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METHODOLOGY FOR ASSESSING THE ECOLOGICAL AND ECONOMIC EFFICIENCY OF INVESTMENTS IN THE DEVELOPMENT OF TERRITORIAL NATURAL AND RECREATIONAL SYSTEMS

Abstract. The article discusses ways to improve the efficiency of attracted investments for the economic development of territorial natural and recreational systems (RTRS) using the methodology for assessing the environmental and economic results of the effectiveness of investment projects.

The given adapted methodology for the environmental and economic evaluation of investment projects for TPRS is based on the methods of retrospective forecasting, net present value, internal rate of return, assessment of environmental income and outflows, and the coefficient of sociological losses. The combination of these techniques, the degree expresses a comprehensive assessment of the potentials combined in with an integral indicator.

The methodology of ecological and economic assessment of investment projects in relation to TPRS allows using statistical data as initial information for forecasting indicators of recreational activities. Such an approach can limit manipulations in predicting the volume of services rendered in the recreational sector, and therefore, provide a more objective assessment of the effectiveness of investments.

On the basis of an adapted methodology for evaluating investment projects for the development of TPRS, an application program called "Calculation of environmental and economic efficiency for evaluating an investment project for the development of a natural and recreational system. An application

program’ was developed, which saves labor costs and ensures efficiency when evaluating investment projects.

Key words: territorial natural and recreational system, investments, ecological and economic assessment, economic efficiency assessment.

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АУМАҚТЫҚ ТАБИҒИ-РЕКРЕАЦИЯЛЫҚ ЖҮЙЕЛЕРДІ ДАМЫТУҒА ИНВЕСТИЦИЯЛАРДЫҢ ЭКОЛОГИЯЛЫҚ-ЭКОНОМИКАЛЫҚ ТИІМДІЛІГІН БАҒАЛАУ ӘДІСТЕМЕСІ

Аннотация. Мақалада инвестициялық жобалар тиімділігінің экологиялық-экономикалық нәтижелерін бағалау әдіснамасын пайдалана отырып, аумақтық табиғи-рекреациялық жүйелерді (РТРС) экономикалық дамыту үшін тартылатын инвестициялардың тиімділігін арттыру жолдары қарастырылады.

TPRS үшін инвестициялық жобаларды экологиялық және экономикалық бағалаудың бейімделген әдістемесі ретроспективті болжау әдістеріне, таза ағымдағы құнға, ішкі пайда нормасына, экологиялық кірістер мен ағындарды бағалауға, сондай-ақ әлеуметтік шығындар коэффициентіне негізделген. Осы әдістердің тіркесімі, дәреже интегралды индикатормен бірге потенциалдарды жан-жақты бағалауды білдіреді.

ТПР-ға қатысты инвестициялық жобаларды экологиялық және экономикалық бағалау әдістемесі статистикалық деректерді рекреациялық қызмет көрсеткіштерін болжау үшін бастапқы ақпарат ретінде пайдалануға мүмкіндік береді. Бұл тәсіл рекреациялық секторда көрсетілетін қызметтер көлемін болжау кезінде айла-шарғы жасауды шектеуі мүмкін, сондықтан инвестициялардың тиімділігін неғұрлым объективті бағалауды қамтамасыз етеді.

ТПРС дамыту бойынша инвестициялық жобаларды бағалаудың бейімделген әдіснамасы негізінде «табиғи-рекреациялық жүйені дамыту бойынша инвестициялық жобаны бағалау үшін экологиялық және экономикалық тиімділікті есептеу» атты қолданбалы бағдарлама әзірленді. Еңбек шығындарын үнемдейтін және инвестициялық

жобаларды бағалау кезінде тиімділікті қамтамасыз ететін қолданбалы бағдарлама жасалды.

Түйін сөздер: аумақтық табиғи-рекреациялық жүйе, Инвестициялар, экологиялық-экономикалық бағалау, экономикалық тиімділікті бағалау.

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МЕТОДИКА ОЦЕНКИ ЭКОЛОГО-ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ ИНВЕСТИЦИЙ В РАЗВИТИЕ ТЕРРИТОРИАЛЬНЫХ ПРИРОДНО-РЕКРЕАЦИОННЫХ СИСТЕМ

Аннотация. В статье рассматриваются способы повышения эффективности привлекаемых инвестиций для экономического развития территориальных природно-рекреационных систем (ТПРС) с использованием методики оценки эколого-экономической эффективности инвестиционных проектов.

Приведенная адаптированная методика эколого-экономической оценки инвестиционных проектов для ТПРС основывается на методах ретроспективного прогнозирования, чистой приведенной стоимости, внутренней нормы доходности, оценки экологических доходов и оттоков и коэффициента социологических потерь. Комбинация этих методик выражает комплексную оценку потенциалов объединенных в интегральный показатель.

Методика эколого-экономической оценки проектов инвестирования применительно к ТПРС позволяет использовать в качестве исходной информаци для прогнозов показателей рекреационной деятельности статистические данные. Такой подход может ограничить манипуляции при прогнозировании объемов оказанных услуг рекреационной сферы, а значит, обеспечит более объективную оценку эффективности инвестиций.

На основе адаптированной методики оценки инвестиционных проектов по развитию ТПРС разработана прикладная программа «Расчет эколого-экономической эффективности для оценки инвестиционного проекта по развитию природно-рекреационной системыю Прикладная программа», позволяющая экономить трудозатраты и обеспечивающая оперативность при проведении оценки проектов инвестирования.

Ключевые слова: территориальная природно-рекреационная система, инвестиции, эколого-экономическая оценка, оценка экономической эффективности.

Introduction. World experience shows that developed territorial natural and recreational systems make a significant contribution to the economy of the state. The problem is that Kazakhstan, possessing significant natural recreational potential, does not use it effectively. Tied into a single territorial natural recreational system, the natural environment, infrastructure of the territory and the quality of the provided recreational services do not meet international standards and norms, causing serious damage to the economic potential of the recreational sphere of Kazakhstan.

Many theoretical and methodological issues of the development of territorial natural and recreational systems are covered in the works of domestic and foreign scientists. However, the issues of ensuring the efficiency of investments attracted in the development of TNRS, taking into account their specific features, have not been sufficiently researched and poorly studied in the domestic literature. P. Eagles, S. McCool, C. Hines, L. Emerton, J. Bishop, M.A. Kuksova, E.Yu. Zhidkova, D.A. Lisin, D.V. Nikolaenko and other foreign authors made fundamental contribution to scientific-theoretical, methodological and practical aspects which accompanies terms of economic development of TNRS (Eagles et.al, 2016). Topical issues related to economic characteristics and direction of recreational system development are disclosed in contemporary scientific works of L.Z. Baiguzina, N.S. Mironenko, I.T. Tverdokhlebova, V.B. Nefedova, E.D. Smirnova, V.P. Chizhova and others (Baiguzina, 2013; Mironenko et.al, 1998; Nefedova et.al, 1980). Theoretical and methodological aspects of economic use of natural potential and development of TNRS are represented in works of N.K. Mamyrova, M.S. Tonkopiya, E.M. Upusheva, S.R. Erdavletova, A.A. Saryan and others (Mamyrov et.al, 2003; Yerdavletov, 2000; Saryan, 1990). Significant contribution to research of investment approaches to projects for the development of organizational systems are made by domestic scientists U. Baymuratov, A.Z. Nurmagambetova, K.K. Abuov, A.S. Kulmaganbetova, Nurmukhanova K.Zh., Altaybaeva Zh.K., Alimkhanova R.K and others (Baimuratov, 2005; Nurmaganbetova, 2014; Abuov, 2017), russian scientists K.V. Baldin, E.L. Makridenko, O.I. Shvaika, S.A. Barkalov, V.P. Morozov, T.A. Sviridova, B.I. Kochuro and others (Baldkin, 2016; Barkalov et.al, 2015; Kochurov et.al, 2013). These works have significant value, however economic efficiency investment supply attracted to development of TNRS actualizes the development of new theoretical and methodological approaches that correspond to modern economic realities.

One of the direction of investment efficiency improvement of TNRS development projects and development of tourism in the framework of this system is offering usage methodology of ecological-economical assessment of projects. Recreational health monitoring was based on aspectual, regional and correlation analysis of factors, sociological survey of target respondents group with subsequent processing of the results with the "stat +" program.

The given adapted methodology of ecological-economic assessment of investment projects for TNRS is based on methods of retrospective forecasting, net present value, internal rate of return, natural estimates of environmental revenues and outflows, and sociological loss rates. Combination of these methodologies expresses a comprehensive assessment of the potentials combined into an integral indicator.

The methodology allows with a high degree of justification on the basis of cost characteristics to establish the potential of efficiency of TNRS development projects investment and tourism in the framework of this system. On the basis of this adapted methodology, an application program has been developed that allows to save labor costs and ensure efficiency in assessing environmental investment projects at the level of recreational TNRS, as well as tourism projects.

Purpose of the research: increasing the efficiency of attracted investments for the economic development of TNRS and tourism development projects within these systems based on the use of methods for assessing the environmental and economic efficiency of investment projects.

Materials and methods. Research methods are: methods of retrospective forecasting, net present value, internal rate of return, natural estimates of environmental revenues and outflows, and sociological loss rates. Combination of these methodologies expresses a comprehensive assessment of the potentials combined into an integral indicator.

Results and discussions. Project on development of Bayanauyl TNRS as one of the most primary touristic area determined in the framework of tourism development program in Kazakhstan until 2025, must be invested on a public-private partnership basis. Earlier, we noted that the development of TNRS, first of all, depends on the efficiency of recreational activities and infrastructure, since the effects of these activities extend to the entire service of this system. Therefore, we assume that investing in the recreational activities of this territory will lead to the development of the Bayanauyl TNRS (Table 1).

The total cost of the project is conventionally accepted by us as 1,000,000 thousand tenge.

Table 1. Data on the value of the invested project.

Cost of the project	1000000
Investment year	2021
Terms and amounts of repayment of the principal debt	2021-2025yy
Percentage of remuneration	7%
2021	200000
2022	200000
2023	200000
2024	200000
2025	200000

Alternative projects of various costs can be considered, but they will be limited to the development of the projected volumes of recreational services for the period of return of borrowed funds on investments (so that incomes cover expenses).

In order to comply with the interests of investors and not to encourage dependent sentiments in business, investment, in our opinion, should be carried out on a paid basis. But the fee should be at the level of government programs accepted for investment, should not be high, since the project has a social orientation. The tourist and recreational business in the Bayanauyl natural zone is seasonal. This is reflected in the evenness of cash flows from the services provided, this is one of the reasons why preferences and other measures to stimulate their participation should be provided for private investors in the framework of PPP.

To predict the volume of direct percentages of recreational services for 2021-2025, statistical data for 2012-2020 were used, which are presented in the table 2. Stat.data

Table 2.Initial data on direct recreational activities of Bayanaul region for 2012-2020.

Year	Number of beds	Occupancy, %	Person-days of stay actually served		Volume of services rendered, thousand tenge	Average price per stay, tenge	
Source of data	Stat.data	Stat.data	calculation group2 *365*group 3	Stat. data	Stat.data	Group 6:group 4	Stat.data
2012	0	0	0,0	10790	34314	3180,0	1027
2013	2278	12,9	107259,6	63866	238656,2	2225,0	1178
2014	2306	7,9	66493,5	70581	286604,4	4310,3	515
2015	2405	12,4	108850,3	73855	297512,7	2733,2	1381
2016	3653	22,2	296002,6	84465	383296,4	1294,9	460
2017	3684	23	309271,8	82231	403856,40	1305,8	545
2018	3349	10,5	128350,4	40947	451590,2	3518,4	7102
2019	4643	23,4	396558,6	47744	396558,6	1456,5	5826
2020	4718	22,2	382299,5	14742	69651,5	1821,9	5667

Based on these data, we calculated (table 3) the average coefficients and growth rates on a retrospective basis, we obtained data on the average growth rates for the last five years in terms of the volume of recreational services in the Bayanayul resort zone (further in the calculations, links will be given to the data of these tables).

Table 3. Calculation of the average growth rates of indicators of recreational services volume for 2013-2020.

Indicators	2013 г.	2014 г.	2015 г.	2016 г.	2017 г.	2018 г.	2019 г.	2020 г.	Avarage coeffi-cient	Taking into acco-unt the inaccuracy
Beds coeffi-cient growth (group 1 from table 2)	1,00	1,01	1,04	1,52	1,01	0,91	1,39	1,02	1,11	0,24
Occupancy coefficient growth (group 3 from table 2)	1,00	0,61	1,57	1,79	1,04	0,46	2,23	0,95	1,21	0,32
Coefficient of growth of price per bed stay (group 7 from table 2)	1,00	1,94	0,63	0,47	1,01	2,69	0,41	1,25	1,18	0,43
Inaccuracy 1 (П1) (group 4-5)/ group 4 from table 2	0,40	-0,06	0,32	0,71	0,73	0,68	0,88	0,96	0,12	x
Inaccuracy 2 (П2) (group 7-group 8)/ group 7 from table	0,47	0,88	0,49	0,64	0,58	-1,02	-3	-2,11	-0,26	x

In the process of environmental and economic assessment of the investment project in the context of insufficient baseline information carried out in this study, the authors relied on the methodology of O.M. Gusarova, which is the need to use retrospective modeling as a way of planning and predicting the results.

Table 4 shows the projected volume of activity 2021-2025, taking into account the average growth rates for the previous five years

In Table 4, based on the projected indicators of recreational activities, projected cash flows (income from recreational activities) are calculated.

Table 4: Calculation of projected cash flow from recreational activities for 2021-2025.

Indicators	2021 г.	2022 г.	2023 г.	2024 г.	2025 г.
Number of beds, taking into account the growth coefficient.	5248,8	5839,3	6496,2	7227	8040
Occupancy rate with growth factor, % (из табл. 2 гр3 * из табл. 3 гр 7)	26,78	32,30	38,96	47,00	56,69
The average price of a bed-day of stay taking into account the growth factor, tenge. (из табл 2. гр 7* из табл. 3 гр 7)	2140,73	2515,36	2955,54	3472,77	4080,50
Cash flow, thousand tenge (line 1* ‖2*3*365 days)/100% /1000	1098311,1	1731634,9	2730285,4	4305511,9	6788420,7

Projected cash flows (Table 5) for all competitive projects for the development of Bayanaul TPRS will be the same, provided that the projections of the volume of recreational activities are calculated on a retrospective basis (according to tables 3 and 4).

Table 5. Calculation of projected payments to personnel of the recreational sphere of Bayanaulsky district for 2021-2025.

Indicators	2021 г.	2022 г.	2023 г.	2024 г.	2025 г.
Number of employees (number of beds from Table 3: 22*), persons	238,6	265,4	295,3	328,5	365,4
Average annual wage fund per employee (based on 100 thousand tenge per month), taking into account conditional growth, 1.15 ***.	1587,0	1825,1	2098,8	2413,6	2775,7
payment to personnel, thousand tenge	378658,2	484381,54	619775,64	792867,6	1014240,78
*bed service by one employee ***growth coefficient of salaries					

Table 6 calculates projected cash flows from operating, investing, financial activities and projected net cash flow.

Table 6: Calculation of projected net cash flow for 2021-2025, thousand tng.

Indicators	2021 y	2022 y.	2023 y.	2024 y.	2025 y.
Operational activities					
1. Income from the sale of services (Table 4)	1098311,1	1731634,9	2730285,4	4305511,9	6788420,7

2. payment to employees (Table 5)	378658,2	484381,54	619775,6	792867,6	1014240,8
3. Payments to suppliers (approximately 10% of sales	109831,1	173163,5	273028,5	430551,2	678842,1
4. Tax (from turnover 3%)	32949,33	51949,0	81908,6	129165,4	203652,6
5. Cash flow from operating activities	576872,5	1022140,8	1755572,7	2952927,7	4891685,2
Finance					
Taking loans (condition), thousand tenge	1000000				
2. Loan repayment, thousand tenge	200000	200000	200000	200000	200000
1. Interest payment (7% per annum) thousand tenge	70000	56000	42000	28000	14000
Cash flow from financial activities, thousand tenge	730000	-256000	-242000	-228000	-214000
Investment					
1.Purchase of fixed assets, HMA, thousand tenge	1000000				
2.Sale of fixed assets, thousand tenge	17903,79				
3.Cash flows from investment activities thousand tenge	-982096,21	0	0	0	0
Final net cash flow NCF=(CFo+CFf+CFi) thousand tenge	0,00	766140,8	1513572,7	2724927,7	4677685,2

In terms of net cash flow value, alternative competitive projects will differ because the flows from operating, financing, and investing activities will be different. They depend on the estimated operating costs, accounted income and costs of financial and investment activities, represented by a particular project. The differences will be due to the different cost of investments requested by the project, the timing of their return, the planned expenditures under the project activity.

We calculate the repayment of borrowed funds for investments for five years. Conditionally calculated income and expenses. By years, the net cash flow is presented in Table 6.

Investments, which stimulate the development of organizational systems and increase competitiveness, affect the state of the ecological-economic system as a whole, since any activity related to the use of natural resources affects the environment.

Among the particularly highlighted reasons for insufficient consideration of environmental factors in assessing the effectiveness of investment projects are:

- the complexity of identifying environmental impact factors due to their diversity;

- Lack of adapted methodologies to provide a comprehensive assessment of the effectiveness of investment projects to develop systems;

- insufficient institutional definition of relations on compensation of damage caused to the environment

We used O.M. Gusarova, I.P. Nuzhina, M.S. Krass' methodology of ecological and economic assessment of investment projects.

The value of each particular natural resource is determined by the income that its owner can receive when using it. If the income exceeds the income received from a similar type of activity in the neighboring areas, then we can say that the additional income is received due to the natural properties of the natural object. In our example, we conditionally call this additional income "Eco-Income". To determine it, we calculated the share of ecoincome in the price (Table 7).

Table 7. Calculation of the share of eco-income in the price of a bed-day of stay in Bayanaul district.

Indicator title	2013	2014	2015	2016	2017	2018	2019	2020	Average percentage of eco-income in the price, %
The average price of a bed-day stay in Bayanaul district, tenge (from Table 2. gr.7)	2225,0	4310,0	2733,0	1294,9	1305,8	3518,4	1456,5	1821,9	x
Average price of a bed-day of stay in rural areas in Pavlodar region, based on tenge (taken conventionally 80% profit from line 1	1780,0	3448,2	2186,6	1035,9	1044,6	2814,7	1165,2	1457,5	x
Eco-income of a bed-day stay in Bayanaul district (line1 - line2)	445,0	862,1	546,6	259,0	261,2	703,7	291,3	364,4	x
The share of eco-income in the price, % (line3:line 1)	20	20	20	20	20	20	20	20	20

The share of eco-income in the price, in our example, was 20%.

Since the project was evaluated by territorial system, and not by a particular business entity, we adapted the methodology to the evaluation of the project

on Bayanaul natural recreation system. This is manifested in the fact that to calculate the forecasts for 2021-2025 we used statistical data on the volume of services provided by the accommodation facilities of holidaymakers in Bayanaulsky district, taking into account the average growth rate for five years.

Let's calculate the ecological component of the cash inflow (ЭСД). It consists of Eco-Income and Charges for the use of natural resources (Table 8).

Table 8: Calculation of the environmental component of the cash inflow (ЭСД).

Indicator name	2021 y	2022 y	2023 y	2024 y	2025 y
Average price of a bed-day in Bayanaul district, tenge (from Table 4)	2140,7	2515,4	2955,5	3472,8	4080,50
Eco-income per bed day of stay in Bayanaul district, tenge (average percentage of eco-income in the price, possibilities from the following in the text table 7).	428,1	503,1	591,1	694,5	816,1
Number of beds, units (from tab. 4,)	5248,8	5839,3	6496,2	7227	8040
Occupancy (from table 4)	26,78	32,30	38,96	47,00	56,69
Ecoincome (EI) (line 2* line 3* line 4*365):1000, thousand tenge	2196386,1	3463462,5	5460496,8	8610354,4	13576841,5
Payment for the use of natural resources (static data)	41307	44674	49547	54997	61046
ЭСД (строка 5+стр.6) Calculation of the environmental component of the cash inflow (2196386,1+41307)	2237693,1	3508136,5	5510043,8	8665351,4	13637887,5

To calculate the environmental component of the outflow of funds OFn, allocate investment and current costs for the implementation of environmental measures provided for by the project (OFn or Con - value of the outflow of funds (cash outflow) ; n - number of the calculation step, n = 0,1,2.....,ni).

To calculate the outflow component we used statistical data on environmental costs, on average for 2014-2016: [64963 thousand tenge + 38690 thousand tenge + 59279 thousand tenge]:3 = 54311 thousand tenge. For the forecast calculations of these indicators we take a growth coefficient of 1.15, then:

- For 2017, 54311*1,15=62457 thousand tenge,
- For 2018, 62457*1,15=71826 th. tenge.

We use the 2018 indicator for further calculations in Table 9, taking into account the growth coefficient of 1.15 for 2021-2025.

The value of cash outflow for 2021-2025 is presented in Table 9.

Table 9. The amount of cash outflow.

Indicator title	2021 y.	2022 y.	2023 y.	2024 y.	2025 y.	The average mean	Total
COn taking into account the growth rate 1.15	109238	125624	144468	166138	191059	147305	736527

The ecological flow model can be represented as

Ecoli = ECi – COi = B.i-/Ni-COi I Ecol.i

is,

ECi - ecological component of cash flow

COi - cash outflow

B.i - benefit obtained

Ni - the possibility of losses and negative changes in the environment

Positive impact of the project on the environment

- the development of the market for environmental works and services is expanding;

- the investment attractiveness of recreation increases (Gusarova, 2014; Nuzhina, 2014; Crass, 2013).

The cost estimate of the conditionally assumed damage is taken as an adverse environmental impact.

Depending on the forms of expression of losses and characteristics of the object of influence, economic, environmental, social and socio - economic consequences of the implementation of an investment project can be distinguished; conditionally assumed damage will have similar characteristics (Gusarova, 2014).

For (N) we will take the possibility of losses and negative changes in the environment caused by the implementation of the investment project, while (N) will be designated as Economic conditionally assumed damage - loss of products, services, property, fuel, energy, raw materials and other materials as a result of waste generation and wasteful use of resources. For its value, we used the environmental components of the cash outflows.

Environmental conditionally assumed damage (Nekol) - deterioration of the state of ecological systems and natural resources. We used statistical data on the chamber for regulatory and excess emissions and funds collected for compensation for damage caused by violation of environmental legislation on average for 2014-2016 (108146+116196+203722+6240+357+2177+3785):3 =142818 thousand tenge, then:

-for 2017 y. 142818*1,15=164241 thousand tenge;

-for 2018 y/ 164241*1,15=188877 thousand tenge.

We use the 2018 indicator for further calculations in Table 9 for 2021-2025.

Social conditionally assumed damage (Ns) - an increase in psychological stress on the population, a decrease in the quality and life expectancy - 0.

The provisionally assumed socio-economic damage (Ns-e) - the costs of social security and health care due to the increase in morbidity caused by environmental pollution - 0, since the costs of social contributions and statistical data are included in the costs of environmental protection, that is, they are included in the Ne indicator and are not generated separately in statistical data (Table 10).

Table 10. Calculation of conditionally assumed damage, thousand tenge.

Indicator title	2021 y.	2022 y.	2023 y.	2024 y.	2025 y.	The average mean	Total
Ne with a growth factor of 1.15	109238	125624	144468	166138	191059	147305	736527
Nekol with a growth rate of 1.15	249790	287259	330348	379900	436885	336836	1684182
Ns-e (the amount in our example is taken conditionally)	-	-	-	-	-	-	500000

The most effective method for determining social losses is the method of expert assessments. The experts are invited to estimate the value of the social loss factor (Vs.l.), which ranges from 1.00 to 2.00 factor value:

-1.00 - insignificant for the social impact of the project;

-1.25 - is of insignificant importance for the social impact of the project;

-1,5 - has no definite meaning;

-1.75 - significant for the social impact of the project;

-2.00 - value is obvious and significant for the social impact of the project.

The coefficient of social losses is determined by the formula [20, c.88-92; 22, c.67-70; 23]

$$Кс.п. = \frac{\sum_{m=1}^{M} Pi.m}{M},$$

where, Pi.m - the assessment of the value of the i-th factor by the expert m;

M - the number of experts.

In the course of the study, 30 of the Bayanaul region were interviewed to assess the value of the coefficient of social losses. The results are shown in Table 11.

Table 11. Calculation of social loss ratio (Vs.l.)

Indicators	Indicator values					Total
Selected scores from 1 to 2	1	1,25	1,5	1,75	2	
The number of respondents (M) who chose the appropriate score, people	2	5	7	6	10	30
Pi.m (1 line*2page)	2	6,25	10,5	10,5	20	49,25
social loss ratio Vs.l.	x	x	x	x	x	1,64

The total value of the conditionally assumed damage (Nn.p) as a result of the implementation of the investment project can be calculated as,

$$Nn.p = Ne + Nekol + Ns.-e. * Vs.l. \quad (3)$$

Based on the data in table 10 on damages and table 11 on the social loss rate? calculate the conditionally estimated damage Nn.p;

Nn.p = 736527 + 1684182 + 500000 * 1,64 = 4789962 thousand tenge

The value of Nn.p should not exceed the normative conditionally assumed damage Nn, which is calculated in compliance with the standard indicators of the quality of the environment. To take into account the ratio of the normative (no data) and conditional estimated damage in assessing the effectiveness of an investment project, it is necessary to calculate the environmental index of the project (Gusarova, 2014; Nuzhina, 2014; Crass, 2013):

$$IecolF.i = Ni / Nn.i \quad (4)$$

If the value of Iecol.i exceeds 1, this means that the permissible damage is exceeded (for the calculation, there are no data on the normative conditionally assumed damage).

Ecoflow (EcolF.i) is determined by the formula:

$$EcoFl.i = EC.i – CO.i \quad (5)$$

The calculation of the ecological component of the income stream (EcolF.i) is presented in Table 12

Table 12. Calculation of the ecological income stream (EcolF.i) thousand tenge.

Indicator name	2021 y.	2022 y.	2023 y.	2024 y.	2025 y.	Total
Ecological component of outflows (CO.i tab 9),	109238	125624	144468	166138	191059	736527
Ecological component of tributaries (EC tab 8)	2237693,1	3508136,5	5510043,8	8665351,4	13637887,5	33559112,3
Calculation of the ecological revenue stream (EcolF line2-page1)	2128455,1	3382512,5	5365575,8	8499213,4	13446828,5	2822585,3

Now based on cash flows over five years (from Table 13) from CFi investment, operating CFo activities and EcolF ecoflow (from the table above in the text), consisting, in turn, of inflows and outflows over five years, CFi, CFo, ECe , CO.f funds for the project, you can calculate the main performance indicators of the investment project.

Table 13. Cash flow calculation.

Indicator name	2021 year	2022 year	2023 year	2024 year	2025 year	Total
Operating cash flow (CFo)	576872,5	1022140,8	1755572,7	2952927,7	4891685,2	11199198,9
Cash flow from investing activities (CFi)	-982096,2	0	0	0	0	-982096,2
Ecolo-gicalflow (EcoFe)	2128455,1	3382512,5	5365575,8	8499213,4	13446828,5	2822585,3
Total cash flow CFi CFo +EcolFe (page 1+page 2+page3)	1723231,4	4404653,3	7121148,5	11452141,1	18338513,7	13039688

Accumulation in a single cash flow of expenses for environmental support of the project with the subsequent indication of positive and negative environmental consequences allows you to determine:

- the relationship between the volume of costs and the result of environmental protection measures;

-optimal level of the ratio of these indicators to achieve the required level of environmental safety of the project;

-integral indicators expressing the efficiency of spending on environmental protection (Crass, 2013).

The integral ecological and economic effect is calculated by the formula:

$$E_{i.e-e} = Vs.l. * \frac{CF_i + CF_o + EcolF_e}{(1+E)_i}$$

$$E_{i.e-e} = 1{,}64 * \frac{-982096{,}2 + 11199198{,}9 + 2822585{,}3}{(1+0{,}07)^5} = 1496956{,}18 \text{ thousand tenge}$$

where, E - discount rate (required rate - 7%)

The project will be considered effective if Ei.e.-e. has a positive meaning (Gusarova, 2014).

Thus, the ecological and economic assessment of the investment project for the development of the Bayanaul TPD for 2021-2025 has a certain algorithm, which is presented in Table 14.

Table 14. Algorithm of ecological and economic assessment of the investment project for the development of the Bayanaul TPD

1 Calculation of the internal rate of return of the project	
1A. General data and calculations for alternative projects:	
1	
STEP 1. Formation of initial data provided by placements for the previous eight years according to statistical data;	
STEP 2. Calculation of average growth rates based on the indicators of the volume of services provided by the placements to predict the volume of services provided by the placements for the project years 2021-2025 based on the data from STEP 1;	
STEP 3. Calculation of the predicted volumes of services provided by the places of distribution for 2021-2025 based on the data of STEP 1 and 2.	
1B. Separate data for calculations:	
According to the project	Alternative project
STEP 4. Calculations of the projected costs of operating activities (Entering data on the object);	
STEP 5. Calculation of cash flow from financial activities based on STEP 3 and 4	
STEP 6. Calculation of cash flow from financial activities, taking into account flows from the project under consideration based on the data in Table 6;	
STEP 7. Calculation of cash flow from investment activities, taking into account flows from the project under consideration based on the data in Table 6	

STEP 8. Calculation of the net cash flow for the project based on the data from STEP 5, 6 and 7	
2. Calculation of the integral ecological and economic effect	
2A. General data and calculations for alternative projects:	
STEP 9.Calculation of the share of eco-income in the price of a bed-day of stay based on Table 7;	
STEP 10. Eco-Income (EI) Calculation Based on STEP 9 Data and Table 7;	
STEP 11.Inputs data payments for the use of natural resources (statistical data);	
STEP 12.Calculation of the environmental component of the cash inflow (EC) based on the data from STEP 10.11	
STEP 13. Cash outflow (COi) based on statistical data;	
STEP 14. Calculation of the social loss rate (Vs.l.) based on a social survey	
STEP 15. Calculation of the imputed damage (Nn.i) based on statistical data and STEP 14;	
Project Environmental Index (Iecol.i) based on STEP 15 and regulations (No data available)	
STEP 16. Calculation of the ecological flow (EcolF) based on the data from STEP 12, 13	
2B. Separate data and calculations	
According to the project	Alternative project
20.Cash flow calculation (CFi + CFo + EcolFe), according to table 6 and STEP 16	
STEP 21. Integral environmental and economic impact (Ei.e.-e)	
Analysis of the integral ecological and economic impact (Ei.e.-e) and comparison with alternative projects	

Conclusion. According to this algorithm of the adapted methodology for assessing the ecological and economic efficiency of investments for the development of TPRS, an applied computer program "Calculation of the ecological and economic efficiency for evaluating an investment project for the development of a natural recreational system. Application program" was developed, for which an author's certificate was obtained. The use of the application program will save labor costs and ensure efficiency in evaluating investment projects. The initial statistical data on the volume of recreational activities and environmental flows are entered into the program, the parameters provided for by the investment project are set (the amount of investment, period, cost of capital, expected cash flows and outflows), then all labor-intensive calculations are automatically made.

According to the environmental and economic methodology for evaluating alternative investment projects, the choice is made on the basis of project performance indicators (NPV), as well as conditionally assumed damage as an integral environmental and economic effect and the determination of the integral cost effectiveness index.

As a result of such an assessment of the investment project for the development of the Bayanaul TPD for 2021-2025, we obtained certain results presented in Table 15.

Table 15 - The results of the assessment of the investment project for the development of the Bayanaul TPRS for 2021-2025.

Evaluation Indicator	Meaning of the indicator	Results	
Ei.e-e Integral ecological and economic effect	1496956,18 thousand tenge	The value is positive, which means that eco-costs will be covered by revenues	In favourof project acceptance
I - ecol.n- environmental index of the project	-	Due to the lack of data on the normative conditionally assumed damage Nn was not calculated	Additional information required

In our calculation, the integral ecological and economic effect has positive values; this, when making a decision to invest in the considered project for the development of the TPRS, inclines towards a positive conclusion. Unfortunately, we cannot compare the results of evaluating the effectiveness of contingent investments according to the Bayanaul TPP with any practical example, since there is no experience in assessing investments in a similar definition as TPP. Comparison with other definitions, in our opinion, will distort the principle of comparability..

The ecological and economic assessment of the investment project for the development of the Bayanaul TPD has its own characteristics.

1) the project is, complex, consolidated (investment value) throughout the recreational area, including investments for specific investment objects;

2) forecast data on the cost of the volume of recreational services can be calculated based on statistical data (Bayanaul district, tourism industry);

3) if alternative projects are considered, then the initial data on the predicted cost of the volume of recreational services for calculating the internal rate of return and ecoflow for calculating the integral ecological and economic effect of the project will be the same;

4) the assessment of the project has been positively assessed. Evaluation results are not indisputable for making a decision on the project;

5) the proposed adapted methodology for the environmental and economic assessment of the investment project can be used:

- firstly, for the selection of investment projects for territorial natural recreational systems;

- secondly, to plan the possible amount of financing when approving state programs for the development of tourism in natural recreational areas.

The ecological and economic assessment of the efficiency of an investment project is an important tool for investment planning. With the help of the project evaluation results, business entities and authorities will be able to

ensure sustainable environmentally acceptable development of TPRS by limiting or completely eliminating the negative impact of the consequences of the investment project on the economy, the environment and the population.

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