indicates an excellent standard of living, while the average level of ecological safety options $\tilde{X}_{12}^{Б,Ж} = \{4;3\}$ and $\tilde{X}_{16}^{Б,Ж} = \{5;4\}$ meet practically excellent level of environmental safety and slightly above average level of life.

The result of the obtained graph (Fig. 6), which is called many intense options to transition of a system from one state to another. As can be seen from the algorithm of its construction, it contains all tense options for strategic development of the tourism industry, the importance of a comprehensive evaluation index of "satisfactory".

To obtain any busy option, you must perform the following steps. Consider the starting point (entrance) the set of solutions. From it are the four arcs. Take any of them, for example, arc, which leads to the top $\tilde{X}_2^{C,E} = \{2;3\}$, going out of the two arcs. Note both of these arcs. Arc, which leads to the top 3 for the criterion of "E"indicates that it must achieve the state of "satisfactory". Arc, which leads into the top 2 in terms of "C", indicates that for him to reach the state of "bad". Of the three transition options to achieve a value of 2 for indicator "From the" select any (for example, option $\tilde{X}_9^{Б,Ж} = \{4;1\}$,which corresponds to the assessment of "good" according to the criterion of "Б", and the assessment of critical - according to the criterion of "Ж". Received intense variant corresponds to the subgraph of many decisions, which is highlighted in Fig. 6 thick arcs. It defines such a stressful option of strategic development $\tilde{X}^{Б,Ж,E} = \{4;1;3\}$.

Having lots of intense variants of strategic development of the tourism industry, it is easy to determine the number of them, which provide the required value is a comprehensive evaluation index options. To do this, apply the indexing algorithm (label) vertices solutions [2]:

1-th step. Denote the finite vertex set of solutions in an index with a value of 1 (Fig. 6 indices of the vertices are listed in the top half of squares and circles);

2-th step. Moving upwards, consistently labeled on all of the vertices. The index of the vertices of the circle is equal to the product indexes related two vertices of a lower level. The index of the vertices of the square on the figure corresponds to the sum of indices of adjacent vertices of a lower level. The index of the initial vertex-square determines the number of intense options.

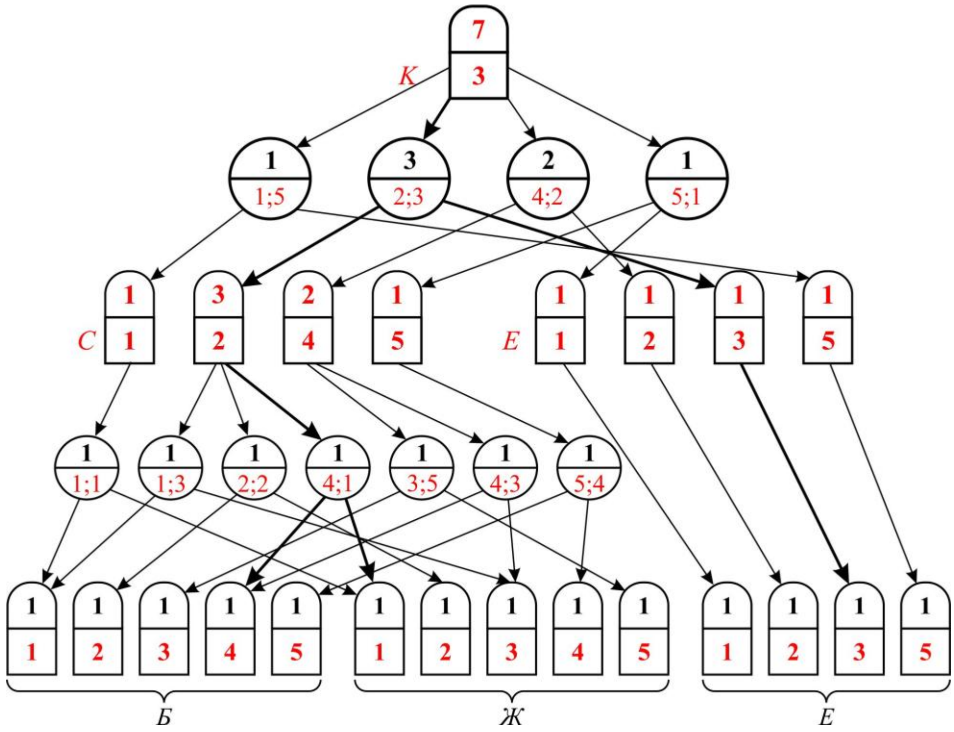

Fig. 6. Count many intense variants of strategic development of the tourism industry

Rationale the health of that algorithm goes directly from the described method of determining the indices. The indices of the vertices are listed in Fig. in the upper part 6 vertices. The number of intense options is 7.

3. Examples of optimum selection of strategic development the tourism industry

Building the set intense options, you can perform various tasks formation of acceptable options for the strategic development of tourism taking into account cost factors [3] and risk of implementation [4]. We first consider the problem of a choice of variants of strategic development, which ensures the achievement of this goal with the minimal expenses for its implementation. Let for the i-th criterion identified costs

$$\tilde{\tilde{S}} = \left\{ \tilde{S}_i = \{s_{ij},\ j = \overline{1,n}\},\ i = \overline{1,m} \right\},$$

necessary to ensure the j-th level of the state of the tourism industry. This means that developed many possible variants of strategic development which ensures the growth of the criteria to the j-th level. We assume that the ways by different criteria are independent, there is an option for the i-th criterion does not affect other development options. In this case there is an efficient algorithm to determine the optimal strategic development of the minimum implementation costs [3]. The basis of this algorithm is also a method of indexing vertices of intense options from bottom to top.

Denote the lower vertices of many decisions indexes sij. The tops of the next (higher) level many intense options will be denoted only after denote all adjacent vertices level which is below. The index of the vertices of a square (in such peaks recorded a single number - the value of the corresponding aggregate) corresponds to the minimum of indexes of the adjacent peaks-circles of the lowest level, and the index of the vertices of the group (in a mug recorded two numbers is a pair of values of criteria of the lower level of aggregation which gives the appropriate value of the criterion of top-level) is equal to the sum of indices of adjacent vertices of the squares of the lowest level.

Subject to such an algorithm is the index of the initial vertex-square is equal to the minimum costs on realization of a corresponding version of the strategic development. The optimal variant is "reverse" - top-down. First find top-circle, adjacent to the initial vertex set of solutions, which has the lowest value of the index among all the vertices adjacent to the initial one. With this top-mug out two arcs to the heights of-squares level which is below. For each vertex-square we find the top of the circle has the lowest index among all the vertices adjacent to the corresponding vertex-square etc. Result of the implementation of such actions will be allocated subgraph, which determines the optimal variant of the strategic development of the tourism industry with the minimal expenses for its implementation.

Consider the work of the algorithm on the example of selection of the many intense options listed in Fig. 6.

Приклад 2. Let the matrix of costs ($\tilde{\tilde{S}}$ \$) is as follows:

Table. 2. Matrix of costs on implementation of variants of strategic development

$i \setminus j$	**1**	**2**	**3**	**4**	**5**
Б	8	32	52	63	67
Ж	14	19	30	46	82
Е	2	13	41	78	96

Values of the indices of the vertices of the set of solutions obtained on the basis of this algorithm is shown in Fig. 7 in the top half of the respective nodes. Best option is highlighted by thick lines. This is a variant of $\tilde{X}^{Б,Ж,Е} = \{1;3;3\}$ with the combined costs s_0 = 79, \$, that corresponds to the balanced development of the tourism industry on all criteria.

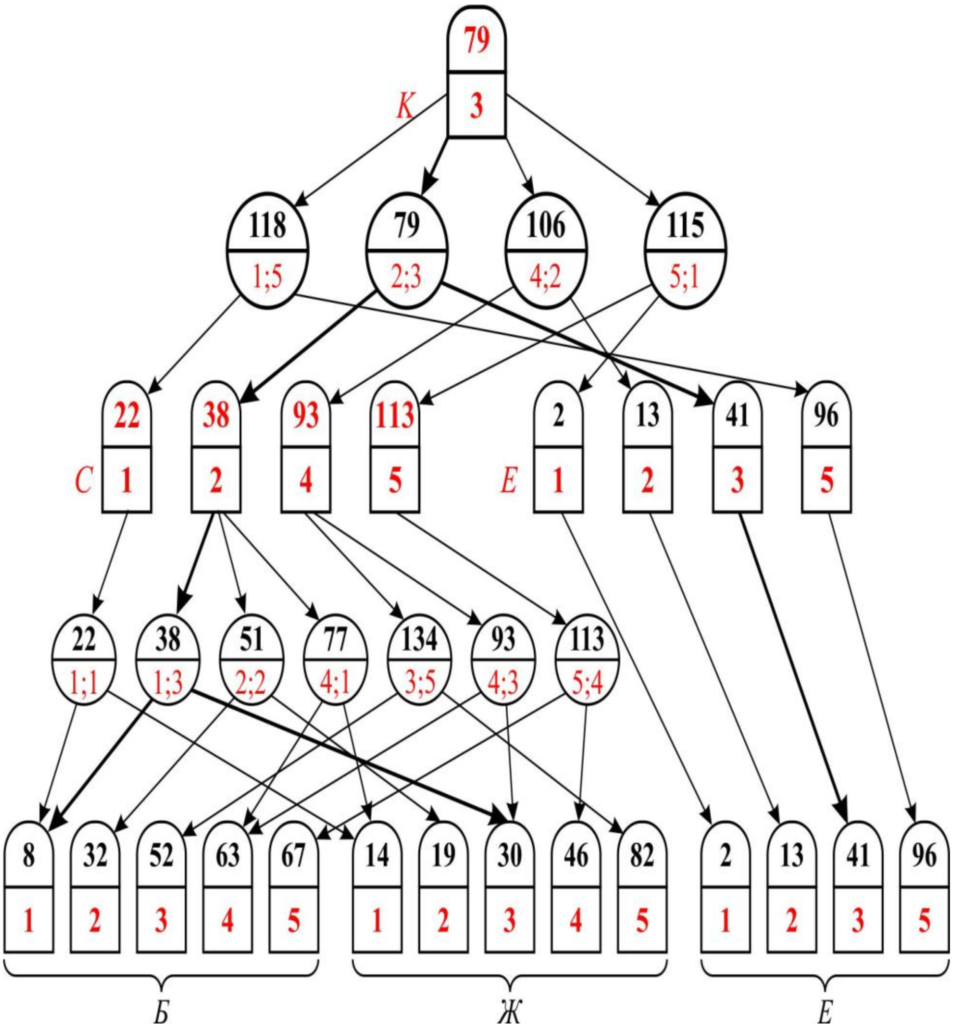

Fig. 7. Count many intense variants of strategic development of the tourism industry

Sorry, but only in some cases is the assumption of independence of individual options on the criteria of their realization. Generally, options are dependent among themselves, i.e. their implementation in regard to some criteria has an impact on the options implemented for other кри-тері-рit. Especially this concerns the criterion of increasing the level of economic efficiency (E), which leads to a better quality of life (Ж), and the level of environmental safety (В). If the impact on the level of life, as a rule, is positive (increase economic efficiency helps increase танню remuneration, the increase in employment, the growth of service-what), what influence the level of environmental safety (Б) is, as a rule, negative (depletion of natural resources, increase the risk of accidents and disasters, etc). So, from strategy of development of tourist industry aimed at increasing level of economic efficiency (E)should be expected to reduce the costs of achieving the required value of the standard of living (Ж) and growth of budget spending on the achievement of the required value level ecological security (Б).

Let for each value of the criterion of assessment of the level of economic efficiency of the expenses specified ($s_{Б,i}$) і ($s_{Ж,j}$), you need to reach the j-th value in accordance with the criteria (*Б*) and (*Ж*). In this case, the algorithm for determining the appropriate version of the strategic development of the minimum cost is based on enumeration of possible values for the criteria of evaluation of the level of economic efficiency (E). Each time the importance of the need to solve the problem of search of variants of strategic development of the minimum cost for other criteria. Five variants, which correspond to the five possible value of the level of economic efficiency, select the best.

Example 3. Let expenses ($s_{Б,i}$) і ($s_{Ж,j}$) for different levels of economic efficiency have values that are listed in the table. 3.

Table. 3. Expenses ($s_{Б,i}$) and ($s_{Ж,j}$) for different levels of economic efficiency

E	*i \ j*	1	2	3	4	5
1	***Б***	3	10	35	50	57
	Ж	21	26	41	77	129
2	***Б***	5	15	45	70	88
	Ж	13	18	27	48	85
3	***Б***	8	30	60	99	122
	Ж	9	12	19	29	52
4	***Б***	18	40	74	120	152
	Ж	4	7	11	17	32
5	***Б***	38	62	96	148	182
	Ж	2	4	6	11	18

For each level of economic efficiency, we obtain a set voltage groom options that have пі-дграфом many decisions contained in the note 1. Results of solving of the problem are given in table. 4.

Table 4. Total cost of implementation of variants of strategic development of the minimum cost for different values of expenditures by criteria ($s_{Б,i}$) and ($s_{Ж,j}$)

$Б_i \backslash Ж_j$	1	2	3	4	5
1	77	69	63	55	50
2		73	65	57	52
3			68	60	55
4				70	65
5					85

It should be noted that these subgraphs intersect only at the initial vertex and some final tops. Divide the end of the top, in which intersect subgraphs, several peaks so that all subgraphs had only one vertex, namely the initial (Fig. 8). Now, to get the set of solutions apply described above algorithm to determine the version of the strategic development of the tourism industry of the minimum cost, and the results for different values of the criteria $Б_i$ and $Ж_j$ bring in the table.

$i \setminus j$	**1**	**2**	**3**	**4**	**5**
$\boldsymbol{Б_1}$	3	10	35	50	57
$\boldsymbol{Ж_5}$	2	4	6	11	18

One of the possible options at the $Б_3$ and $Ж_3$ atmospheric air G3 shown in Fig. 8 thick lines. This is a variant of $\tilde{X}^{Б,Ж,Е} = \{1;3;3\}$ with the cost of $s_0 = 68$. Similarly, you can determine the optimal variants of strategic development of the tourism industry and for the case when one of the directions of development influences the other

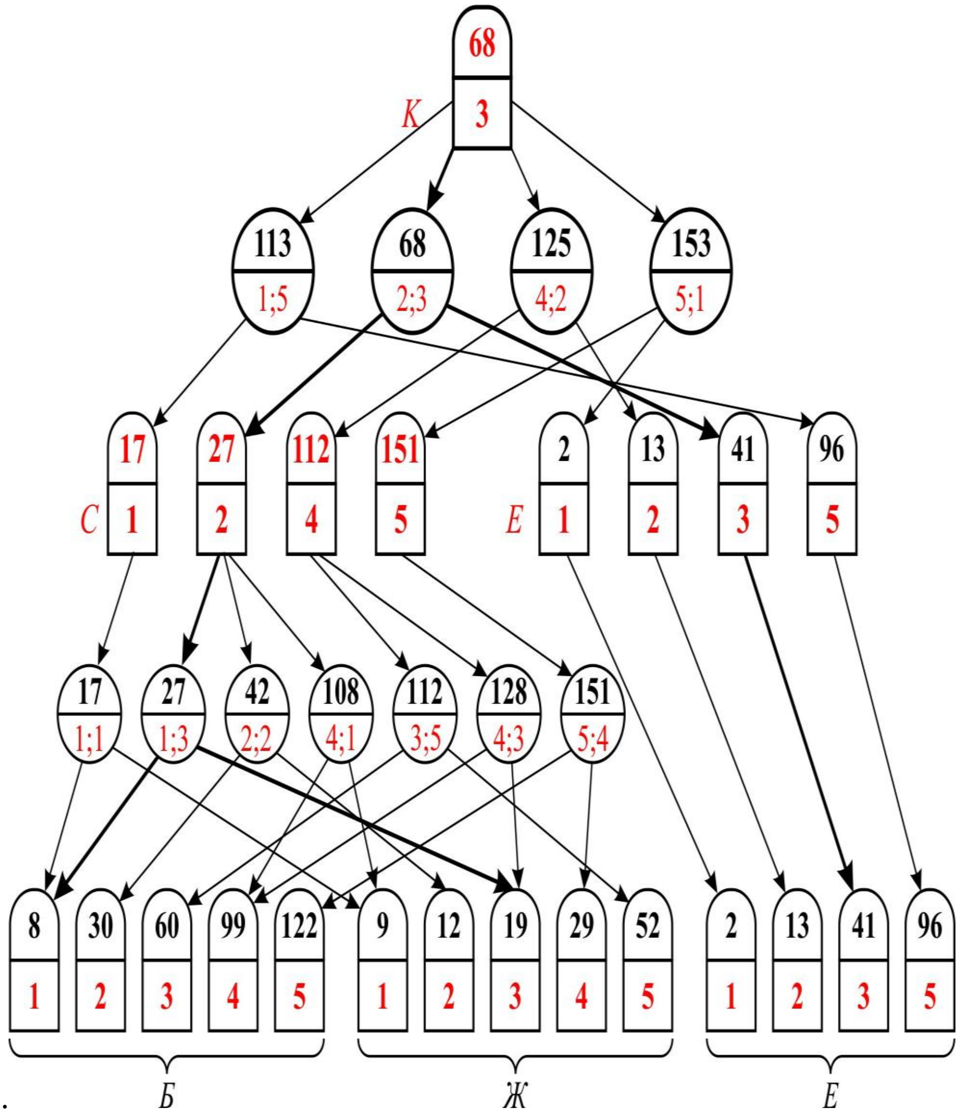

Fig. 8. Count many intense variants of strategic development of the tourism industry

Conclusions

1. Since the goal of the strategic development of the tourism industry is mainly contradictory to each other, to post several of them have to solve a multicriteria problem of search of the optimal variant. There are several approaches to solving this class of problems, most of which are somehow connected with the formation of the complex index of feasible options, the importance of which in the aggregate represent specific objectives of strategic development.

2. It is found that the easiest way to get the value of a comprehensive evaluation index of variants of strategic development is linear convolution of criteria through the weights (importance) of each of them, the values of which are determined on the basis of expert judgement. The disadvantage of this method is that you risk losing effective variants of the Pareto set. It is considered that option is effective (Pareto optimal)if there is no other option, which is not worse at all the criteria.

3. Found that among people who make the final decisions, popularity received a method of formation of a complex indicator assessment criteria based on the construction of the hierarchical structure (tree) criteria. At each level of this hierarchy is the structure of the aggregate assessment criteria of the previous level. Feature ієра-рхічної structure is to aggregate in each tree node only two criteria or indicators for their evaluation, which is the main advantage of this method.

4. Examples of implementing relevant tasks, which help to understand the essence of these methods of formation of a complex indicator evaluation criteria, as well as analyze the results of the estimation of variants of strategic development of the tourism industry on several criteria - economic efficiency, quality of life and environmental safety.

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