# **EVALUATION METHODOLOGY**

IN TERMS OF ENVIRONMENTAL CRITERIA FOR PROJECT PROPOSALS AND ALTERNATIVES IN THE ROAD SECTOR

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# I. Annotation

This methodology is intended to identify general parameters, as well as technical and ecological evaluation criteria to be applied for all alternatives.

The analysis and comparison of the alternatives is carried out on the basis of quantitative and qualitative indicators, through an integrated evaluation approach, in accordance with the principle "source – impact pathway – receptor".

The evaluation criteria have been developed on the basis of estimated impacts on the environment from the implementation of the project and take into consideration the influence of road infrastructure on environmental components, which are affected and/or changed to the highest degree.

For the development of the methodology for the calculation of the base data the following documents have been used:

- Criteria for initial assessment of the impact on environmental limiting factors for Struma Motorway Lot 3, Kresna Gorge area (developed by NCSIP and presented in the Struma Motorway Development Plan, 2015);
- □ Struma Motorway Lot 3 Environmental Strategy (JASPERS, 2012);
- □ BREF "Economics and Crossmedia Effects", European Commission, 2006;
- Design Manual For Roads And Bridges, Vol. 11 Environmental assessment, Section 3 – Environmental assessment techniques, Part 10 Road drainage and the water environment, UK Highways Agency, August 2009;
- Design Manual For Roads And Bridges, Vol. 11 Environmental assessment, Section 3 – Environmental assessment techniques, Part 1 Air Quality, UK Highways Agency, August 2009.

The methodology is developed in accordance with the basic principles and guidelines for the evaluation of environmental components and factors, according to:

- Sectoral EIA Guidelines for Motorway and Road Construction Projects, Bulgaria, JASPERS, 2013;
- Environmental Impact Assessment of National Road Schemes A Practical Guide, National Roads Authority 2008.
- □ Environmental Impact Assessment of Projects, European Commission, 2013.



#### II. Methodology Assessment

The methodology is developed for two main assessment stages (cases), depending on the required level of detail and includes:

- □ Basic Evaluation (multi-criteria level of analysis);
- Detailed Evaluation (at level Evaluation of Environmental Impact and Environment)

Each option is assessed according to the evaluation criteria within the framework by using the scoring scale.

Tab. 1.	Evaluation	framework	with	scoring scale	
TUD. 1.	Lvaluation	II affic work	<b>vv</b> itii	Scoring Scale	

Indicator	Weight
Construction period	22%
Visual Impact/Landscape Character	1
Agricultural Land	1
Protected species and habitats	4
Natura 2000 sites	4
Air Quality	2
Noise	2
Water	2
Soils and geology	2
Waste and materials	2
People and communities	2
Operation period	17%
Visual Impact	2
Protected species and habitats	3
Natura 2000 sites	3
Animal mortality rates	3
Air Quality	1
Noise	1
Water	1
Climate change (greenhouse gasses)	2
People and communities	1

To optimize the process of assessment and consistency in computing operations, an assessment tool Enviro Tool V 1.0. has been developed. This is a specialized tool developed in MS Excel, with the help of which the overall evaluation is made, based on criteria set in the methodology and computational algorithms.

Detailed description of Enviro Tool V 1.0 is given in Appendix A.



#### 2.1. Basic Evaluation

The basic evaluation is set on the general/basic criteria and is applied for the purposes of multicriteria analysis in a comprehensive evaluation of various alternatives.

The evaluation methodology is developed in accordance with the principles of multi-analysis and is based on two hierarchical levels (stages):

- □ Stage 1 –initial/preliminary evaluation (of investment alternatives);
- □ Stage 2 detailed evaluation (of options of the chosen investment alternative).

The evaluation of investment alternatives is carried out on the basis of predefined ecological criteria for integrated evaluation, taking into account the possibility for occurrence of negative impact on environmental components, as well as human health, discomfort in the affected areas and the inconveniences associated with it.

#### 2.1.1. Initial Evaluation of the Alternatives (Stage 1)

During this stage the alternatives, which are in apparent contradiction with legislative requirements and provisions (for example affecting territories with special protection and conservation status, etc.) shall be ruled out. This procedure is based on initial assessment of the so-called fatal flaws.

Fatal flaws are considered the prohibitive conditions and restrictions stipulated in the environmental legislation with respect to the protection and conservation of sites, included in the National Ecological Network. The presence of one or more fatal flaws (prohibitive conditions) shall be sufficient reason for unconditional ruling out of a given alternative. This approach allows the next evaluation stage to be focused solely on the alternative, which is realistically feasible in compliance with the environmental protection requirements.

The initial evaluation stage comprises of collection, incorporation (preparation) and analysis of existing information and data, including maps and other graphical documents of the project area and National Ecological Network sites, as well as preparation of specialized maps and layers in GIS.

For the purpose of identification of affected areas and territories with protection and conservation status the alignments of the alternatives are compared against the outlines of the protected sites in the GIS. The alignments that cross national protected areas or territories are inspected to determine whether there is a conflict or not. For example an alternative may cross a national protected area (layout) but the longitudinal profile may show that a tunnel is foreseen, hence it can be concluded that the alternative is not in apparent contradiction with the legal requirements and can be retained. The exact extent of the possible influences is to be determined at the next evaluation stage.

#### A/ Identification of the affected area and areas with protected status

During the initial assessment stage, an identification of potentially affected territory is being carried out, technologically based on remote sensing of the Earth's surface:

 Automated procedures in a GIS environment for selecting objects by predefined categories and criteria;



□ Computer-assisted visual interpretation of vector and raster graphic data.

Processing of data volumes is in the following order:

- □ Formation of new layers in GIS, using restrictive conditions (protected zones, areas, etc.);
- □ Formation of final products (maps in electronic form) for analysis and expert evaluation.

#### **B / Analysis and evaluation**

During this phase, the collected information is systematized, summarized and analyzed and on this basis a preliminary (initial) assessment of compliance with the alternative with restrictive and/or prohibitive factors in the environment is carried out.

#### 2.1.2 Detailed Evaluation of the Alternatives (Stage 2)

During this stage a detailed evaluation, requiring a more profound analysis, is conducted. On the basis of this analysis the acceptable from environmental point of view alternatives are prioritised. Subject of evaluation are investment alternatives, approved as acceptable during the previous assessment phase (initial/preliminary assessment)

Each alternative is evaluated in accordance with the criteria included in the evaluation framework based mostly on quantitative and some qualitative indicators.

The analysis covers the following factors:

- □ Air quality;
- □ Climate change;
- □ Acoustic environment (noise pollution);
- Biodiversity and Protected area;
- □ Natura 2000;
- □ Animal mortality;
- □ Water quality;
- □ Agricultural land;
- □ Soils and geology;
- □ Waste;
- Landscape
- □ People and communities (Social effect).



#### 2.2. Detailed Evaluation

Essentially, the assessment is carried out on the basis of the above-mentioned basic criteria, but with a higher level of particularity and detail. It is applied for the purposes of Environmental Impact assessment (EIA) and Appropriate assessment (AA) in specialized evaluation of various alternative decisions/solutions. The proposed method cannot replace or appear as an alternative to the required specialized EIA and AA, but can be used in combination with them.

Unlike the basic evaluation, in the detailed, additional parameters are included to evaluate the components and the environmental factors, with the help of which the impact on a component is measured, based on the specific environmental conditions and way of transfer of pollutants / emissions (impact pathway) relevant to the corresponding sensitive receptors (environmental components).

The Assessment is carried out in accordance with the principles and the guidelines for evaluation of components and environmental factors, while the impact on economic factors and the social impact are not taken into consideration.

The analysis covers the following factors:

- □ Air quality;
- □ Climate change;
- □ Acoustic environment (noise pollution);
- Biodiversity and Protected area;
- □ Natura 2000;
- □ Animal mortality;
- □ Water quality;
- □ Agricultural land;
- □ Soils and geology;
- □ Waste;
- □ Landscape



# III. Evaluation Criteria

10 groups of criteria, summarized in significance, have been developed and they represent basic (groups I - IX) and general (Group X). Each set of criteria contains sub criteria, characteristic in the relevant level of detail and particularity to the main (basic) criteria. Some of the parameters in the application of the criteria are quantitative, while others are qualitative.

#### 3.1 Agricultural lands

#### **Classification criteria**

Number Criteria :	1
Categories:	-
Subcriteria:	1 pc.

N⁰	Criteria (with addition clarification)	Indicator
1.	Affected agricultural lands	Total area (dka)

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification, based on which quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each sub criterion is described in quantitative manner and is expressed in measurement units (meters, kilometers, m<sup>3</sup> and etc.), as per the given indicator in the table.

It is required (if applicable) to apply graphics/maps in the appropriate scale to display the information.

#### 3.2 Soils and Geology

Number Criteria :	II
Categories:	Soils and uncultivated lands
Subcriteria:	5 pc.

N⁰	Criteria (with addition clarification)	Indicator	
1	Soils and uncultivated lands		
1.1	Area of the Permanent works, with permanent change in its purpose (road envelope)	Total area (dka)	
1.2	Areas for construction sites (temporary) without permanent change of use – concrete plants, storage area, asphalt plants and etc.	Total area (dka)	
1.3	Area roads during construction	Total area (dka)	



N⁰	Criteria (with addition clarification)	Indicator
1.4	Areas for temporary storage of excavated spoil	Total area (dka)
1.5	Areas for permanent storage of excavated spoil - construction landfills	Total area (dka)

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification, based on which quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each sub criterion is described in quantitative manner and is expressed in measurement units (meters, kilometers, m<sup>3</sup>, dka and etc.), as per the given indicator in the table.

It is required (if applicable) to apply graphics/maps in the appropriate scale to display the information. For example, a scheme or a map with the location and the occupied area of the site for temporary and permanent storage of waste.

# 3.3 Protected areas3.3.1 Biodiversity and Protected areas

Number Criteria:	
Categories:	Protected areas
Subcriteria:	4 pc.

N⁰	Criteria (with addition clarification)	Indicator	
1	Protected areas		
1.1	Affected protected areas	pcs.	
1.2	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary	
1.3	Percentage of the areas affected by the zone	dka / % of affected protected area	
1.4	Need to change the area / regime of the protected area	Yes/No	



# 3.3.2 National ecological network "Natura 2000"

Number Criteria :	IV
Categories:	Protected areas for conservation of wild flora and fauna and natural habitats;
	Protected areas for conservation of wild birds.
Subcriteria:	25 pcs.

N⁰	Criteria (with addition clarification)	Indicator
1	Protected areas for conservation of wild flora and fauna and natural habitats – SCI	
Prote	cted areas	
1.1	Affected protected areas	pcs.
1.2	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary
1.3	Scope of affected protected areas	dka / % of affected protected area
Natu	ral habitats	
1.4	Affected natural habitats	pcs.
1.5	Affected natural habitats, subject of conservation in the SCI	dka / % of natural habitats
1.6	Fragmentation	Yes/No
1.7	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary
1.8	Priority	priority; non-priority
1.9	Conservation Status	adverse bad; adverse unsatisfactory; good
Habit	ats of species	
1.10	Affected habitats of species, subject of conservation in the SCI	pcs.
1.11	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary
1.12	Affected areas	dka / % of protected area



N⁰	Criteria (with addition clarification)	Indicator
1.13	Fragmentation	Yes/No
1.14	Priority	priority; non-priority
1.15	Conservation Status	adverse bad; adverse unsatisfactory; good
2	Protected areas for conservation of wild birds – SPA	
Prote	cted areas	
2.1	Affected protected areas	pcs.
2.2	Scope of affected protected areas	дка / % of protected area
2.3	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary
Habit	ats of species	
2.4	Affected habitats of species, subject of conservation in the SCI	pcs.
2.5	Type of influence	directly and permanently; directly and temporary; indirectly and continuously; indirect and temporary
2.6	Affected areas	dka / % of protected area
2.7	Fragmentation	Yes/No
2.8	Vulnerability	threatened; low threatened; not threatened



#### 3.3.3 Animal mortality

#### Classification criteria

Number Criteria :	V
Categories:	Mortality in vertebrate species; Mortality in birds
Subcriteria:	2 pcs.

N⁰	Criteria (with addition clarification)	Indicator
1	Mortality in vertebrates	
1.1	Mortality risk in groups of species high/moderate/low	
2	Mortality in birds	
2.1	Mortality risk in groups of species	high/moderate/low

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification from which a quantitative and qualitative evaluations are made by the specified parameters for each criterion.

The route of the alternative/design solution, in accordance with the design specification, is applied with the help of spatial data for the affected protected areas (BG0000366 "Kresna-Ilindentsi" Habitats and BG0002003 "Kresna" Birds) of the Natura 2000 network in formats \* shp. (ESRI Shape file) and \* gdb. (ESRI File Geodatabase), in a coordinate system WGS 84, UTM 35 N, generated as a result of the project "Mapping and determining of the conservation status of habitats and species - Phase I".

By using the GIS software, around the aerial parts of the alternative a 200 m. wide buffer zone emerges on both sides of the track range. For this buffer (for example a strip with a width of 430 m - 400 m buffer plus the track, the size of a motorway road, which is 30 meters wide together with the roadsides) that is falling within the affected protected areas, orthophotos are developed at a scale of 1:5000, available at GIS server of The Ministry of The Regional Development (http://212.122.182.101/MRRB/). Based on these, as well as on satellite images (for example Google Earth), can be determined polygons of natural habitats and habitats of species, subject to conservation in the affected areas protected in accordance with Natura 2000 database. Based on the results the quantitative and qualitative number/ type/size of the affected key elements of protected areas are defined. Such preliminary data is subject to further field inspection.

When calculating the affected areas, including fragmentation of habitats and fragmentation of their ecotone, for output data were used the values specified in the standard forms of protected areas, as well as actual data, incl. methods and criteria of the developed methodology being the result of the project "Mapping and determining of the conservation status of habitats and species - Phase I".

Each subcriterion is described in a quantitative manner, in accordance with the indicator shown in the table.

It is required (if applicable) to apply graphics /maps in an appropriate scale to display the information. For example, scheme or image map with the location of the route regarding the National Ecological Network.



#### 3.4 Air Quality

#### Classification criteria

Number Criteria :	VI
Categories:	Emissions of harmful substances into the air; Discomfort for the residents -
	permanent residents
Subcriteria:	4 pcs.

N⁰	Criteria (with addition clarification)	Indicator	
1	Emissions of harmful substances into the air		
1.1	Mass of air pollutants released (Inventory of pollutants)	amount of pollutants such as dust (fine particles <sub>10</sub> ), nitrogen oxides (NOx) and carbon oxides (CO) in the air (Mg/km; kg/vehicles/ km; Mg <sub>total</sub> )	
1.2	Dispersion of pollutants	Predicted concentration of pollutant: dust (PM <sub>10</sub> ), Nitrogen oxides (NOx) and Carbon monoxide (CO) in the air (mg/m <sup>3</sup> )	
2	Discomfort for the residents – permanent residents		
Cons	truction site		
2.1	Affected settlements	pcs.	
2.2	Distance of the nearest village, to the construction site	meters	
2.3	Duration of the construction period	year	
Servi	ng road		
2.4	Affected settlements	pcs.	
2.5	Distance of the nearest village, to the truck road	meters	
2.6	Duration of the construction period	year	

#### **Evaluation Methodology**

A brief description is provided of the elements of the alternative/design solution, in accordance with the design specification, based on which the quantitative and qualitative evaluations are made under the given parameters for each criterion.

Each criterion is described in a quantitative manner (dimension), in accordance with the given indicator in the table.

Air pollutant emissions are calculated on the basis of the updated methodology EMEP/EEA Emission Inventory Guidebook 2013, 1.A.3.b Road transport, SNAP CODE: 0701 "Passenger cars"; 0702 "Light-duty vehicles"; 0703 "Heavy-duty vehicles". As an additional calculation method the methodology, published in Handbook Emission Factors for Road Transport (HBEFA) may be used.



The technical guidebook for preparation of emission inventories is available at: <u>http://www.eea.europa.eu/publications/emep-eea-guidebook-2013</u>.

It is required (if applicable) to apply graphics/maps in an appropriate scale for displaying the information. For example, scheme or image map with the location of the route regarding the sites/settlements for protection (map with the distribution of the concentration field by kinds of pollutants); graphics of the estimated quantities of pollutants by alternatives.

#### 3.5 Climate change

#### **Classification criteria**

Number criteria:	VII
Categories:	-
Subcriteria:	2 pcs.

N⁰	Criteria (with addition clarification)	Indicator
1	Mass of greenhouse gases released (Inventory of greenhouse gases)	Quantity of greenhouse gasses: carbon monoxide (CO <sub>2</sub> ); methane (CH <sub>4</sub> ); and nitrogen oxide (N <sub>2</sub> O) in (Mg/km; kg/vehicles/ km; Mg <sub>total</sub> )
2	Global warming	Potential of greenhouse gases: carbon monoxide (CO2); methane (CH4); and nitrogen oxide (N2O) for global warming (kg eqvCO <sub>2</sub> )

#### **Evaluation Methodology**

A brief description is provided of the elements of the alternative/design solution, in accordance with the design specification, based on which the quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each criterion is described in a quantitative manner (dimension), in accordance with the indicator given in the table.

For calculation of the Global-warming potential (GWP) is used the methodology described in BREF "Economics and Crossmedia Effects", Chapter 2, Global Warming, European Commission, 2006.

It is required to apply graphics of the calculated quantities of pollutants and the potential of global warming by alternatives.



#### 3.6 Acoustic Environment (noise pollution)

#### **Classification criteria**

Number criteria:	V
Categories:	Discomfort for the residents – permanent residents
Subcriteria:	3 pcs.

N⁰	Criteria (with addition clarification)	Indicator
1	Discomfort for the residents – permanent residents	·
1.1	Noise emissions in the environment	Predicted noise level in dB(A) for L <sub>day</sub> ; L <sub>evening</sub> ; L <sub>night</sub> , at the borders of residential areas or isolated houses
Cons	truction site	·
1.2	Affected settlements	pcs.
1.3	Duration of the construction period	year
Servi	ng road	
1.4	Affected settlements	pcs.
1.5	Duration of the construction period	year
1.6	Distance to the nearest residential buildings	meters

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification from which a quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each sub criterion is described in quantitative terms (dimension), in accordance with the indicator given in the table.

It is required (if applicable) to apply graphics/maps in an appropriate scale for displaying the information. For example, scheme or image map with the location of the route, in regard with the sites/settlements for protection (noise maps); graphics; tables, used computational models, methodologies, incl. detailed description of the methods for calculating the noise emission levels.



#### 3.7 Waste

#### Classification criteria

Number criteria:	VI
Categories:	-
Subcriteria:	2 pcs.

N⁰	№ Criteria (with addition clarification) Indicate	
1	Amount of redundant excavated spoil	m <sup>3</sup>
2	Quality of redundant excavated spoil (possibility for use in construction)	%

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification from which a quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each sub criterion is described in quantitative manner and is represented in measurement units (m<sup>3</sup>), under the indicator given in the table. The "quality" is evaluated with regard to the possibility to use waste material in construction and is expressed in%.

#### 3.8 Water quality

Number criteria:	VII
Categories:	Surface water; Ground water; Risk of polluting surface and ground waters during accidents
Subcriteria:	10 pcs.

N⁰	Criteria (with addition clarification)	Indicator
1	Surface water	·
1.1	Affected surface water bodies	yes/no
1.2	Distance to water body	meters
1.3	Potentially lowering the drainage capacity	yes/no
1.4	Category of the water body	1, 11, 111
1.5	Degree of flood risk	high; moderate; low
1.6	Connection to runoff / surface water from the roadway to the water body	direct/indirect .
1.7	Treatment / purification of surface runoff / surface water from the carriageway before discharge into the hydrographic network	type of treatment.
2	Ground water	·
2.1	Groundwater status (1-st aquifer)	critical; at risk; good
	Affected sanitary protection zones	pcs.
2.2	Risk of contamination of ground water	high; moderate; low
3	Risk of polluting surface and ground waters during accidents	•



N⁰	Criteria (with addition clarification)	Indicator
3.1	Probability of incidents with the potential to cause significant pollution	acceptable risk / potential risk

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification from which a quantitative and qualitative evaluations are made by the specified parameters for each criterion.

Each sub criterion is described in quantitative terms (dimension), in accordance with the indicator given in the table.For the quantitative definition of the Risk of polluting the underground waters, is used the methodology described in the

For quantitative determination of the risk of polluting surface and ground waters during accidents is used the methodology, described in Design Manual For Roads And Bridges, Vol. 11 Environmental assessment, Section 3 – Environmental assessment techniques, Part 10 Road drainage and the water environment, Annex I, UK Highways Agency, August 2009.

It is required (if applicable) to apply graphics/maps in an appropriate scale for displaying the information. For example, scheme or image map with the location of the route, in regard with the objects for protection (sanitary protection zones); graphics and tables with the calculated risk categories.

#### 3.9 Landscape/Visual impact

#### **Classification criteria**

Number criteria:	VIII
Categories:	Character of the surrounding terrain and visual impact
Subcriteria:	4 pcs.

N⁰	Criteria (with addition clarification)	Indicator		
1	Character of the surrounding terrain and visual impact			
1.1	Landscape feature	positive; negative		
1.2	Visual effects	acceptable; unacceptable		
1.3	Implementation of landscape management mitigation	yes/no		
1.4	Inscription of elements of road infrastructure in the surrounding terrain	acceptable; unacceptable		

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification from which a quantitative and qualitative evaluations are made by the specified parameters for each criterion.



Each sub criterion is described in terms of quality, in accordance with the indicator shown in the table.

It is required (if applicable) to apply graphics/maps in an appropriate scale for displaying the information. For example, a scheme or a map with the location of the route with regard to the evaluated objects; graphics, charts and other.

#### 3.10 Social effect

#### **Classification criteria**

Number criteria:	X
Categories:	Discomfort for the residents; Impact on local economy
Subcriteria:	5 pcs.

Nº	Criteria (with addition clarification)	Indicator	
1	Discomfort for the residents		
1.1	Need to reorganize the traffic	yes/no	
1.2	Duration of the reorganize traffic	years	
1.3	Duration of the construction period	years	
2	Impact on local economy		
2.1	Transport distances – Time to move to the community center / location	shorter; longer	
2.2	Accessibility and communication – Communication to the community center / location	good; bad	

#### **Evaluation Methodology**

Provision of a brief description of the elements of the alternative/design solution in accordance with the design specification.

Each sub criterion is described in terms of quantity and is represented in measurement units, under the indicator given in the table.

It is required (if applicable) to apply graphics/maps in an appropriate scale for displaying the information, incl. graphics, charts and other.



#### VI. Fundamentals of methodology

As a general rule is adopted the approach where the alternative with the least impact on the environmental components and factors, gets the most points.

The evaluation approach is based on the weight of the common environmental criteria in the overall evaluation framework (scoring scale). As a unified evaluation framework was adopted the scoring scale, applied for the purposes of multi-criteria analysis (MCA) - 40% the weight of the environmental criteria.

The total/common environmental criteria is a set of specific criteria, each of which contributes its specific weight.

Every specific criterion is made up of sub criteria.

The value of each criterion is calculated using an algorithm that takes into account the interaction between the different sub-criteria involved. To generate numerical value a set of indicators are used with the relevant coefficients, that depending on the selected parameter generate the evaluation number.

The general rule is based on an evaluation approach, where the maximum numerical value of all sub criteria, should not exceed the maximum value (weight) of the relevant basic criterion, specified in the evaluation framework.

The results are presented in the form of "overall score" and "effectiveness".

The overall score is the arithmetic average of all criteria and sub-criteria presented as a numerical value.

Efficiency is an additional tool, which describes what part of the maximum value of each criterion is reached. It is expressed as a percentage of the norm (maximum weight) of the criterion. 30 % is accepted as the minimum (threshold) value of efficiency.

It is assumed that an overall efficiency below 30% leads to the occurrence of a significant impact on the environmental components and factors and the given alternative should be considered unacceptable/risky.

Thus, design solutions or technical alternatives, despite of the clear difference in the overall scores between them, they may appear unacceptable in terms of environment, if the overall effectiveness of each is below 30%.

Also, the "effectiveness" serves as an indicator of the impact and it shows which component is the most vulnerable and where the main impact is expected. Based on this evaluation, mitigating measures could be proposed to limit the impact on a particular component or environmental factor.

**Appendix B** presents the technical characteristics of the used criteria in the methodology with the relevant indicators, coefficients and computational algorithms.



# Appendix A

# Enviro Tool V 1.0

# Tool for evaluating design projects and alternatives on environmental criteria

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#### 1. Introduction

Enviro Tool V 1.0 is an evaluation tool created for the purposes of this methodology in MS Excel environment. This is a specialized tool with the help of which an overall assessment is made, based on the criteria set out in the methodology and the computational algorithms.



Enviro Tool V 1.0 is the product of object-oriented programming, created in VBA (Visual Basic for Application) - visually object-oriented high-level programming language.

# 1.1. System Requirements:

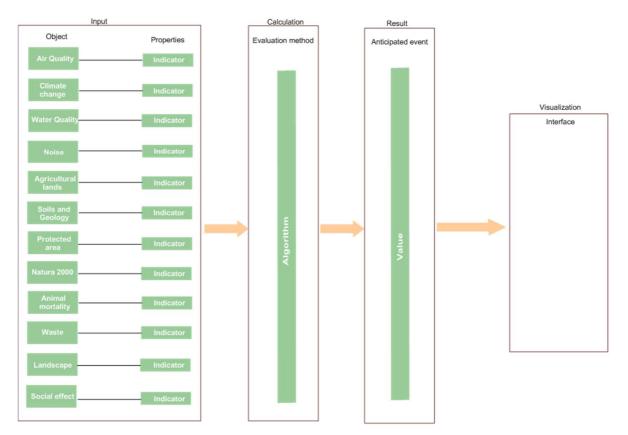
- □ Windows 7;
- □ Microsoft Excel 2013 or above

# 1.2. Program Configuration and logical sequence

The program is structured on the principle of logical connection between the object under assessment (environmental component/factor); the properties of the assessed object (variables); assessment method (algorithm); and the anticipated event (the result of the assessment method)



Each object is presented as a separate unit and is spatially oriented object. In turn, each module is programmed to perform a coherent set of instructions, enabling the algorithm to solve a specific task in a logical sequence.



The visualization of individual elements of the program and the calculated results is done by using an interface that provides quick and easy access to the various menus and sub-menus in the program. The program's interface is easy and convenient to use (User friendly), and includes a set of keys and buttons for quick access to menus, information windows, optional buttons and other instruments through which the work process is guided. For users 'convenience special additional



buttons have been created (Help buttons), that provide additional guidance for a specific parameter or function of the program. Also, special mechanisms are provided to ensure the reliability of the results obtained by directing and guiding the process in the required sequence and in order to avoid mistakes.

# 2. Quick Start Guide

#### <u>Step 1</u>

Change the decimal settings on your computer from "Regional settings" from a comma (,) to dot (.)

Numbers Currency Time Date	
Example	
Positive: 123 456 789.00	Negative: -123 456 789.00
Decimal symbol:	
No. of digits after decimal:	2 .
Digit grouping symbol:	•
Digit grouping:	123 456 789 🔹
Negative sign symbol:	•
Negative number format:	-11 *
Display leading zeros:	0.7 •
List separator:	; •
Measurement system:	Metric
Standard digits:	0123456789 •
Use native digits:	Never
Click Reset to restore the system de numbers, currency, time, and date.	

#### <u>Step 2</u>

Change the text and icon size on your monitor from "Control panel Home" – "Display" – "Smaller – 100% (default)"



Evaluation methodology in terms of environmental criteria for project proposals and alternatives in the road sector

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😋 💮 = 💻 🕨 Control Panel 🕨	All Control Panel Items     Display		👻 🍫 🛛 Search Control Panel	٩
Control Panel Home Adjust resolution Calibrate color Change display settings Adjust ClearType text Set custom text size (DPI)	Make it easier to read what's or You can change the size of text and other temporarily enlarge just part of the screen Smaller - 100% (default) Medium - 125% Larger - 150%	items on your screen by choosing one of these		0
See also Personalization Devices and Printers				

# <u>Step 3</u>

Start the program – EnviroTool\_V\_1.0\_xlsm



# <u>Step 4</u>

Enter the name of the object and the phase/stage of evaluation in the dialog window by pressing the button "enter alternative"



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# <u>Step 5</u>

Choose the period/stage of evaluation from optional button <sup>(С Период на строителство)</sup> "construction period". Start the evaluation module for the first criterion (Атмосферен въздух "Air"

x Microsoft Excel - EnviroTool_V_L0_New_1		a destate			- 0 <b>- X</b>
АТМОСФЕРЕН ВЪЗДУХ ВОДИ	АКУСТИЧНА СРЕДА ЗЕМЯ И ЗЕМЕПОЛЗВАНЕ	отпадъци БР и ЗТ	НАТУРА 2000	ландшафт	СОЦИАЛЕН ЕФЕКТ
Галгност на оценкат.	Проект: 66 123 - 12 - 32. "Изграждане на автомали Алтериатика: Заладен вариант Фаза: 080C/0C Полявател: Иван Иваное	трана"			
<b>В</b> Обнази	ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕК	СПЛОАТАЦИЯ Г Ефективнос –		
ОЦЕНИ АЛТЕРНАТИВА	Оценка	Оценка			
СРАВНИ АЛТЕРНАТИВА	Атмосферен въздух	Атмосферен възд	ух 📃		
	Води	Изменение на климата			
	Шум	Води			
	Земеделски земи	Шум			
	Почви и геология	БР и ЗТ			
	Отпадъци	Натура 2000 Смъртност			
	БР и ЗТ	Ландшафт			
	Harypa 2000	Социален ефект			
	Ландшафт Социален ефект				_
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#### <u>Step 6</u>

Press the **EMUCUU HA BPEGHU BELIECTBA** "harmful substances emissions" button and from the dialog box choose the relevant parameters/indicators from the drop down menu (pop-up menu). After the data is chosen, press the button **U OUEHU** "evaluate". To complete the evaluation in this module, press the **SATEOPU** "close" button.

Nicrosoft Excel - EnviroTool, V_110_New 1				- 0 ×
	ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ —		ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕКСПЛОАТАЦИЯ
			Оценка	Оценка
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	ПЕРИОД НА СТРОИТЕЛСТВС			
	Дискомфорт за населението - 1.30			
	постоянни обитатели 1.30			
ИЗМЕНЕНИЕ НА КЛИМАТА				
	период на експлоатацие			
	Масов товар на			
	Jamb Userformé		x x x	
	замъ Ди	скомфорт за населението - постоянни обитатели		
		Стоност/Точки	🗙 Затвори	
		1.30		
	Жилишни райони и единични къщи засегнати от строителст			
	Засегнати жилищни райони и	<ul> <li>бр. 1.5</li> <li>Засегнати жилищии район иаселени места</li> </ul>	ии от 2-5 • бр. 1.0	
L	населени места			
	Изменени	00 • m 1.5 Отстояние на спрямо трас	200 · 500 • m 2.0	
	-ИЗМЕНЕНИ. строителната площадка/обект 500 - 10	оо таката на преминаване	2001300 1 m	
	ПЕРИО, Продължителност на от 2 - 5 строителството	год. 0.1 Продължителност на строителството	от 2 - 5 • год. 0.1	
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"Climate change" button is active only during the evaluation stage: " Exploitation period"

#### <u>Step 7</u>

To go back to the main menu of the program, press the close" button.

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	ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ		ПЕРИОД НА СТРОИТЕЛСТВО ПЕ	РИОД НА ЕКСПЛОАТАЦИЯ
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	Г ПЕРИОД НА СТРОИТЕЛСТВК	· · · · · · · · · · · · · · · · · · ·	Оценка	706.0
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	Дискомфорт за населението -			
	Дискомфорт за населението - 1.30			
ИЗМЕНЕНИЕ НАКЛИМАТА				
	ПЕРИОД НА ЕКСПЛОАТАЦИ:			
	Масов товар на			
	замърсителите			
	Дисперсия на замърсителите			
	17	2		
	ИЗМЕНЕНИЕ НА КЛИМАТА		ПЕРИОД НА ЕКСПЛОАТАЦИЯ	
			Оценка	
	Г ПЕРИОД НА ЕКСПЛОАТАЦИ:			
1	Масов товар на			
ОЦЕНИ АЛТЕРНАТИВА	парниковите газове			
	Потенциал на въобално			
	затоплине			
		1		
				КСИП
			HAUMON	ална компания
			CTPATER	ИЧЕСКИ ИНФРАСТРУКТУРНИ ПРОЕКТИ
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#### <u>Step 8</u>

Select the next evaluation phase/stage from optional button period". Start again the evaluation module for the first criterion (АТМОСФЕРЕН ВЪЗДУХ "Air".

АГНОСТ НА ОЦЕНКАТ	Проект: В5 123 - 12 - 32. "Изграждане на затомагистрала" Алтериятива: Западен заризит Фаза: ОВОС/ОС Полвател: Иван Изинов ПЕРИОД НА СТРОИТЕЛСТВО Оценка води води	ПЕРИОД НА ЕКСПЛОАТАЦИЯ Оценка Аллосферен въздух Изаманалия на миниата
ОЦЕНИ АЛТЕРНАТИВА	Оценка Бадух Баскинсс	Оценка
	Оценка С	Оценка Сарана Са
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		Kummata
	Шум	
		Води
	Земеделски земи	Шум
	Почви и геология	6P w 3T
	Отпадьци	Harypa 2000
	5РиЗТ	Смъртност
	Натура 2000	Ландшафт
	Ландшафт	Социален ефект
	Социален ефект	
🗙 Затвори		Стратегически инфраструктурни г

#### Step 9

Press the **EMUCIUI HA BPECHIU BELLECTBA** "harmful substances emission" button and in the dialog box that appears, select and fill in the relevant parameters/indicators from the buttons in drop-down (pop-up) menu.

In the sub-menu "traffic intensity" fill in the blanks with information about the density of traffic, respectively number of Motor Vehicles/24h (AADT); % Light-duty vehicles (LV); % Heavy-duty vehicles

(HV). After finishing filling out the data, press the 😼 USUNCINI "Calculate" button.



Microsoft Excel - EnviroTool V 10 New 1						- 6 ×
	ЕМИСИИ НА	ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ —			ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕКСПЛОАТАЦИЯ
	- 00010.0.00		_		Оценка	Оценка
СЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	Г ПЕРИОД НА С	IPONIEICIBI				
		орт за населението - ни обитатели 1.30				
ИЗМЕНЕНИЕ НА КЛИМАТА	_					
	Use	erform2				
	г период		Инвентаризация на емисиите / Масов товар на	замърси	телите	
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	39WP	Референтна 2040 -	Дължина на 27 km	Стоност	/Точки	
	Дисти	Референтна 2040 <u>-</u>	дължина на 27 km отсечката		Продължи 🔿	
		Плытност на трафика	Енноия на запъроителите		ощ 🔯 Оцена	
		MПС/24h ЛТ %	π %	NOx	РМ	
		17000 28	3 kg/HftC/km			
		ЛА/бр ЛТ/бр	TT/6p Hg/km			
	-ИЗМЕНЕНИ					
	ИЗМЕНЕНИ	14700	510 Hg			
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ОЦЕНИ АЛТЕРНАТИВА	Масон парни					
	Потен					
	затопл					
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					НАЦИОНАЛНА КОМПАНИЯ	
					СТРАТЕГИЧЕСКИ ИНФРАСТРУКТУРНИ ПРОЕКТИ	
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To fill in the data in the "'Harmful substances emissions" submenu, press the ure "evaluate" "evaluate" button. In the dialog box that appears, press the "Calculate" button, after that press "close" button. From the buttons in the right-hand corner of the dialog window, press ure "evaluate".

1											Оценка	НА СТРОИ	Телство	ПЕРИОД НА ЕК	СПЛОАТАЦИЯ
ИСИИ НА ВРЕДНИ ВЕЩЕСТВА		UserForm30													
ИЗМЕНЕНИЕ НА КЛИМАТА		Азотни оконди (NO Категория	х) Вид гориво	EF	Mg	Mg/km	kg/MIIC/km	Сажди (РМ)	Вид гориво	Ø	Mg	Mg/km	kg/MIIC/km	🗶 Затвори	
	11 4	Леки	Бензин	g/km	0.0154554	0.0005724	0.000061	МПС Леки	Бензин	g/km	0.0003547	0.0000131	0.0000014		
			Дизел	0.110	0.0069676	0.000372	0.00011	Леки	Дизел	0.0015	0.0003800	0.0000140	0.0000015		
		Лекотоварни	Бензин	0.054	0.0016450	0.0000605	0.000064	Лекотоварни	Бензин	0.0012	0.0000308	0.0000011	0.0000012		
			Дизел	0.117	0.0120294	0.0004455	0.000117		Дизел	0.0009	0.0000231	0.0000008	0.0000005		
		Тежкотовари	Бензин	0.00	0.00	0.00	0.00	Тежкотоварн	Бензин	0.00	0.00	0.00	0.00		
			Дизел	0.42	0.0057834	0.0002142	0.00042		Дизел	0.0012	0.00001652	0.00000061	0.0000012		
		Выглероден оконд	(co)					интензивност на тр	ation						
	-ИЗМ	Категория	Вид гориво	EF	Mg	Mg/km	kg/MIIC/km		/6p/24h	ЛТ/бр/24h		TT/6p/24h			
		Леки	Бензин	g/km 0.620	0.1570881	0.0058180	0.00062	117	30	4760		510			
	Γ	1	Дизел	0.049	0.0124150	0.0004598	0.000049		ензин	Бензин		Бензин			
ОЦЕНИ АЛТЕРНАТИВА		Лекотоварни	Бензин	1.30	0.3293784	0.0121992	0.0013	938	14	952		0.0			
		1	Дизел	0.075	0.0190026	0.0007035	0.0000012	1	раел	Дизел		Дизел			
		Тежкотоварн	бензин	0.00	0.00	0.00	0.00	234	6	3808		510			
		1	Дизел	0.305	0.02660364	0.00098532	0.000105								
		Изчисли											ксиг		
											12	НАЦИО	НАЛНА КОМПАНИ	IR	
											-	CTPATE	ГИЧЕСКИ ИНФРА	СТРУКТУРНИ ПРОЕКТИ	ия Аструктурни проек
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# <u>Step 10</u>

To go to the next evaluation stage, press the "continue" button  $\square$ . In the dialog box, choose the relevant parameters/indicators from the buttons in the drop-down menu.

Microsoft Excel - EnviroTool V_10 New 1					
	ЕМИСИИ НА	ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ		ПЕРИОД НА	СТРОИТЕЛСТВО ПЕРИОД НА ЕКСПЛОАТАЦИЯ
				Оценка	Оценка
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	Г ПЕРИОД НА С	ТРОИТЕЛСТВА		o quinto	
	Дискоме	орт за населението - 1.30			
	постояни	и обитатели 1.30			
ИЗМЕНЕНИЕ НА КЛИМАТА	6	rrForm2		The second se	
	05				
	- период	И	нвентаризация на емисиите / Масов товар на за	мърсителите	
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	замър	Референтна 2040 -	On exercise tex	Стоност/Точки	
	Диспи	Референтна 2040 -	отсечката	0.20	Продължи →
	Janta				
		Плытност на трафика	Енноия на запъроителите		(many many many many many many many many
				NOx PM	Оцени
		МПС/24h ЛТ %	TT % kg/MIRC/km 0.0020752 0.0	0.0000052	
		17000 28	3	AND C	
		ЛА/бр ЛТ/бр	TT/6p Mg/km 0.020166216 0.0	0.0000298248	
	-ИЗМЕНЕНИ	11730 4760	510 Mg 0.511187032 0.0		
	HIMEHERIN	Laure Lower L	Ng 0.511187032 0.0	118802255 0.0008052525	
		📲 Изчисли	🐴 Изчисли		
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## <u>Step 11</u>

After the data is selected, press	the "evaluate" button	<u>ы</u> оцени . То	finish the evaluation in this
module press the "close" button	🗙 Затвори		

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	ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ	ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕКСПЛОАТАЦИЯ
			Оценка
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ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА			
	Дискомфорт за населението - постоянии обитатели 1.30		
	постояным оригатели		
ИЗМЕНЕНИЕ НА КЛИМАТА			
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	Macoe to		
	замърсит Дисперсия на замърсителите в атмосфе	ония въздух	
	Дисперси замърсит		
		🗙 Затвори	
		Стоност/Точки	
		Clouder) Toska	
	Концентрация по вид запьротел	0.5	
	Занъронтел		
	Cmax 40 mg/m3 NOX - 0.25		
	-ИЗМЕНЕНИЕ КА		1
	Отстояние на трасето до най- близкото населено място 500 - 1000 -		
	Г ПЕРИОДНА		
	Засегнати населени места <2 • 6p. 0.096		
ОЦЕНИ АЛТЕРНАТИВА	парников		
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	затоплян		
		НКСИЛ национална компания стратегически инфраструктурни проекти	
		НАЦИОНАЛНА КОМПАНИЯ	
		СТРАТЕГИЧЕСКИ ИНФРАСТРУКТУРНИ ПРОЕКТИ	
			НКСИП национална компания
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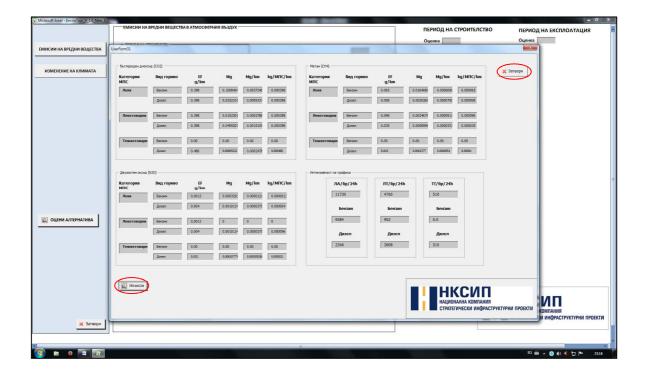
Microsoft Excel - EnviroTool V 10 New 1		and designed		m-m Cir
	ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ		ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕКСПЛОАТАЦИЯ
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	ГРЕИОДНА СТРОИТЕЛСТВС Дискомфорт за населението - постояни обигатели 130	_	Оценка	Оценка
ИЗМЕНЕНИЕ НА КЛИМАТА	Г пениод на експлоатаци			
	Масовтовар на 0.20 замъроптелите Дисперсия на 0.5 замъроптелите	_		
	— ИЗМЕНЕНИЕ НА КЛИМАТА —		ПЕРИОД НА ЕКСПЛОАТАЦИЯ	
🔝 ОЦЕНИ АЛТЕРНАТИВА	<ul> <li>периодна експлоатацие</li> <li>Масов товар на парниковите газове</li> </ul>	_		
	Потенциал на любално затопляне			
🔀 Затеори				НКСИЛ национална компания стратегически инфраструктурни проекти
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# <u>Step 12</u>

by pressing the "climate change" button \_\_\_\_\_\_. Repeat the operation from step 10-11.

Microsoft Excel - EnvirpTool_V_10_New 1	ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА В АТМОСФЕРНИЯ ВЪЗДУХ			- 0 ×
	CHINCHIN IN MILLION DELLECTION DATINGCOUPING DOSLEY		ПЕРИОД НА СТРОИТЕЛСТВО	ПЕРИОД НА ЕКСПЛОАТАЦИЯ
			Оценка	Оценка
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	- ПЕРИОД НА СТРОИТЕЛСТВК			
	Дискомфорт за населението -			
	Дискомфорт за населението - постоянни обитатели 1.30			
ИЗМЕНЕНИЕ НА КЛИМАТА				
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	Дист Референтна 2040 - Дължина и замъ година отсечката	a 27		
	замъ година отсечката		Продължи 🛶	
	Интекаяност на трафика	ия на парчиковите газови	Оцени	
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		kg/HIIC/km		
	17000 28 3			
	лА/бр лТ/бр ТТ/бр	Mg/km		
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# <u>Step 13</u>

To generate the numeric value for "Air" and "Climate change" during construction and exploitation, press the "Evaluate Alternative" button \_\_\_\_\_\_.

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			Оценка 1.30	Оценка 0.70
ЕМИСИИ НА ВРЕДНИ ВЕЩЕСТВА	Г ПЕРИОД НА СТРОИТЕЛСТВА	1	Оценка 1.30	042100 0.70
chine of spin besterior	Дискомфорт за населението -	1:30		
14 A.	Дискомфорт за населението - постоянни обитатели 1.30			
ИЗМЕНЕНИЕ НА КЛИМАТА				
	г период на експлоатаци	-		
	and a second a second state of the second seco	0.70		
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	Дисперсия на 0.5			
	замърсителите			
	17			
	ИЗМЕНЕНИЕ НА КЛИМАТА		ПЕРИОД НА ЕКСПЛОАТАЦИЯ	
			Оценка 0.74	
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ОЦЕНИ АЛТЕРНАТИВА	Масов товар на 0.18 парниковите газове			
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#### <u>Step 14</u>

To go back to the main menu of the program, press the "close" button

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	замърсителите			
	Дисперсия на 0.5			
	замърсителите			
	ИЗМЕНЕНИЕ НА КЛИМАТА			
			ПЕРИОД НА ЕКСПЛОАТАЦИЯ	
			Оценка 0.74	
	ПЕРИОД НА ЕКСПЛОАТАЦИ:	0.74		
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The results from the evaluation in "Air" and "Climate change" are automatically filled in the text windows in the main menu.

Проект: 06 123 - 12 - 32: "Изграждане на автомалистра Алтернатива: Занаден вариант Фаза: 080С/ОС Ползвател: Иван Иван Ов Ползвател: Иван Иван Ов Сценка Алтосферен въздух 130 Води Води Вама валосферен въздух 130	а" ПЕРИОД НА ЕКСПЛОАТАЦИЯ Оценка Атласферен въздух Иманалоние на Оли Води
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Оценка Тао Атмосферен въдух Тао Води Шум	Оценка     П       Атлассферен въздух     0.70       Извелезие на клината     0.74       Води     П
Води	Изменение на 0.74
Шум	клината Води
Земеделски земи	Шум
Почви и геология	5P и 3T
Отпадъци	Натура 2000
БР и ЗТ	Смъртност
Harypa 2000	Ландшафт
Ландшафт	Социален ефект
Социален ефект	
	Стратегически инфраструктур
	Ландшафт

For an overall evaluation of all environmental criteria, the following operations are carried out - Steps 5-14, similar to the evaluation in "Air" and "Climate Change" criteria.



After the completion of the evaluation for an alternative (design solution) in all environmental

criteria, click the "evaluate alternative" button from the main menu. In the text windows automatic calculation is carried out of the overall value of alternatives for different periods of evaluation (period of construction and exploitation), individual overall environmental evaluation for each ecological criterion, as well as the overall and the individual effectiveness of the alternative .

МОСФЕРЕН ВЪЗДУХ	води	АКУСТИЧНА СРЕДА	ЗЕМЯ И ЗЕМЕПОЛЗВАНЕ	отпадъци	БР и ЗТ	НАТУРА 2000	ландшафт	СОЦИАЛЕН ЕФЕК
ТАЛНОСТ НА ОЦЕНКАТ. ————			123 - 12 - 32 "Изграждане на	автомагистрала"				
Период на строителство			аден вариант DC/OC					
Период на експлоатация		Ползвател: Ива	ин Иванов					
🕲 Обнови		ПЕРИОД НА СТРО			ПЕРИОД НА ЕКС			
ОЦЕНИ АЛТЕРНАТИВА		Оценка 16.4	- Ефективнос ~ %74.5		Оценка 10.3	Ефективнос		
СРАВНИ АЛТЕРНАТИВА		Атмосферен въздух	1.30 %65.0		Атмосферен вызду	× 0.70 %70.0		
		Води	1.85 %92,5		Изменение на климата	0.74 %37.0		
		Шум	1.20 %60.0		Води	0.80 %80.0		
		Земеделски земи	0.85 %85.0		БР и ЗТ	2.1 \$570.0		
		Отпадъци	1.70 %85.0 2.0 %100.0		Натура 2000	2.0 %66.7		
		6P N 3T	3.5 %87.5		Смъртност	2.5 %83.3		
		Harypa 2000	3.0 %75.0		<b>Ландшафт</b> Социален ефект	0.9 %45.0		
		Ландшафт	1.0 %100.0		N 10			
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To enter and evaluate a new alternative (design solution), click the "close" button from the main menu and repeat steps 4-14.

After the data is entered and the selected alternatives evaluated (maximum number of alternatives

-6), click "compare the alternative" button from the main menu.



МОСФЕРЕН ВЪЗДУХ	води	АКУСТИЧНА СРЕДА 3	ЕЕМЯ И ЗЕМЕПОЛЗВАНЕ	отпадъци	БР и ЗТ	НАТУР	A 2000	ЛАНДШАФТ	СОЦИАЛЕН ЕФЕ
ТАПНОСТ НА ОЦЕНКАТ		Проект: 86 12	3 - 12 - 32 "Изграждане на авто	омагистрала"			_		
Период на строителство		Алтернатива: Запад	ен вариант						
Период на експлоатация		Фаза: ОВОС	/oc						
период на експлоатация		Ползвател: Иван	Иванов						
🛿 Обнозат		ПЕРИОД НА СТРОИ	ИТЕЛСТВО		ПЕРИОД НА ЕКС	плоатаци	9		
ОЦЕНИ АЛТЕРНАТИВА	r		Ефективнос				рективнос -		
		Оценка 16.4	%74.5		Оценка 10.3		%60.8		
СРАВНИ АЛТЕРНАТИВА	N	Атмосферен въздух	1.30 %65.0		Атмосферен въздух	× 0.70	%70.0		
		Води	1.85 9492,5		Изменение на климата	0.74	%37.0		
		Шүм	1.20 %60.0		Води	0.80	%80.0		
		Земеделски земи	0.85 %85.0		Шум	0.60	%60.0		
		Почви и геология	1.70 %85.0		БР и ЗТ	2.1	%70.0		
		Отпадъци	2.0 %100.0		Harypa 2000	2.0	%66.7		
		БР и ЗТ	3.5 %87.5		Смъртност	2.5	%83.3		
		Hatypa 2000	3.0 %75.0		Ландшафт	0.9	%45.0		
					Социален ефект		%0.0		
		Ландшафт	1.0 %100.0						
🗙 Затвор	и	Социален ефент	\$0.0					НКСИ НАЦИОНАЛНА КОМПЛ СТРАТЕГИЧЕСКИ ИНО	RNHA

The maximum number of alternatives for evaluation is 6 and after that the "evaluate alternative" button оцени алтернатива becomes inactive. To remove the entered data for the alternatives, click the "refresh" button Собнови.

In the submenu that appears there is an option for graphic visualization of the results from the evaluated alternatives, depending on the user's preferences, by clicking the "compare by overall

value" to fanoba ouerka and "compare by efficiency"	👆 СРАВНИ ПО ЕФЕКТИВНОСТ	. To clear the
graphics, click the " clear graphic" button		
From the optional buttons in the language menu BG "BG "select the working language.		, the user can

The program can generate a printed report with the results from the evaluation, by clicking on the

"Print" button





To close the program, press the "close" button in the main menu and in the start menu.

Do not use "X" from the MS Excel menu





# Appendix B

# Technical specification of the criteria, indicators, ratios and computational algorithms used in the methodology.

## Contents

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2.2. Operation period	46
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3.1. Construction period	53
3.2. Operation period	60



#### I. Annotation

Within the core of the methodology are computational algorithms capable to interpolate numerical values of relevant criteria, based on indicators and ratios. To generate a numerical value, a set of indicators are used, with the relevant coefficients, that depending on the selected parameter generate an evaluation number.

The value of each criterion is calculated with the help of an algorithm that calculates the interaction of different sub criteria involved.

Sub criteria are involved with a certain numerical value depending on the severity (importance) of the respective sub criterion, when describing the main criterion.

For example, in evaluating in criterion "waste and waste materials," the main criterion is characterized by two sub - "Quantity of generated excess earth and rock mass" and "Potential to utilize in construction."

The advantage is given in the sub-criterion "Potential to utilize in construction", which receives 60% or 1.2 of the total value (weight) of the basic criterion (2.0), since it is assumed that the main importance falls on prevention and the options for utilization of waste materials, rather than its quantity. In other words, the better alternative is always the one that provides greater opportunity to utilize and reuse of waste material, than the one with smaller quantities of generated waste, but with low utilization percentage. The higher the utilization percentage is, the less is the generated amount of final waste.

To obtain the numerical expression of each sub criterion, an indicator is used, which depending on the selected parameter, generates a number (numerical ratio).

In this case, sub criterion "Potential to utilize in construction" is defined by four indicators, each corresponding to a certain numerical coefficient.

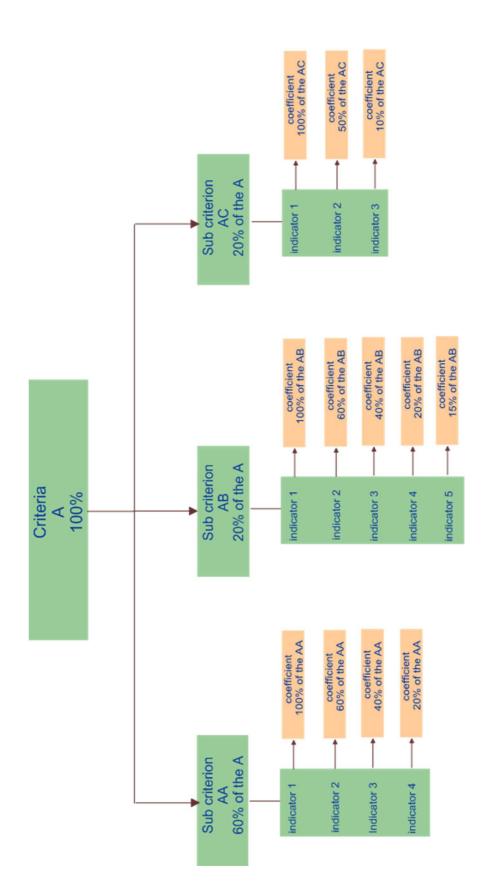
The value of the numerical coefficients is determined by the total amount (weight) of the respective sub criterion and is distributed according to the weight of the indicator.

As a general rule, an approach is adopted, where the maximum value of the numerical coefficient may not exceed the maximum value (weight) of the respective sub criterion.

In the example above, sub criterion "Potential to utilize in construction" gets 60 % or 1.2. of the total value (weight) of the main criterion, consequently the numeric coefficients, describing the evaluation indicators have the following distribution:

Criteria		Indicator	Coefficient
Waste Ws – 2.0			
Possibility for use in construction, 60%		≤ 30	0.12 (10% of the 1.2)
(1.2)	14/5	30 – 50	0.48 (40% of the 1.2)
	Wr	50 – 70	0.72 (60% of the 1.2)
		> 70	1.20 (100%)







#### II. Multi-criteria analysis

Essentially, the assessment is perform in two main stages / evaluation period:

- □ Consruction period;
- □ Operation period.

#### 2.1. CONSTRUCTION PERIOD

## Air Quality – value 2.0

Criteria	Indicator	Coefficient	Algorithm	
Air Quality – 2.0		•	-	
Affected settlements (pcs.)		≤ 2	2.0	
	R	2 – 5	1.5	
	n.	5 – 10	1.0	
		> 10	0.5	
Distance of the nearest		≤ 200	3.0	$(\mathbf{P} / \mathbf{Am}) = \mathbf{A}^{\dagger}$
village, to the construction	Δm	200 - 500	2.0	(R / Δm) - Δt
site (m)		500 - 1000	1.5	
		> 1000	1.0	
Duration of the	Δt	≤ 1	0.0	
construction period (years)	Δι	2 – 5	0.1	
		> 6	0.2	

## Water Quality – value 2.0

Criteria			Alg	orithm		
/50%)	·					
50%)						
rface wa	ter, R <sub>pol</sub> – 0.6 (	60%)				
<u>Cr</u>	yes	0.0	S			
31	no	0.36	× +			
	yes	0.0	Сb			
Ср		0.12	+			
	no	0.12	S =	flow		
	I	0.012	lod	+ F	R <sub>GW</sub>	
Ks	Ks	П	0.07	Ľ.	. lod	+
	Ш	0.12			R <sub>sw</sub> +	
6)				o <sub>sw</sub>	Ľ.	
	high	0.04		-		
	moderate	0.16	11			
R	low	0.40	flow			
			Ľ Ľ			
	Sr Cp Ks	50%) face water, R <sub>pol</sub> – 0.6 (f Sr yes no yes Cp I Ks II III Ks High moderate	<b>/50%) 50%) face water, R</b> pol − <b>0.6 (60%)</b> <b>Sr</b> yes 0.0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	yes       0.0         yes       0.0         rface water, $R_{pol} - 0.6$ (60%)       +         yes       0.0         yes       0.0         Cp       yes       0.0         No       0.12       +         Ks       II       0.012         Ks       II       0.012         Moderate       0.16       #		



Ground water, P <sub>GW</sub> – 1.0	50%)				
Risk of contamination of gro					
Groundwater status (1-st		critical	0.04	ре	
aquifer)	S <sub>WB</sub>	at risk	0.16	S <sub>zone</sub>	_
		good	0.40	S <sub>WB</sub> +	: R <sub>pol</sub>
Affected sanitary		no	0.6	= Sv	=
protection zones (number)	Szone	1-2	0.36	R <sub>pol</sub> =	P <sub>GW</sub>
		2 – 4	0.24	8	
		> 4	0.06		

#### Acoustic environment – value 2.0

Criteria		Indicator	Coefficient	Algorithm
Noise, Ac – 2.0				
Predicted noise levels at the		≤ 50	2.0	
points of impact (Lday		50 - 60	1.2	$Ac = L_{day}$
dB(A))	$L_{day}$	60 - 62	1.0	
		62 - 65	0.8	
		> 65	0.2	

# Visual impact/Landscape – value 1.0

Criteria		Indicator	Coefficient	Algorithm
Landscape, L – 1.0				
Landscape feature – 0.5		positive	0.5	
(50%)	Ls	negative	0.05	L = Ls + Vi
Visual effects – 0.5 (50%)	\ <i>\</i> ;	acceptable	0.5	
	Vi	unacceptable	0.05	

# Soils and uncultivated lands - value 2.0

Criteria	Criteria		Coefficient	Algorithm
Soils and uncultivated lan				
Area of the Permanent		≤ 500	1.60	
works, with permanent		500-1000	0.96	
change in its purpose (road	Ar	1000 - 2000	0.64	
envelope) (dka),		2000 - 4000	0.32	
80%		> 4000	0.16	S <sub>I</sub> = Ar+Aw
Areas for permanent		≤ 10	0.4	SL – AITAW
storage of excavated spoil -		10-50	0.32	
construction landfills (dka),		50 - 100	0.26	
20%	Aw	100 - 200	0.16	
		200 - 400	0.08	
		400 - 600	0.04	
		> 600	0.02	



# Agricultural lands – value 1.0

Criteria	Criteria		Coefficient	Algorithm
Agricultural lands, Ag – 1.				
Affected agricultural land		≤ 100	1.0	
(dka)		100 - 200	0.8	
		200 - 400	0.6	
	A I	400 - 600	0.4	Ag = Agl
	Agl	600 - 800	0.2	
		800 - 1000	0.15	
		1000 - 1200	0.10	
		> 1200	0.05	

#### Waste – value 2.0

Criteria		Indicator	Coefficient	Algorithm
Waste material, Ws – 2.0				
Amount of redundant		≤ 500 thous.	0.80	
excavated spoil, 40%	Wq	500 thous -	0.64	
		1mln.		
		1mln. – 2mln.	0.48	
		2mln. – 4mln.	0.32	Ws = Wq+Wr
		> 4mln.	0.08	
Possibility for use in		≤ 30	0.12	
construction, 60%	Wr	30 – 50	0.48	
	vvr	50 – 70	0.72	
		> 70	1.20	

#### Social Effect – value 2.0

Criteria	Criteria			Coefficient	Algorithm
People and Communities,					
Need to reorganize the			≤ 1	1.5	
traffic		1/05	1 –2	1.0	
	Ds	yes	2 –4	0.8	
			> 4	0.6	D = Ds – T
		no		2.0	If $D = Ds = 1$
Duration of the		≤1		0.1	1103 - 110, then $0 - 2.0$
construction period (years)		1-2		0.2	
	Т	2 – 4		0.3	
		4 – 6		0.4	
		> 6		0.5	



# Natura 2000 sites – value 4.0

TS, P <sub>AI</sub> (50%)	н — 2.0 (50%)		I		
(50%)					
	1	0.20			
Pt	2 – 5	0.10			
	> 5	0.04			
	Direct and	0.04	g		
	permanent		4 +		
	Direct and	0.16	Ē		
1	temporary		5t +		
In	Indirect and	0.24	"		
	permanent		P		
	Indirect and	0.40			
	temporary				
	≤ 0.1	0.40			
Aa	0.2 – 0.5	0.20			
	> 0.5	0.08			
25%)					
	1	0.075			
н	2 – 5	0.037		т	
	> 5	0.015		÷ Š	
	≤ 0.1	0.15		ž	Aa
At	0.2 - 0.5			+	Р <sub>Ан</sub> + Аа
					PAF
				AH -	
Fr	2 – 5		+ Ss		
	I		ь. Рг		
	Direct and	0.014	+		
		0.011			
		0.056	- L L		
		0.030	+		
Im		0.084			
		0.001	т Т		
		0.14			
		0111	2		
		0.035			
Pr			1		
1			1		
	Adverse upsetisf	0.10	{		
Ss		0.10			
	Good	0.21			
	25%) H At Fr Im Pr	InDirect and permanentInDirect and temporaryIndirect and permanentIndirect and temporaryAa $0.2 - 0.5$ > 0.525%) $1$ H $2 - 5$ > 5At $0.2 - 0.5$ > 0.5Fr $2 - 5$ > 5Fr $2 - 5$ > 5Indirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentIndirect and permanentAdverse badAdverse bad	$\begin{tabular}{ c c c c } \label{eq:hermanent} & 0.04 \\ \hline permanent & 0.16 \\ \hline temporary & 0.16 \\ \hline temporary & 0.24 \\ \hline permanent & 0.40 \\ \hline temporary & 0.40 \\ \hline temporary & 0.40 \\ \hline Aa & 0.2 - 0.5 & 0.20 \\ \hline > 0.5 & 0.08 \\ \hline \hline > 0.5 & 0.08 \\ \hline \hline > 0.5 & 0.08 \\ \hline \hline > 0.5 & 0.015 \\ \hline > 0.5 & 0.015 \\ \hline > 0.5 & 0.015 \\ \hline > 0.5 & 0.037 \\ \hline > 5 & 0.015 \\ \hline > 0.5 & 0.030 \\ \hline At & 0.2 - 0.5 & 0.075 \\ \hline > 0.5 & 0.030 \\ \hline Pr & 1 & 0.075 \\ \hline Pr & Priority & 0.035 \\ \hline Non-priority & 0.35 \\ \hline Adverse unsatisf. & 0.10 \\ \hline \end{tabular}$	$\begin{tabular}{ c c c } & $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$	$\begin{tabular}{ c c c c } & & & & & & & & & & & & & & & & & & &$



Habitats of spacies, S <sub>H</sub> –	0.5 (25	5%)			
Module 1 – 0.2 (20%)					
Affected habitats of		≤ 5	0.05		
spaces, subject of	٨.۴	5 – 10	0.03		
conservation in the SCI,	Af	10-15	0.02		
25%		> 15	0.005		
Affected areas, 50%		≤ 0.1	0.1		
	Aa	0.2 – 0.5	0.05		
		> 0.5	0.02		
Fragmentation, 25%		1	0.05	Απ	
	Fr	2-5	0.025	t +	
		> 5	0.01	+	
Module 2 – 0.8 (80%)				<u> </u>	
Priority, 50%		Priority	0.04	- + -	
	Pr	Non-priority	0.4	<u> </u>	
Type of influence, 15%		Direct and	0.012	Af + Aa + Fr + Pr + Im + St + Am	
		permanent		да -	
		Direct and	0.048	(+ j	
	Im	temporary		= Af	
		Indirect and	0.072	S <sub>H</sub> =	
		permanent			
		Indirect and	0.12		
		temporary			
Conservation status, 25%		Adverse bad	0.02		
	St	Adverse unsatisf.	0.10		
		Good	0.20		
Risk of animal mortality,		High	0.008		
10%	Am	Moderate	0.04		
		Low	0.08		
PROTECTED AREAS FOR CO	NSERV	ATION OF WILD BI	RDS, Aa – 2.0		
(50%)		-		_	
Protected areas, Pav – 0	.3 (20%		I	_	
Number of affected		1	0.06	_	
protected areas, 20%	Ха	2-5	0.03	4	
		> 5	0.012	4	
Type of influence, 40%		Direct and	0.012	At	
		permanent		<u>+</u>	Aav
		Direct and	0.048	l l l Pav = Xa + lm + At	Pav + Aav
	Im	temporary	0.072	- Ş	Pav
		Indirect and	0.072	=	II
	1	permanent	0.12	Pav	Аа
		Indirect or -!	/		
		Indirect and	0.12		
Demonstrate of officiated		temporary		_	
Percentage of affected		temporary ≤ 0.1	0.12	_	
Percentage of affected protected areas, 40%		temporary $\leq 0.1$ 0.2 - 0.5	0.12 0.06	_	
_	At	temporary ≤ 0.1	0.12	-	



Habitats of spaces, Aav –	1.2 (8	0%)			
Module 1 – 0.36 (30%)					
Affected habitats of		≤ 5	0.072		
spaces, 20%	Va	5 – 10	0.043		
	Ya	10-15	0.030		
		> 15	0.007		
Percentage of affected		≤ 0.1	0.18		
protected areas, 50%	At	0.2 – 0.5	0.09		
		> 0.5	0.036	<u>L</u>	
Fragmentation, 20%		1	0.072	Ss + In	
	Fr	2 – 5	0.036	+ S	
		> 5	0.014	₩	
Risk of animal mortality,		High	0.0036	+ At + Fr + Am +	
10%	Am	Moderate	0.018	+ Fr	
		Low	0.036	At -	
Module 2 – 0.84 (70%)				+	
Type of influence, 20%		Direct and	0.017	Aav = Ya	
		permanent		ac	
		Direct and	0.068	A	
	Ss	temporary			
	55	Indirect and	0.10		
		permanent			
		Indirect and	0.17		
		temporary			
Vulnerability, 80%		Threatened	0.067		
	In	Low threatened	0.33		
		Not threatened	0.67		

# Biodiversity and Protected areas - 4.0

Criteria		Indicator	Coefficient	Algorithm
<b>Biodiversity and Protecte</b>	d areas	, Р <sub>зн</sub> – <b>4.0 (100%</b>	5)	
Affected protected areas,		1	0.8	
20%	At	2 – 5	0.4	
		> 5	0.16	ت ن
Type of influence, 20%		Dir. and perm.	0.08	+
	In	Dir. and temp.	0.32	Аа
		Indir. and perm.	0.48	+ <u>_</u>
		Indir. and temp.	0.8	+
Percentage of the areas		≤ 0.1	2.0	= At
affected by the zone, 50%	Aa	0.2 – 0.5	1.0	P <sub>SH</sub> =
		> 0.5	0.4	<u>c</u>
Need to change the area /		Yes	0.04	
regime of the protected	Cr	NL -		
area, 10%		No	0.4	



# 2.2. OPERATION PERIOD

# Air Quality – value 1.0

Criteria	Criteria		Coefficient	A	lgorithm
Mass load of pollutants, N	1 – 0.4 (4	40%)		()	
Inventory of pollutants	E	Quantity of pollutants in Mg	-	$M = M_{max} - (\Sigma E_{(NOx)} + E_{(CO)} + E_{(PM)})$ $M_{max} = 0.4$	
Dispersion of pollutants, I	Dis – 0.6	(60%)			
Concentration of		≤ 30	0.36		M + Dis
pollutant at the points of	C <sub>max</sub>	30 – 40	0.18		
impact , μg – 0.36 (60%)		> 40	0.036		
Distance of the nearest		≤ 50	0.012	= C <sub>max</sub> + Δm + R	
village , m – 0.12 (20%)		50 – 100	0.024	E L	
	Δm	100 – 200	0.048	7+	
		200 – 500	0.072	max	
		500 - 1000	0.096		
		> 1000	0.12	Dis	
Affected villages, pcs. –		≤ 2	0.12	]	
0.12 (20%)	R	2 – 5	0.072	]	
	К	5 – 10	0.048	]	
		> 10	0.012		

## Climate change – value 2.0

Criteria	Indicator	Coefficient	Alg	gorithm	
Mass of greenhouse gases rele	ased, G	Wm – 0.8 (40%)			
Inventory of greenhouse					
gases	E	Quantity of greenhouse gases, Mg	-	$GWm = GWm_{max} - (\Sigma E_{(co2)} + E_{(N20)} + E_{(cH4)})$	GWm + GWp



Global warming, GWp – 1.2 (60					
Potential of greenhouse gases	M <sub>eqv</sub>	Potential of greenhouse gases, kgeqvCO₂	-	Meqv = GWp(k) * M <sub>GW</sub> /1000 GWp = Meqv	

# Water Quality – value 1.0

Criteria		Indicator	Coefficient	Algorithm
Degree of surface water	R <sub>sw</sub>	acceptable	0.5	
risk	RSW	unacceptable	0.05	
Degree of ground water	Б	acceptable	0.5	$R = R_{SW} + R_{GW}$
risk	$R_{GW}$	unacceptable	0.05	

Criteria		Indicator	Coefficient	ļ	Algorithm		
Surface water, P <sub>SW</sub> – 0.5 (50%) Risk of polluting surface waters during accidents, P <sub>inc</sub>							
Annual probability of a spilla pollution incident, Pspl							
Road length	RL	km	-				
Spillage rates		No Junction	0.36	/100)			
	SS	Slip Road	0.43	(HGW	loq	<sup>D</sup> GW	
		Roundabout	3.0	х ( <sub>-</sub> 01	$P_{inc} = P_{psl} + P_{pol}$ $R_{SW} = P_{inc}$	P <sub>sw</sub> + P <sub>Gw</sub>	
Annual average daily traffic	AADT	AADT	-	DT x 365 x :	P <sub>inc</sub> = 1 R <sub>Sw</sub>		
Percentage of heavy goods vehicles	HGW	%	-	R <sub>spl</sub> = RL x SS x (AADT x 365 x 10 <sup>-9</sup> ) x (HGW/100)			



The probability, given a spil will result, Ppol	lage, tha	at a serious poll	ution incident			
Distance of the emergency services and response time to site		Urban (response time to site <20 minutes)	0.45	Rt		
	Rt	Rural (response time to site <1 hour)	0.60	P <sub>pol</sub> = Rt		
		Remote (response time to site >1 hour)	0.75			
Ground water, P <sub>GW</sub> – 0.5	(50%)					
Risk of polluting ground wa	ters duri	ing accidents, P	inc	-		
Annual probability of a spill pollution incident, Pspl	age with	-	o cause a serious			
Road length	RL	km	-	W/100)		
Spillage rates		No Junction	0.36	x (HGV		
	SS	Slip Road	0.43	x 10 <sup>-9</sup> )		
		Roundabout	3.0	x 365 )		
Annual average daily traffic	AADT	AADT	-	x SS x (AADT x 365 x 10 <sup>-9</sup> ) x (HGW/100)	P <sub>psl</sub> +P <sub>pol</sub>	
Percentage of heavy goods vehicles	HGW	%	-	R <sub>spl</sub> = RL x	$P_{inc} = P$	
The probability, given a spill result, Ppol	age, tha	t a serious pollu	tion incident will			
Distance of the emergency services and response time to site	Rt	Urban (response time to site <20 minutes) Rural	0.3	P <sub>pol</sub> = Rt		
		(response time to site <1 hour)				



Remote	0.5		
(response			
(response time to			
site >1 hour)			

Assessment matrix on degree of risk - P <sub>inc</sub>					
Value	Degree of risk				
≤ 1.0	Acceptable risk				
> 1.0	Potential risk				

#### Acoustic environment (Noise) – value 1.0

Criteria		Indicator	Coefficient	Algorithm	
Acoustic environment, Ac	Acoustic environment, Ac – 1.0 (100%)				
Predicted noise levels at		≤ 50	1.0		
the points of impact, dB(A)		50 - 60	0.6	$Ac = L_{day}$	
	$L_{day}$	60 - 62	0.5		
		62 – 65	0.4		
		> 65	0.1		

#### Natura 2000 sites - value 3.0

Criteria	Criteria		Coefficient	Alg	orith	m
Natura 2000 – 3.0						
PROTECTED AREAS/HABITA						
Protected areas, P <sub>A</sub> – 0.75	5 (50%)					
Affected protected areas,		1	0.15			
20%	Pt	2 – 5	0.075			
		> 5	0.03			
Type of influence, 40%		Direct and	0.03		SH	
		permanent		ģ		
	In	Direct and	0.12	Pt + In + Aa	+ ×	
		temporary		<u> </u>		
	111	Indirect and	0.18	4 7	PA⊢	Р <sub>АН</sub> + Аа
		permanent		П	- 11	
		Indirect and	0.3	Р	P <sub>AH</sub>	
		temporary				
Scope of affected		≤ 0.1	0.3			
protected areas, 40%		0.2 – 0.5	0.15			
	Aa	> 0.5	0.06			
		I				



Natural babitate N 0 27	()=%)				
Natural habitats $N_H - 0.37$ Module 1 - 0.11 (30%)	(25/0)			-	
Affected natural habitats,		1	0.027	-	
25%	н	2-5	0.027	-	
2370		>5	0.0054	-	
Affected natural habitats,		≤ 0.1	0.055	-	
subject of conservation in	At	0.2 – 0.5	0.033	-	
the SCI, 50%	AL	> 0.5	0.027	-	
Fragmentation, 25%		1	0.011	Ss	
Flagmentation, 25%	Fr	2-5	0.027	- + -	
	ГІ	>5	0.014	- +	
Module 2 – 0.26 (70%)		> 5	0.0054	H + At + Fr + Im + Pr + Ss	
Type of influence, 20%		Direct and	0.0052	_ + _	
Type of influence, 20%		permanent	0.0052	+	
		Direct and	0.021	- At -	
		temporary	0.021		
	Im	Indirect and	0.031		
		permanent	0.031	ž	
		Indirect and	0.052	-	
		temporary	0.052		
Priority, (50%)		Priority	0.0013	-	
(30%)	Pr	Non-priority	0.13	-	
Conservation status, 30%		Adverse bad	0.0078	-	
	Ss	Adverse unsatisf.		-	
	35	Good	0.039	_	
Habitat of chasics Sur 0	27/25		0.078		
Habitat of species, $S_H - 0$ . Module 1 – 0.07 (20%)	37 (23	970)		-	
Affected habitats of		≤ 5	0.017	-	
spaces, subject of		<u>5</u> 5 – 10	0.017	-	
conservation in the SCI,	Af	10-15	0.010	-	
25%		> 15		-	
			0.0017	-	
Affected areas, 50%	1.0	≤ 0.1	0.035	Ss	
	Aa	0.2 - 0.5	0.017		
<b>E</b>		> 0.5	0.007		
Fragmentation, 25%	_	1	0.017	- L	
	Fr	2-5	0.008	<u>+</u>	
		> 5	0.0034	Af + Aa + Fr + Pr + Im +	
Module 2 – 0.3 (80%)				Aa	
Priority, 50%	Pr	Priority	0.015	+	
		Non-priority	0.15	- 11	
Type of influence, 20%		Direct and	0.006	Š	
		permanent		4	
		Direct and	0.024		
	Im	temporary		4	
		Indirect and	0.036		
		permanent		4	
		Indirect and	0.06		
		temporary			



Conservation status, 30%		Adverse bad	0.009			
	Ss	Adverse unsatisf.		_		
	55	Good	0.045	-		
PROTECTED AREAS FOR WI			0.05			
Protected areas, Pav – 0.3	_					
Number of affected	5 (20/0	9 <b>/</b>	0.06	_		
protected areas, 20%	Va	2-5	0.08	_		
protected areas, 20%	Ха			_		
Turne of influence 400/		> 5	0.012	t -		
Type of influence, 40%		Direct and	0.012	Pav = Xa + Im + At		
		permanent	0.040	<u> </u>		
		Direct and	0.048	+		
	Im	temporary	0.070			
		Indirect and	0.072	av		
		permanent	0.10			
		Indirect and	0.12			
		temporary		-		
Percentage of affected		≤ 0.1	0.12			
protected areas, 40%	At	0.2 – 0.5	0.06			
		> 0.5	0.024			
Habitats of spaces, Aav –	1.2 (8	0%)				
Module 1 – 0.36 (30%)		•			٦¢	
Affected habitats of		≤ 5	0.09	-	Pav + Aav	
spaces, 25%	Va	5 – 10	0.054		+ >	
	Ya	10-15	0.036		= Pa	
		> 15	0.009		Aa =	
Percentage of affected		≤ 0.1	0.18		4	
protected areas, 50%	At	0.2 – 0.5	0.09	7_		
		> 0.5	0.036			
Fragmentation, 25%		1	0.09	+ Fr + Ss + In		
	Fr	2-5	0.045	+		
		> 5	0.018	- <u>-</u> +		
Module 2 – 0.84 (70%)		75		¥		
<b>Module 2 – 0.84 (70%)</b> Type of influence, 20%		1		+		
<b>Module 2 – 0.84 (70%)</b> Type of influence, 20%		Direct and	0.017	+		
		Direct and permanent	0.017	+		
		Direct and permanent Direct and				
	Ss	Direct and permanent Direct and temporary	0.017	+		
	Ss	Direct and permanent Direct and temporary Indirect and	0.017	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent	0.017 0.068 0.10	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and	0.017	+		
Type of influence, 20%	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and temporary	0.017 0.068 0.10 0.17	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and	0.017 0.068 0.10	+		



# Biodiversity and Protected areas – 3.0

Criteria		Indicator	Coefficient	Algorithm
<b>Biodiversity and Protecte</b>	d areas	, Р <sub>SH</sub> – 4.0 (100%	5)	
Affected protected areas,		1	0.6	
20%	At	2 – 5	0.3	
		> 5	0.12	. <u>ა</u>
Type of influence, 20%		Dir. and perm.	0.06	+
	In	Dir. and temp.	0.24	Аа
		Indir. and perm.	0.36	+ <u> </u>
		Indir. and temp.	0.6	+
Percentage of the areas		≤ 0.1	1.5	= At
affected by the zone, 50%	Aa	0.2 – 0.5	0.75	P <sub>SH</sub>
		> 0.5	0.3	<u>~</u>
Need to change the area /		Yes	0.03	
regime of the protected area, 10%	Cr	No	0.3	

# Animal mortality – value 3.0

Criteria		Indicator	Coefficient	Algorithm
Animal mortality, Am – 3	.0			
Mortality in vertebrate sp	oecies	– 1.5 (50%)		
Mortality risk in groups of		High	0.15	
species	Db	Moderate	0.75	
		Low	1.5	Am = Db + Da
Mortality in birds – 1.5 (5	0%)			AIII – DD + Da
Mortality risk in groups of		High	0.15	
species	Da	Moderate	0.75	
		Low	1.5	

# Visual Impact/Landscape – value 2.0

Criteria		Indicator	Coefficient	Algorithm
Landscape, L – 2.0 (100%)				
Implementation of landscape management	Ls	Yes	0.8	
mitigation – 0.8 (40%)	LS	No	0.08	L = Ls + Vi
Inscription of elements of		acceptable	1.2	
road infrastructure in the surrounding terrain – 1.2 (60%)	Vi	unacceptable	0.12	



# Social effect – value 1.0

Criteria Indicator			Coefficient	Algorithm				
Improve the local econom	Improve the local economy, public and business sector, Se –							
1.0 (100%)								
Transport distances – 0.5	(50%)							
Time to move to the community center /	Δt	Shorter	0.5					
location	2.	Longer	0.05	Se = Δt + L				
Accessibility and communica	ation – (	).5 (50%)						
Communication to the		Good	0.5					
community center / location	L	Bad	0.05					

## III. Environmental impact assessment (EIA/AA)

The evaluation is performed on the main stages / periods in the realization of linear objects, and includes:

- □ Construction period;
- □ Operation period.

#### 3.1. CONSTRUCTION PERIOD

## Air Quality – value 2.0

Criteria		Indicator	Coefficient	Algorithm	
Air Quality – 2.0 (50%/50%	6)				
Construction site, Cw – 1.0 (	50%)				
Affected settlements, (pcs.)		≤ 2	1.5		
	R	2 – 5	1.0		
	n.	5 – 10	0.5		
		> 10	0.2		
Distance of the nearest		≤ 200	3.0		
village, to the construction	Δm	200 - 500	2.0	(R / Δm) - Δt	
site, (m)		500 - 1000	1.5		≥
		> 1000	1.0		Cw + Tv
Duration of the	۸+	≤ 1	0.0		Š
construction period, (years)	Δt	2 – 5	0.1		
		> 6	0.2		
Serving roads, Tv – 1.0 (50%)					
Affected settlements, (pcs.)		≤ 2	1.5		
		2 – 5	1.0		
	R	5 – 10	0.5		
		> 10	0.2		



Distance of the nearest		≤ 200	3.0	
village, to the truck road,	Δm	200 – 500	2.0	(R / Δm) - Δt
(m)		500 - 1000	1.5	
		> 1000	1.0	
Duration of the		≤ 1	0.0	
construction period, (years)	Δt	2 – 5	0.1	
		> 6	0.2	

# Water Quality – value 2.0

Criteria		Indicator	Coefficient	Al	gorithm	
Water Quality – 2.0 (50%)	/50%)					
Surface water, P <sub>SW</sub> – 1.0 (	50%)					
Risk of contamination of su						
Affected surface water	Sr	yes	0.0	S		
bodies – 0.36 (60%)	51	no	0.36	Sr + Cp + Ks		
Potentially lowering the		yes	0.0	Cp		
drainage capacity – 0.12	Ср			+	flow	
(20%)		no	0.12	= S	+	
Category of the water		1	0.012	R <sub>pol</sub> =	$P_{SW} = R_{pol} + R_{flow}$	
body –0.12 (20%)	Ks	П	0.07	Ľ.	"	
		III	0.12		Psw	
Risk of flood, R <sub>flow</sub> – 0.4 (409	%)			£		2
Degree of flood risk		high	0.04	Ш		P <sub>sw</sub> + P <sub>Gw</sub>
	R	moderate	0.16	Rflow		+ ≥
		low	0.40	~		Ps
Ground water, P <sub>GW</sub> – 1.0	(50%)					
Risk of contamination of gro	ound wa	ter, R <sub>pol</sub> – 1.0				
Groundwater status (1-st		critical	0.04	e		
aquifer)	S <sub>WB</sub>	at risk	0.16	S <sub>zor</sub>	_	
		good	0.40	/B +	a a	
Affected sanitary		no	0.6	$R_{pol} = S_{WB} + S_{zone}$	$P_{GW} = R_{pol}$	
protection zones (number)	Szone	1-2	0.36	= loq	P <sub>G</sub>	
		2 – 4	0.24	R		
		> 4	0.06			



# Acoustic environment – value 2.0

Criteria		Indicator	Coefficient	Algori	thm
Acoustic environment, Ac	: - 2.0			•	
Prediction of noise propaga	tion, N∟				
Predicted noise levels at		≤ 50	1.4		
the points of impact, dB(A)		50 - 60	1.2	-	
	$L_{day}$	60 - 62	1.0	$N_L = L_{day}$	
		62 – 65	0.8		
		> 65	0.2		
Impact of construction site,	Cw				
Affected settlements (pcs.)		≤ 2	0.30		
	Ri	2 – 5	0.25	Ri / Δt	
	КI	5 – 10	0.20		Ac = N <sub>L</sub> + Cw + Tv
		> 10	0.15		+
Duration of the	• •	≤ 1	1.0		z
construction period	Δt	2 – 5	2.0		= 2
		> 6	3.0		4
Impact of serving roads, Tv	1		I		-
Affected settlements (pcs.)		≤ 2	0.30		
	D:	2-5	0.25		
	Ri	5 – 10	0.20	Ri∕∆t	
		> 10	0.15	1	
Duration of the	A+	≤1	1.0	]	
construction period	Δt	2 – 5	2.0		
		> 6	3.0		

## Soils and uncultivated lands – value 2.0

Criteria	Criteria		Coefficient	Algorithm
Почви и необработваеми земи Ас – 2.0				
Area of the Permanent		≤ 500	1.0	
works, with permanent		500-1000	0.6	
change in its purpose (road	Ar	1000 - 2000	0.4	
envelope),		2000 - 4000	0.2	
50%		> 4000	0.1	
Areas for construction sites		≤ 10	0.10	
(temporary) without	AI	10-20	0.06	Ac = Ar + Al + At + Ap + Aw
permanent change of use,		20 – 50	0.04	
5%		> 50	0.01	
Areas of temporary roads		≤ 2	0.30	
15%		2 – 5	0.18	
	At	5 – 10	0.12	
		10-20	0.06	
		> 20	0.03	



Areas for temporary		≤ 5	0.20	
storage of excavated spoil	4.0	5 – 10	0.12	
10%	Ар	10-20	0.04	
		> 20	0.02	
Areas for permanent		≤ 10	0.4	
storage of excavated spoil -		10-50	0.32	
construction landfills, 20%		50 - 100	0.24	
	Aw	100 - 200	0.16	
		200 - 400	0.08	
		400 - 600	0.04	
		> 600	0.02	

# Natura 2000 sites - value 4.0

Criteria		Indicator	Coefficient	Al	Algorithm		
Natura 2000 – 4.0							
<b>PROTECTED AREAS/HABITA</b>	ATS, PAI	ı — 2.0 (50%)					
Protected areas, P <sub>A</sub> – 1.0	(50%)						
Affected protected areas,		1	0.20				
20%	Pt	2 – 5	0.10				
		> 5	0.04				
Type of influence, 40%		Direct and	0.04	Ъа			
		permanent		+			
		Direct and	0.16	= Pt + In + Aa			
	In	temporary		- Ft			
		Indirect and	0.24	 ⊄			
		permanent		PA			
		Indirect and	0.40				
		temporary			SH		
Scope of affected		≤ 0.1	0.40		P <sub>A</sub> + N <sub>H</sub> + S <sub>H</sub>	ŋ	
protected areas, 40%	Aa	0.2 – 0.5	0.20		Z +	₹ +	
		> 0.5	0.08		PA	Р <sub>Ан</sub> + Аа	
Natural habitats, N <sub>H</sub> – 0.5 (2	25%)				II H	ц	
Module 1 – 0.3 (30%)					$P_{AH}$		
Affected natural habitats,		1	0.075	Ss			
25%	н	2 – 5	0.037	+			
		> 5	0.015	+			
Affected natural habitats,		≤ 0.1	0.15	<u>2</u>			
subject of conservation in	At	0.2 – 0.5	0.075	+			
the SCI, 50%		> 0.5	0.030	+			
Fragmentation, 25%		1	0.075	At			
	Fr	2 – 5	0.037	+ 			
		> 5	0.015	N <sub>H</sub> = H + At + Fr + Im + Pr + Ss			
Module 2 – 0.7 (70%)				Ż			
Type of influence, 20%	Im	Direct and	0.014				
		permanent					



			0.050		
		Direct and	0.056		
		temporary		4	
		Indirect and	0.084		
		permanent			
		Indirect and	0.14		
		temporary			
Priority, (50%)	Pr	Priority	0.035		
	FI	Non-priority	0.35		
Conservation status, 30%		Adverse bad	0.021		
		Adverse unsatisf.	0.10		
	Ss		0.10		
		Good	0.21		
Habitate of enacioe Su - (		Ø∕ \			
Habitats of spacies, $S_H = 0$	J.J (25	/0]		-	
Module 1 – 0.2 (20%)				4	
Affected habitats of	1	≤ 5	0.05	4	
spaces, subject of	Af	5 – 10	0.03		
conservation in the SCI,	/ 11	10-15	0.02		
25%		> 15	0.005		
Affected areas, 50%		≤ 0.1	0.1		
	Aa	0.2 – 0.5	0.05		
		> 0.5	0.02		
Fragmentation, 25%		1	0.05		
-	Fr	2-5	0.025		
		> 5	0.01		
Module 2 – 0.8 (80%)		_		+ Pr + Im + St + Am	
Priority, 50%		Priority	0.04		
Thomey, 50%	Pr	Non-priority	0.4		
Type of influence, 15%		Direct and	0.4		
Type of influence, 15/0			0.012		
		permanent Direct and	0.049		
			0.048	Aa	
	Im	temporary	0.072	-  <u>-</u>	
	1	Indirect and	0.072	L L = Af + Aa + Fr	
	1	permanent	0.12	- <sup>2</sup>	
	1	Indirect and	0.12		
	1	temporary		4	
		I Advarca had	0.02		
Conservation status, 25%		Adverse bad		-	
Conservation status, 25%	St	Adverse unsatisf.	0.10		
	St		0.10 0.20		
Conservation status, 25% Risk of animal mortality,	St	Adverse unsatisf.	0.10		
	St	Adverse unsatisf. Good	0.10 0.20		
Risk of animal mortality,		Adverse unsatisf. Good High	0.10 0.20 0.008		
Risk of animal mortality,	St Am	Adverse unsatisf. Good High Moderate	0.10 0.20 0.008 0.04		
Risk of animal mortality,		Adverse unsatisf. Good High Moderate	0.10 0.20 0.008 0.04		



Protected areas, Pav – 0	.3 (20%	6)			
Number of affected		1	0.06		
protected areas, 20%	Xa	2-5	0.03		
[······		>5	0.012		
Type of influence, 40%		Direct and	0.012		
Type of mildence, 10/0		permanent	0.012	At	
		Direct and	0.048	3	
		temporary		+	
	Im	Indirect and	0.072	Xa	
		permanent	01072		
		Indirect and	0.12	Ра	
		temporary	0.112		
Percentage of affected		≤ 0.1	0.12		
protected areas, 40%		0.2 - 0.5	0.06	-	
,,,,	At	> 0.5	0.024	-	
Habitats of spaces, Aav	- 1.2 (8	60%)			
Module 1 – 0.36 (30%)			1		S
Affected habitats of		≤ 5	0.072		Pav + Aav
spaces, 20%	Ya	5 – 10	0.043		av -
	Ta	10 - 15	0.030		ă II
		> 15	0.007		a: Aa
Percentage of affected		≤ 0.1	0.18		
protected areas, 50%	At	0.2 – 0.5	0.09		
		> 0.5	0.036	<u> </u>	
Fragmentation, 20%		1	0.072	+ s	
	Fr	2 – 5	0.036	+	
		> 5	0.014	Am + Ss + In	
Risk of animal mortality,		High	0.0036		
10%	Am	Moderate	0.018	_ <u></u>	
		Low	0.036	At -	
Module 2 – 0.84 (70%)				+	
Type of influence, 20%		Direct and	0.017		
		permanent		av :	
		Direct and	0.068	ΪÄ	
	Ss	temporary			
	35	Indirect and	0.10		
		permanent			
		Indirect and	0.17		
		temporary			
Vulnerability, 80%		Threatened	0.067		
	In	Low threatened	0.33		
		Not threatened	0.67		



Criteria		Indicator	Coefficient	Algorithm
<b>Biodiversity and Protecte</b>				
Affected protected areas,		1	0.8	
20%	At	2 – 5	0.4	
		> 5	0.16	ъ ъ
Type of influence, 20%		Dir. and perm.	0.08	+
	In	Dir. and temp.	0.32	Аа
		Indir. and perm.	0.48	+ <u>_</u>
		Indir. and temp.	0.8	+
Percentage of the areas		≤ 0.1	2.0	= At
affected by the zone, 50%	Aa	0.2 – 0.5	1.0	P SH
		> 0.5	0.4	<u>A</u> .
Need to change the area /		Yes	0.04	
regime of the protected	Cr			
area, 10%		No	0.4	

# **Biodiversity and Protected areas – value 4.0**

### Waste – value 2.0

Criteria		Indicator	Coefficient	Algorithm
Waste material, Ws – 2.0				
Amount of redundant		≤ 500 thous.	0.80	
excavated spoil, 40%		500 thous -	0.64	
	14/~	1mln.		
	Wq	1mln. – 2mln.	0.48	
		2mln. – 4mln.	0.32	Ws = Wq+Wr
		> 4mln.	0.08	
Possibility for use in		≤ 30	0.12	
construction, 60%	14/5	30 – 50	0.48	
	Wr	50 – 70	0.72	
		> 70	1.20	

# Visual impact/Landscape - value 1.0

Criteria		Indicator	Coefficient	Algorithm
Landscape, L – 1.0				
Landscape feature – 0.5		positive	0.5	
(50%)	Ls	negative	0.05	L = Ls + Vi
Visual effects – 0.5 (50%)	\ <i>\</i> ;	acceptable	0.5	
	Vi	unacceptable	0.05	



# 3.2. OPERATION PERIOD

# Air Quality – value 1.0

Criteria		Indicator	Coefficient		Algorithm
Mass of air pollutants, N	/1 – 0.4 (4	40%)	•	<u> </u>	
Inventory of pollutants	E	amount of pollutants in Mg	-	$M = M_{max} - (\Sigma E_{(NOx)} + E_{(CO)} + E_{(PM)})$ $M_{max} = 0.4$	
Dispersion of pollutant,	Dis – 0.6	60%)			
Concentration of		≤ 30	0.36		M + Dis
pollutant at the points of impact, μg – 0.36	C <sub>max</sub>	30 - 40	0.18		
(60%)		> 40	0.036	~	
distance to the nearest		≤ 50	0.012	Dis = C <sub>max</sub> + Δm + R	
village, m – 0.12 (20%)		50 - 100	0.024	Δn	
	Δm	100 - 200	0.048	+ ×	
		200 - 500	0.072	ů	
		500 - 1000	0.096	is =	
		> 1000	0.12		
Affected settlements,		≤ 2	0.12		
pcs. – 0.12 (20%)	R	2 – 5	0.072		
	n	5 – 10	0.048		
		> 10	0.012		

# Climate change – value 2.0

Criteria		Indicator	Coefficient	Alg	gorithm
Mass of greenhouse gases rele	ased, G	Wm – 0.8 (40%)			
Mass of greenhouse gases rele Inventory of greenhouse gases	E	Wm – 0.8 (40%) Quantity of greenhouse gases, Mg	-	$GWm = GWm_{max} - (\Sigma E_{(co2)} + E_{(N20)} + E_{(cH4)})$	GWm + GWp



Global warming, GWp – 1.2 (6					
Potential of greenhouse gases	M <sub>eqv</sub>	Potential of greenhouse gases, kgeqvCO <sub>2</sub>	-	Meqv = GWp(k) * M <sub>GW</sub> /1000 GWp = Meqv	

# Water Quality – value 1.0

Criteria		Indicator	Coefficient	Algorithm
Water Quality – 1.0				
Surface water, P <sub>SW</sub> – 0.	5 (50%)			
Risk of polluting surface	waters, R	w – 0.3		
Affected surface water bodies	lw	Да	-	
		Не	0.3	
Distance to water		Във вод. обект	0.16	
bodies, м		< 50	0.04	
	Δm	50 - 100	0.03	
		100 – 200	0.02	
		200 – 500	0.01	
		> 500	0.0	
Connection to runoff / surface water from the		Пряка	0.01	_
roadway to the water body	Sn	Непряка	0.0	Rw = (Rt / 0.3) – Cw - Sn - Δm
Treatment / purification of surface runoff /		Без пречистване	0.0	- Cw
surface water from the carriageway before		Лагуна с биофилтър	0.03	, 0.3) –
discharge into the hydrographic network	Rt	Дренажен филтър	0.035	= (Rt /
		Изпарител	0.04	۶ ۶
		Каломаслоуло вител	0.05	
		Каломаслоулови тел+Изпарител	0.09	
Category of the water		1	0.04	
body			0.02	
	Cw	111	0.0	



Risk of polluting surface	waters d	uring accidents, P <sub>inc</sub>	- 0.2			
Annual probability of a	spillage w	ith the potential to	cause a serious			
pollution incident, Pspl	-	1		6		
Road length	RL	km	-	W/10		P <sub>sw</sub> + P <sub>GW</sub>
pillage rates		Прав участък	0.36	SH) ×		
	SS	Аварийна лента	0.43	x 10 <sup>-9</sup> )		
		Път със завои	3.0	x 365		
Annual average daily		MПC/24h	-	DT		
traffic	AADT			R <sub>spl</sub> = RL x SS x (AADT x 365 x 10 <sup>-9</sup> ) x (HGW/100)	lod	
Percentage of heavy		%	-	L ×	Pi+	
goods vehicles	HGW			R <sub>spl</sub> = R	$P_{inc} = P_{spl} + P_{pol}$ $R_{SW} = P_{inc}$	
The probability, given a result, Ppol	spillage, t	hat a serious pollut	ion incident will			
Distance of the		Urban (response	0.45			
emergency services and		time to				
response time to site		site <20				
·		minutes)		Rt		
		Rural (response	0.60	P <sub>pol</sub> = Rt		
	Rt	time to site <1		പ്		
		hour)				
		Remote	0.75			
		(response time				
		to				
		site >1 hour)				-
Ground Water, P <sub>GW</sub> –						-
Risk of polluting ground	waters, R		I	1		-
Annual average daily		< 50 000	15			
traffic	AADT	50 000 - 100 000	30	Røw = AADT + Rf + Ss + Gw + Rw + Fn + li		
		> 100 000	45	ц Ц		
Rainfall volume	Rf	< 550	15	+ >		
(annual average), mm	ΛI	550 – 700	30	, a	5	
		100 - 200	45	≯		
Soakaway geometry		Continuous	15		)	
		linear		,	2	
		Single point or	30	+ +		
:		shallow		+	<u>.</u>	
	Ss	soakaway		L LC	5	
		serving low road		AAI		
		area				
		Single point,	45	Ma(	, p	
		deep serving			-	



ſſ		T	1	[		
		high road area >				
		5000 m2				
Ground water level		< 5	60			
	Gw	5 – 15	40			
		> 15	20			
Flow type		Heavy	20			
		consolidated				
		sedimentary				
	Bw	deposits				
	DW	Consolidated	40			
		deposits				
		Unconsolidated	60			
		deposits				
Effective grain size		Fine sand	7.5			
	Fn	Coarse sand	15			
		Very coarse	22.5			
		sand				
Litology		< 1% clay	22.5			
	Li	1 - 5% clay	15			
		> 15% clay	7.5			
Risk of polluting ground	waters du	uring accidents, Pinc				
Annual probability of a	spillage w	ith the potential to	cause a serious			
pollution incident, Pspl						
Road length		km	-	0		
	RL			/10		
				Ň		
Spillage rates		No Junction	0.36	365 x 10 <sup>-9</sup> ) x (HGW/100)		
				× (		
	SS	Slip Road	0.43	10 <sup>-9</sup>		
				×		
		Roundabout	3.0	365		
A				×	_	
Annual average daily	1	AADT	-	ΓDΑ	ت <b>P</b>	
traffic	AADT			Y)	– – – – – – – – – – – – – – – – – – –	
				S X	<sub>c</sub> = P <sub>spl</sub> + P R <sub>GW</sub> = P <sub>inc</sub>	
Percentage of heavy		%	-	RL x SS x (AADT	$P_{inc} = P_{spl} + P_{pol}$ $R_{GW} = P_{inc}$	
goods vehicles				RL	_ ₽_	
	HGW			R <sub>spl</sub> =		
				Ŗ		
The probability, given a	spillage, t	hat a serious pollu	tion incident will			
result, Ppol						
Distance of the		Urban (response	0.3			
emergency services and		time to		= Rt		
response time to site	1	site <20		P <sub>pol</sub> =		
	Rt	minutes)		ط		
		Rural (response	0.3			
	1	time to site <1			1	
		hour)				



	Remote	0.5		
	(response time			
	to site >1 hour)			

Criteria		Indicator	Coefficient	Algorithm
Degree of ground water		Low risk	0.3	
risk		$(R_{gw} \le 150)$		
	П	Moderate risk	0.15	
	$R_{gw}$	(R <sub>gw</sub> =150 - 250)		$R = R_{gw}$
		High risk	0.0	
		(R <sub>gw</sub> > 250)		

Criteria		Indicator	Coefficient	Algorithm
Degree of surface water		Acceptable	0.2	
risk during accidents	Б	(P <sub>inc</sub> ≤ 1.0)		
	R <sub>sw</sub>	Potential	0.02	
		(P <sub>inc</sub> > 1.0)		$R = R_{SW} + R_{GW}$
Degree of ground water		Acceptable	0.2	$\mathbf{R} - \mathbf{R}_{SW} + \mathbf{R}_{GW}$
risk during accidents		(P <sub>inc</sub> ≤ 1.0)		
	$R_{GW}$	Potential	0.02	
		(P <sub>inc</sub> > 1.0)		

Assessment matrix on degree of ground water risk - Rgw					
Value Degree of risk					
≤ 150	Low risk				
150 - 250	Moderate risk				
> 250	High risk				

Assessment matrix on degree of risk during accident - Pinc					
Value Degree of risk					
≤ 1.0	Acceptable risk				
> 1.0	Potential risk				



# Acoustic environment – value 1.0

Criteria	Indicator	Coefficient	Algorithm	
Acoustic environment, Ac				
Predicted noise levels at		≤ 50	0.8	
the points of impact dB(A),		50 - 60	0.6	
80%	$L_{day}$	60 - 62	0.4	
		62 – 65	0.2	
		> 65	0.1	
Affected settlements		≤ 2	0.20	$Ac = (L_{day} + S_{set}) - R$
(pcs.), 20%	c	2 – 5	0.15	
	$S_{set}$	5 - 10	0.10	
		> 10	0.05	
Affected areas with special	R	Да	0.1	
protection regime	n	Не	0.0	

# Visual Impact/Landscape – value 2.0

Criteria		Indicator	Coefficient	Algorithm
Landscape, L – 2.0 (100%)				
Implementation of		Yes	0.8	
landscape management mitigation – 0.8 (40%)	Ls	No	0.08	L = Ls + Vi
Inscription of elements of		acceptable	1.2	
road infrastructure in the surrounding terrain – 1.2 (60%)	Vi	unacceptable	0.12	

## Natura 2000 sites – value 3.0

Criteria		Indicator	Coefficient	Alg	orith	m	
Natura 2000 – 3.0							
PROTECTED AREAS/HABITA							
Protected areas, P <sub>A</sub> – 0.75 (50%)							
Affected protected areas,		1	0.15				
20%	Pt	2 – 5	0.075				
		> 5	0.03				
Type of influence, 40%		Direct and	0.03	Ъа	In + Aa N <sub>H</sub> + S <sub>H</sub>		
		permanent		+			
		Direct and	0.12	<u>–</u> +	+	Р <sub>АН</sub> + Аа	
	1.0	In	temporary		Pt +	⊿	r <sub>AH</sub> ' Ad
	111	Indirect and	0.18	 √	н т		
		permanent		PA	P <sub>AH</sub>		
		Indirect and	0.3				
		temporary					
Scope of affected		≤ 0.1	0.3				
protected areas, 40%	Aa	0.2 – 0.5	0.15				
		> 0.5	0.06				



Natural babitate N 0 27	()=%)				
Natural habitats $N_H - 0.37$ Module 1 - 0.11 (30%)	(25/0)			-	
Affected natural habitats,		1	0.027	-	
25%	н	2-5	0.027	-	
2370		>5	0.0054	-	
Affected natural habitats,		≤ 0.1	0.055	-	
subject of conservation in	At	0.2 – 0.5	0.033	-	
the SCI, 50%	AL	> 0.5	0.027	-	
Fragmentation, 25%		1	0.011	Ss	
Flagmentation, 25%	Fr	2-5	0.027	- + -	
	ГІ	>5	0.014	- +	
Module 2 – 0.26 (70%)		> 5	0.0054	H + At + Fr + Im + Pr + Ss	
Type of influence, 20%		Direct and	0.0052	_ + _	
Type of influence, 20%		permanent	0.0052	+	
		Direct and	0.021	- At -	
		temporary	0.021		
	Im	Indirect and	0.031		
		permanent	0.031	ž	
		Indirect and	0.052	-	
		temporary	0.052		
Priority, (50%)		Priority	0.0013	-	
(30%)	Pr	Non-priority	0.13	-	
Conservation status, 30%		Adverse bad	0.0078	-	
	Ss	Adverse unsatisf.		-	
	35	Good	0.039	_	
Habitat of chasics Sur 0	27/25		0.078		
Habitat of species, $S_H - 0$ . Module 1 – 0.07 (20%)	37 (23	970)		-	
Affected habitats of		≤ 5	0.017	-	
spaces, subject of		<u>5</u> 5 – 10	0.017	-	
conservation in the SCI,	Af	10-15	0.010	-	
25%		> 15		-	
			0.0017	-	
Affected areas, 50%	1.0	≤ 0.1	0.035	Ss	
	Aa	0.2 - 0.5	0.017		
<b>E</b>		> 0.5	0.007		
Fragmentation, 25%	_	1	0.017	- L	
	Fr	2-5	0.008	<u>+</u>	
		> 5	0.0034	Af + Aa + Fr + Pr + Im +	
Module 2 – 0.3 (80%)				Aa	
Priority, 50%	Pr	Priority	0.015	+	
		Non-priority	0.15	- 11	
Type of influence, 20%		Direct and	0.006	Š	
		permanent		4	
		Direct and	0.024		
	Im	temporary		4	
		Indirect and	0.036		
		permanent		4	
		Indirect and	0.06		
		temporary			



Conservation status, 30%		Adverse bad	0.009			
	Ss	Adverse unsatisf.		_		
	55	Good	0.045	-		
PROTECTED AREAS FOR WI			0.05			
Protected areas, Pav – 0.3	-					
Number of affected	5 (20/0	9 <b>/</b>	0.06	_		
protected areas, 20%	Va	2-5	0.08			
protected areas, 20%	Ха			_		
Turne of influence 400/		> 5	0.012	t -		
Type of influence, 40%		Direct and	0.012	Pav = Xa + Im + At		
		permanent	0.040	<u> </u>		
		Direct and	0.048	+		
	Im	temporary	0.070			
		Indirect and	0.072	ac		
		permanent	0.10			
		Indirect and	0.12			
		temporary		_		
Percentage of affected		≤ 0.1	0.12	_		
protected areas, 40%	At	0.2 – 0.5	0.06	_		
		> 0.5	0.024			
Habitats of spaces, Aav –	1.2 (8	0%)				
Module 1 – 0.36 (30%)		•			٦¢	
Affected habitats of		≤ 5	0.09	-	Pav + Aav	
spaces, 25%	Va	5 – 10	0.054		+ >	
	Ya	10-15	0.036		= Pa	
		> 15	0.009		Aa =	
Percentage of affected		≤ 0.1	0.18		4	
protected areas, 50%	At	0.2 – 0.5	0.09	7_		
		> 0.5	0.036			
Fragmentation, 25%		1	0.09	+ Fr + Ss + In		
	Fr	2-5	0.045	+		
		> 5	0.018	- <u>-</u> +		
Module 2 – 0.84 (70%)		75		¥		
<b>Module 2 – 0.84 (70%)</b> Type of influence, 20%		1		+		
<b>Module 2 – 0.84 (70%)</b> Type of influence, 20%		Direct and	0.017	+		
		Direct and permanent	0.017	+		
		Direct and permanent Direct and				
	Ss	Direct and permanent Direct and temporary	0.017	+		
	Ss	Direct and permanent Direct and temporary Indirect and	0.017	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent	0.017 0.068 0.10	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and	0.017	+		
Type of influence, 20%	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and temporary	0.017 0.068 0.10 0.17	+		
	Ss	Direct and permanent Direct and temporary Indirect and permanent Indirect and	0.017 0.068 0.10	+		



# Biodiversity and Protected areas - value 3.0

Criteria	Indicator	Coefficient	Algorithm	
<b>Biodiversity and Protecte</b>				
Affected protected areas,		1	0.6	
20%	At	2 – 5	0.3	
		> 5	0.12	5
Type of influence, 20%	In	Dir. and perm.	0.06	+
		Dir. and temp.	0.24	Аа
		Indir. and perm.	0.36	+ <u> </u>
		Indir. and temp.	0.6	+
Percentage of the areas		≤ 0.1	1.5	= At
affected by the zone, 50%	Aa	0.2 – 0.5	0.75	P <sub>SH</sub> =
		> 0.5	0.3	<u>~</u>
Need to change the area /		Yes	0.03	
regime of the protected area, 10%	Cr	No	0.3	

## Animal mortality – value 3.0

Criteria		Indicator	Coefficient	Algorithm
Animal mortality, Am – 3	.0			
Mortality in vertebrate sp	oecies	– 1.5 (50%)		
Mortality risk in groups of		High	0.15	
species	Db	Moderate	0.75	
		Low	1.5	Am = Db + Da
Mortality in birds – 1.5 (5	0%)			AIII = DD + Dd
Mortality risk in groups of		High	0.15	
species	Da	Moderate	0.75	
		Low	1.5	



#### Notes



#### Notes



