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Capacity building programme

WPT3 Policy, capacity building, networking

Project co-funded by European Union funds (ERDF)

Introduction to the SaveGREEN project

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Implementation period, objectives, preliminary results of the project, integration with TRANSGREEN, ConnectGREEN, BISON, etc.

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Introduction to the SEA / EIA Toolbox

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Scope: Propose a toolbox to be used by SEA / EIA practitioners, authorities, NGOs and other stakeholders to identify and assess, in a quantified manner, the impacts on GI caused by plans or projects.

SEA Toolkit: For assessing the impacts on GI, generated by strategic documents (plans, programmes and strategies).

EIA Toolkit: Focused on the identification and quantification of project impacts on GI.

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Introduction to the SEA / EIA Toolbox

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The toolkit follows the precautionary principle.

Precautionary principle:

- It is included in the Maastricht Treaty of the EU since 1992;
- According to the EU Court of Justice “the precautionary principle can be defined as a general principle of Community law requiring the competent authorities to take appropriate measures to prevent specific potential risks to public health, safety and the environment, by giving precedence to the requirements related to the protection of those interests over economic interests”;

In short: the data used in the methodologies should have a sound scientific basis, while any assumptions that need to be included should assume the most unfavourable situation

SEA Procedure

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At EU level: Follows the requirements of the SEA Directive (Directive 2001/42/EC)

At National level: *requires input from PP on legislative requirements + integration of connectivity in Plan level assessments*

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SEA Toolkit - Overview of Strategic Environmental Assessment

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- Main focus of SEA: Identification of relevant environmental issues
- SEA is implemented strategically, with the input and participation of different stakeholders
- Ecological connectivity is not usually considered in detail in SEA
- For transport related Plans, the aim of the SEA should be to ensure the maintenance and restoration of ecological connectivity

SEA Toolkit - Overview of Strategic Environmental Assessment

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- Requires the elaboration of an Environmental Report
- Aim of the Environmental Report:

Ensure that “likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated”

Art. 5, SEA Directive

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Tool for selection of alternatives

Tool for strategic assessment of impacts

Tool for SEA monitoring

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Tool for selection of alternatives at SEA level

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- Implies the analysis of strategic solutions (e.g. possible motorway routes, need for a new railway vs. a new road, etc.)
- Can be done through the use of a Multi Criteria Analysis (MCA)
- The MCA is based on environmental aspects set in accordance with the SEA Directive and the EIA Directive
- Examples: population, human health, biodiversity, land, soil, water, climate, cultural heritage, landscape, etc.

Tool for selection of alternatives at SEA level

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- The MCA should be done quantitatively through measurements and calculations, as much as possible
- Calculations should allow for measurements of the predicted effects
- Due to the strategic nature of SEA, use of field data might not be possible;
- If the plan is addressed to a local scale, field data can be used.

Tool for selection of alternatives at SEA level

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- Data sources can be publicly available data such as:
  - Data from the European Environmental Agency
  - Data from the European Commission
  - Data from the Joint Research Centre of the EU
  - Data from independent projects, such as the results of ConnectGREEN
  - Other relevant spatial resources available.

Exercise - Identification of relevant data

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Tool for selection of alternatives at SEA level

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- The environmental aspects selected to be used in the analysis should allow for the visualisation of differences between the analysed alternatives.

Tool for selection of alternatives at SEA level

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- The environmental aspects selected to be used in the analysis should allow for the visualisation of differences between the analysed alternatives.

Motorway route 1

- Intersects 5 Natura 2000 sites
- Intersects 2 water bodies

Motorway route 2

- Intersects 5 Natura 2000 sites
- Intersects 4 water bodies

Tool for selection of alternatives at SEA level

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- The environmental aspects selected to be used in the analysis should allow for the visualisation of differences between the analysed alternatives.

Motorway route 1	Motorway route 2	Criteria is not relevant
- Intersects 5 Natura 2000 sites	- Intersects 5 Natura 2000 sites	
- Intersects 2 water bodies	- Intersects 4 water bodies	

Tool for selection of alternatives at SEA level

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- The environmental aspects selected to be used in the analysis should allow for the visualisation of differences between the analysed alternatives.

Motorway route 1	Motorway route 2	Criteria is not relevant
- Intersects 5 Natura 2000 sites	- Intersects 5 Natura 2000 sites	
- Intersects 2 water bodies	- Intersects 4 water bodies	Better alternative

Tool for selection of alternatives at SEA level

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- The MCA can be performed using a table, with supportive explanations in a textual format;
- The purpose of the table is to analyse and compare the effects of the different alternatives on the selected environmental aspects;
- For each environmental aspect a quantifiable indicator should be set;
- To delineate better, each environmental aspect should have an importance set.

Tool for selection of alternatives at SEA level - example of table

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Environmental criterion	Indicator	Unit of measurement	Importance	Alternative 1		Alternative 2		Alternative 3		---	Alternative X
				Input	Score	Input	Score	Input	Score		
Noise level	Surface of settlements with increased noise levels	ha	5%	256	25,6	430	43	390	39	...	-
Social aspects	Number of administrative units intersected	Number	5%	13	0,65	25	1,25	28	1,4	...	-
	Number of economic epicentres connected	Number	5%	2	0,1	3	0,15	3	0,15	...	-
Natura 2000 sites	Affected surface of Natura 2000 sites / other Community designated sites (e.g. Emerald Sites)	ha	10%	5	0,5	2	0,2	2	0,2	...	-
Areas of high importance for biodiversity	Areas with Natura 2000 habitats located outside Natura 2000 sites, old-growth forests, etc.	ha	10%	5	0,5	2	0,2	2	0,2	...	-
Other nationally designated protected natural areas	Number of intersections with Parks	Number	10%	2	0,2	0	0	0	0	...	-
Ecological corridors	Intersections with ecological corridors	Yes / No	10%	No	0	Yes	10	Yes	10	...	-
	Importance of ecological corridor	Category	10%	National	10	Regional	5	Local	1	-	-
Core habitats	Intersections with core habitats	Yes / No	10%	No	0	Yes	10	No	0	...	-
Water bodies	Number of intersections with water bodies	Number	10%	20	2	25	2,5	14	1,4	...	-
Air quality	Surface of areas with increased pollutant concentrations	ha	5%	3	0,3	1	0,1	2	0,2	...	-
Climate change	Exposure to flooding	Yes / No	5%	No	0	Yes	5	No	0	...	-
	Exposure to landslides	Yes / No	5%	No	0	Yes	5	No	0	...	-
Cultural heritage	Number of UNESCO WHS sites located at <5 km from the alternative	Number	5%	0	0	1	0,05	0	0	...	-
Land use	Surface requiring deforestation	ha	5%	98	4,9	45	2,25	33	1,65	...	-
...	...	...	...	...	...	...	...	...	...	...	...
Other relevant criteria	-	-	-	-	-	-	-	-	-	...	-
Total score				-	34,25	-	79,5	-	54	-	-

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Tool for selection of alternatives at SEA level

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- Based on the quantifiable measurements a score is attributed to each alternative
- Generally, the lower the score the better the alternative
- The environmental criteria, indicators, units of measurement, importance and alternative analysis should be adapted for each SEA developed by the respective SEA expert.

Tool for strategic assessment of impacts

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- The chosen alternative should be evaluated in an Environmental Report
- Scope of the assessment:

A more in-depth look at the environmental criteria

Assessment from the point of view of the existing environmental problems

Tool for strategic assessment of impacts

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SEA elaboration steps:

1. Description of the relevant environmental criteria, based on the specific situation in the region where the plan or project is proposed
2. Analysis of the current situation related to the selected environmental criteria
3. Analysis of the development and future perspectives concerning the selected environmental criteria (Alternative 0 – the expected development of the environmental criterion without the realisation of the plan/programme);

Tool for strategic assessment of impacts

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SEA elaboration steps:

4. Identification of the main environmental problems in the area where the plan or programme is proposed

5. Identification of the main environmental objectives related to the selected environmental criteria in the area where the plan or programme is proposed

6. Assessment of the effects of the analysed plan or programme related to these environmental objectives and their targets

Tool for strategic assessment of impacts

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Description of SEA methodology at national level (if applicable)

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1 This should include a description of the SEA methodology requirements from national level. If no special requirements are needed, please proceed to the following slides.
Silvia Borlea, 25/10/2022

Tool for strategic assessment of impacts

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- The methodology proposed allows the experts to establish the environmental criteria to be taken into consideration;
- The criteria established should take into account the relevant legislation at national and EU levels (including the requirements of the Habitats Directive and Birds Directive);
- The methodology is based on an assessment table;
- It aims to present the information related to each environmental criterion in an orderly manner, which can allow the SEA expert to identify the potentially significant effects

Tool for strategic assessment of impacts

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Environmental criteria	Baseline conditions		Perspectives in 'Do nothing' scenario			Relevant environmental objective	Plan / Programme proposals	
	Current situation	Current indicator score for the criterion	Perspectives (Alternative "0")	Future indicator score for the criterion	Environmental problems		Effect of the selected alternative on the environmental objective	Proposed measures for impact avoidance or mitigation
Natura 2000 sites	A decrease in the population of brown bears has been observed	-1	Continuation of the decreasing trend for the population of brown bears	-2	There is a decreasing trend in the population of brown bears	Reverse the decreasing trend	The alternative will not significantly affect the population of brown bears. It will not intersect Natura 2000 sites designated for the protection of brown bear	-
Areas of high importance for biodiversity	A decreasing trend in the surface area of habitats of Community interest located outside Natura 2000 sites	-1	Continuation of the decreasing trend for habitat surfaces outside Natura 2000 sites	-2	There is a decreasing trend for Natura 2000 habitats outside Natura 2000 sites	Reverse the decreasing trend	The alternative has the potential to contribute to the decreasing trend in Natura 2000 surfaces outside Natura 2000 sites	Changes to the proposed implementation areas
Other nationally designated protected natural areas	The trend in the number of tourists in the National Parks in the area has been decreasing	-1	The trend in the number of tourists will continue to decrease	-2	There is a decreasing trend in the number of tourists in the National Parks of the area	Reverse the decreasing trend	The alternative will contribute to the environmental objective through the promotion and improvement of the ease of access for tourists to National Parks	-
Ecological corridors	The number of intersections of infrastructure with ecological corridors has been increasing	-1	The number of intersections will continue to increase	-2	Ecological connectivity has become significantly affected by fragmentation due to anthropic development	Re-establish ecological connectivity	The selected alternative will not contribute to the fragmentation of ecological corridors	-
Core habitats	A decreasing trend has been observed in the size of the core habitats for large mammals	-1	The size of core habitats for large mammals will continue to decrease	-2	There is an important loss of core habitats for large mammals	Reverse the decreasing trend and expand the size of core habitats for large mammals	The selected alternative will not contribute to the decrease of core habitats for large mammals (it will not intersect core areas)	-

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Tool for strategic assessment of impacts

Key components in the assessment

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Environmental criteria	Baseline conditions		Perspectives in 'Do nothing' scenario			Relevant environmental objective	Plan / Programme proposals	
	Current situation	Current indicator score for the criterion	Perspectives (Alternative "0")	Future indicator score for the criterion	Environmental problems		Effect of the selected alternative on the environmental objective	Proposed measures for impact avoidance or mitigation
Natura 2000 sites	A decrease in the population of brown bears has been observed	-1	Continuation of the decreasing trend for the population of brown bears	-2	There is a decreasing trend in the population of brown bears	Reverse the decreasing trend	The alternative will not significantly affect the population of brown bears. It will not intersect Natura 2000 sites designated for the protection of brown bear	-
Areas of high importance for biodiversity	A decreasing trend in the surface area of habitats of Community interest located outside Natura 2000 sites	-1	Continuation of the decreasing trend for habitat surfaces outside Natura 2000 sites	-2	There is a decreasing trend for Natura 2000 habitats outside Natura 2000 sites	Reverse the decreasing trend	The alternative has the potential to contribute to the decreasing trend in Natura 2000 surfaces outside Natura 2000 sites	Changes to the proposed implementation areas
Other nationally designated protected natural areas	The trend in the number of tourists in the National Parks in the area has been decreasing	-1	The trend in the number of tourists will continue to decrease	-2	There is a decreasing trend in the number of tourists in the National Parks of the area	Reverse the decreasing trend	The alternative will contribute to the environmental objective through the promotion and improvement of the ease of access for tourists to National Parks	-
Ecological corridors	The number of intersections of infrastructure with ecological corridors has been increasing	-1	The number of intersections will continue to increase	-2	Ecological connectivity has become significantly affected by fragmentation due to anthropic development	Re-establish ecological connectivity	The selected alternative will not contribute to the fragmentation of ecological corridors	-
Core habitats	A decreasing trend has been observed in the size of the core habitats for large mammals	-1	The size of core habitats for large mammals will continue to decrease	-2	There is an important loss of core habitats for large mammals	Reverse the decreasing trend and expand the size of core habitats for large mammals	The selected alternative will not contribute to the decrease of core habitats for large mammals (it will not intersect core areas)	-

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Tool for strategic assessment of impacts

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- The scores for the current and future indicators are based on the expert judgement of observed or known trends, and on the effects that the analysed plan can have on the relevant environmental objectives.

Possible effect	Description
Significant negative effect	-2
Nonsignificant negative effect	-1
No effects	0
Nonsignificant positive effect	1
Significant positive effect	2

Tool for strategic assessment of impacts

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- Significant negative level = if an effect it is considered to threaten the relevant environmental objective and prevents it from being reached;
- Nonsignificant negative level = if an effect affects the relevant environmental objective, but still allows it to be reached;
- Nonsignificant positive level = contributes to reaching the relevant environmental objective in a small manner;
- Significant positive level = addresses the relevant environmental objective directly, and will lead to its fulfilment.

Tool for strategic assessment of impacts

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The assessment should be done in a precautionary manner:

In accordance with the precautionary principle, if it is unknown whether the assessed plan or programme will have a significant or non-significant effect, it is preferable to consider the most unfavourable situation.

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Tool for SEA monitoring

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- To be done in accordance with Art. 10 of SEA Directive;
- The purpose is: “to identify at an early stage unforeseen adverse effects and to be able to undertake appropriate remedial action”;
- The monitoring should include aspects related to the monitoring of the identified significant effects of a plan or programme.

Tool for SEA monitoring

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The programme should:

- focus on the environmental problems and significant effects identified within the assessment;
- address all the relevant environmental criteria for which significant effects have been identified;
- use data from various relevant institutions to allow for an overview of the environmental situation following the implementation of the analysed plan or programme;

Tool for SEA monitoring

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The programme should:

- require complementary field research in order (i) to complete the existing data and information, especially if the data is older, and (ii) to update the current status of the landscape and land use in real time;
- take into consideration the relevant environmental objectives selected within the SEA.

Tool for SEA monitoring

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Stages for the development of the SEA monitoring programme:

1. Establishment of the environmental criteria potentially significantly affected by the plan or programme;

2. Identification of the appropriate indicators for monitoring the effects of the analysed plan or programme:

- Quantifiable
- Allow for clear measurements of values for the indicators

Tool for SEA monitoring

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Stages for the development of the SEA monitoring programme:

3. Identification of the appropriate targets for the indicators. They should establish the main milestone/s for ensuring the decrease in the severity of identified effects to a non-significant level.

4. Identification of the potential data sources which could be used for monitoring. These can be any institution that can gather data, especially if done at a higher level.

Tool for SEA monitoring

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Environmental criteria	Monitoring programme		
	Indicator	Target	Institutions that can collect the data
Natura 2000 sites	Conservation status of habitats and species in Natura 2000 sites	The favourable conservation status for all habitats and species	National Agency for Natural Protected Areas
Areas of high importance for biodiversity	Surface (in ha) of habitats of Community interest outside Natura 2000 sites	At least 250 000 ha at a national level for habitat 91E0*	National Agency for Environmental Protection
Other nationally designated protected natural areas	Conservation status of habitats and species protected at national level	The favourable conservation status for all habitats and species	National Agency for Natural Protected Areas
Structural connectivity (for ecological corridors)	Degree of connectedness (or other connectivity indices)	Implementation of a system of wildlife crossings, which are permeable for the entire species spectrum, with appropriate land use arrangement in the surrounding areas	National Agency for Environmental Protection, NGOs
Functional connectivity (for ecological corridors)	Number of individuals passing through a particular corridor area	No significant difference in the number of sightings / crossings of wildlife compared to the period before the implementation of the plan	National Agency for Environmental Protection, NGOs
Core habitats	Size of the core habitat area	No significant reduction in the size of core habitats after the implementation of the plan	National Agency for Environmental Protection, NGOs
Water bodies	Degree of connectivity and ecological status of water bodies	No additional fragmentation of water bodies. No changes in the ecological status of the water bodies due to the implemented plan	National Water Management Authorities
...	...	...	...
Other relevant criteria	-	-	-

Please note that these environmental criteria and the information in the rest of the table are only examples. They should be changed and adapted for each developed SEA

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EIA toolkit - Overview of Environmental Impact Assessment

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- The EIA should be done within the framework of Directive 2014/52/EU (EIA Directive);
- The Directive applies to public and private projects, which are considered likely to have a significant effect on the environment;
- The EIA procedure includes the development of an Environmental Impact Assessment Report.
- If it is expected that the project will also significantly affect Natura 2000 sites, an Appropriate Assessment (AA) is required.

2 This slide needs to be particularised if additional requirements are needed at country level.
Silvia Borlea, 25/10/2022

EIA toolkit - Overview of Environmental Impact Assessment

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Elaboration of the EIA includes the following procedural stages:

1. Screening - ascertains whether the Project's effects on the environment are expected to be significant;
2. Scoping - establishes the extent of the information required to make an informed decision about the Project and its effects;
3. Preparation of the EIA Report - establishes the avoidance and mitigation measures required for the project

3 This is the EU approach. If the national legislation of the country requires more stages, this slide will need to be adapted.
Silvia Borlea, 25/10/2022

EIA toolkit - Overview of Environmental Impact Assessment

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The methodologies presented here do not specifically address either of the procedural stages presented previously.

For more information on SEA, EIA and AA procedures it is recommended to consult the 'Keeping Nature Connected – Environmental Impact Assessment (EIA) for Integrated Green Infrastructure Planning' deliverable from the TRANSGREEN project:

https://www.interreg-danube.eu/uploads/media/approved_project_output/0001/35/f5374e0aee3813cfd352c8005b5ceb0da52d52c5.pdf

EIA toolkit - Overview of Environmental Impact Assessment

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This toolkit will include methodologies for:

- Analysis of alternatives (including a 'no project' alternative);
- Description of the baseline environmental conditions and their likely future trends;
- Assessment of the envisioned project impacts;
- Elaboration of avoidance, mitigation and/or compensation measures, established to ensure no significant impact;
- Elaboration of monitoring programmes;

EIA toolkit - Overview of Environmental Impact Assessment

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- The EIA procedure (and sometimes the SEA procedure) can also include an Appropriate Assessment, if the project under analysis has the potential to generate a significant impact on the integrity of a Natura 2000 site;
- The AA is performed according to the requirements set out in the Habitats Directive and the Birds Directive;
- Additionally, the EC has released specific guidelines for AA: https://ec.europa.eu/environment/nature/natura2000/management/pdf/methodological-guidance_2021-10/EN.pdf.

Introduction to landscape level connectivity

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- One of the most important components of the EIA for transportation is analysis of impacts on ecological connectivity;
- It is important however to consider ecological connectivity at landscape level, i.e. not only the permeability of the proposed infrastructure, but also the permeability of the landscape where the new infrastructure is proposed.

Introduction to landscape level connectivity

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- Landscape level connectivity should take into consideration:
  - Structural connectivity = spatial relation of contiguity or connectedness between patches of suitable natural habitats, as opposed to habitat isolation, and is measured by analysing landscape structure;
  - Functional connectivity = capacity of the physical structure of habitats to satisfy species' ecological needs, and 'considers the behavioural responses of an organism to the various landscape elements;

Introduction to landscape level connectivity

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- Connectivity can be affected by multiple sectors, such as:
  - Road infrastructure;
  - Railway infrastructure;
  - Agriculture;
  - Hydrotechnical interventions on rivers;
  - Urbanisation;
  - Any other sector which generates physical features or effects that can perturb wildlife (noise, light, etc.).

Introduction to landscape level connectivity

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- Connectivity can be affected by multiple sectors, such as:
  - Road infrastructure;
  - Railway infrastructure;
  - Agriculture;
  - Hydrotechnical interventions on rivers;
  - Urbanisation;
  - Any other sector which generates physical features or effects that can perturb wildlife (noise, light, etc.).

Potential barriers

Introduction to landscape level connectivity

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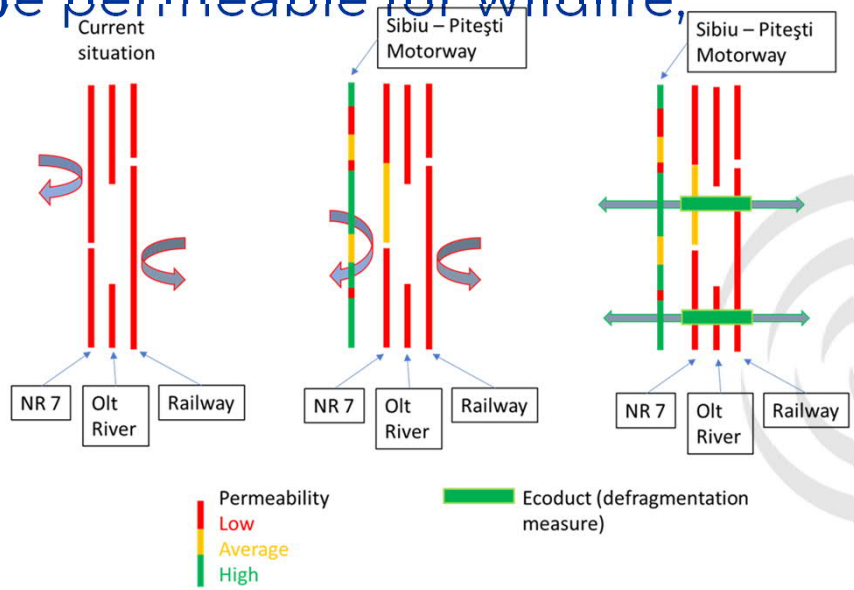
- To ensure adequate connectivity, components of all the sectors must be permeable for wildlife;



Introduction to landscape level connectivity

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- In the context of EIA (and if needed SEA) analysis of landscape level connectivity should be a topic of interest for all procedural stages;
- Analysis of landscape level connectivity should include:
  - Designated corridors at national level;
  - Local level corridors obtained from modeling - A methodology for modeling is proposed within SaveGREEN;
  - Data regarding the existing pressures that contribute to fragmentation (e.g. presence of other roads, railways, hydrotechnical works, urban areas).

Selection of alternatives at project level

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- For the alternative selection at project level, a more detailed version of the MCA should be done;
- At project level, a very solid set of data is required for the MCA;
- MCA should include:

environmental component + financial component + technical component

Selection of alternatives at project level

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- For the environmental component, the expert should select environmental criteria;
- The environmental criteria selected for this MCA should be more detailed than the ones included in the analysis done for SEA;
- Criteria should:
  - Be particular and relevant to the analysed project
  - Be able to indicate differences between the alternatives under analysis

Selection of alternatives at project level

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- The chosen criteria should have corresponding indicators, to be used for quantification;
- It is possible to identify an alternative which should be rejected due to possible unmitigable impacts on very important features;
- The importance and the differences of the weight value of each indicator should be established by each EIA expert;
- The level of importance of each indicator should reflect the country's strategies, plans and intentions in regards to each environmental factor, as well as the requirements of the EU.

Selection of alternatives at project level

Criteria	Indicator	Unit of measurement	Importance	Alternative 1		Alternative 2		Alternative 3		---	Alternative X
				Input	Score	Input	Score	Input	Score		
Noise level	Surface area of settlements affected by increases in noise levels	ha	...	...	...	...	...	...	...	...	...
Social aspects	Number of residential buildings requiring demolition	Number	...	...	...	...	...	...	...	...	...
	Number of settlements separated by the infrastructure alignment	Number	...	...	...	...	...	...	...	...	...
Biodiversity	Surface affected in Natura 2000 sites	ha	...	...	...	...	...	...	...	...	...
	Surfaces of Priority habitats affected outside Natura 2000 sites	ha	...	...	...	...	...	...	...	...	...
	Surfaces of habitats of strictly protected species intersected	ha	---	---	---	---	---	---	---	---	---
	Surfaces of breeding habitats for Natura 2000 species, affected inside and outside Natura 2000 sites	ha	...	...	...	...	...	...	...	...	...
	Length of the proposed infrastructure that can be considered permeable (large bridges, tunnels, etc.)	km	...	...	...	...	...	...	...	...	...
	Number of intersections with priority habitat areas	Number	...	...	...	...	...	...	...	...	...
	Number of intersections with key umbrella species' habitats	Number	...	...	...	...	...	...	...	...	...
	Number of ecological corridors potentially interrupted by the proposed infrastructure (for each relevant species)	Number	...	...	...	...	...	...	...	...	...
Air quality	Surface of settlements with increased levels of air pollution intersected by alternative (considered at risk of lowering air quality)	ha	...	...	...	...	...	...	...	...	...
Water bodies	Number of intersections with water bodies with Very good and Good ecological status	Number	...	...	...	...	...	...	...	...	...
	Length of the intersection of riparian vegetation near water bodies	m	...	...	...	...	...	...	...	...	...

Exercise. Choose the appropriate indicators for the criteria

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Assessment of baseline conditions

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- Has to be completed for all of the environmental factors analysed in the EIA report and potentially impacted by the project;
- Should include field measurements and observations as well as a detailed analysis of the current status of the components under consideration;
- Needs to include and present an evaluation of the sensitivity of the environmental aspects under analysis.

Assessment of baseline conditions - ecological corridors

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- Baseline description should include an analysis of ecological corridors;
- Depending on the situation, this analysis can be carried out with the use of existing information related to ecological corridors;
- If there is insufficient information related to ecological corridors in the area, it is recommended to undertake modelling to identify the local corridors and to confirm its results through fieldwork.

Assessment of baseline conditions - ecological corridors

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- The modeling methodology is presented in Output T1.1 ‘A Methodology for Standardised Monitoring of Ecological Connectivity - Guidelines for the analysis of structural and functional connectivity’ for the SaveGREEN project;
- It is preferable for the assessment of the baseline conditions to also include monitoring activities and fieldwork, including field activities for confirming the modeling results of the connectivity;

Assessment of baseline conditions - ecological corridors

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Examples of data to be used for identifying ecological corridors in Romania:

- Results of the ConnectGREEN project;
- Results of the COREHABS project;
- Results of the NaturREGIO project;
- Other scientific articles which include analyses of ecological connectivity (including local level connectivity)

4 This slide should be particularised if any other data is available.
Silvia Borlea, 27/10/2022

Exercise. Identification of relevant stakeholders

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Explanation regarding the necessity for identification of stakeholders for implementing CSOP

The exercise should be theoretical, but similar to the exercise done for the development of the Local Actions Plan within WP2

It should indicate to the participants what they need to do to contribute to the implementation of the CSOP

Assessment of effects and impacts

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- For this assessment it is necessary to use all the data and information gathered through the monitoring done during the pre-construction phase;
- In the assessment it is recommended to differentiate between the concepts of ‘effects’ and ‘impacts’.

Assessment of effects and impacts

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Assessment of effects and impacts

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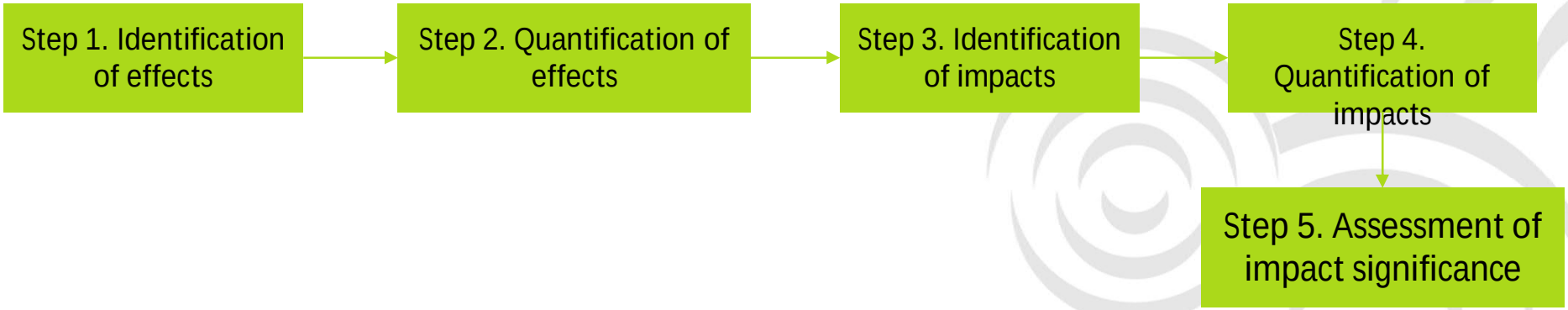
The assessment of effects and impacts can be done by following a series of steps



Identification of effects

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Requires the following:

1. Analysis of all the interventions proposed by the project;
2. Identification of all the activities resulting from the construction and the operation of the project;
3. Identification of all the changes (effects) which take place in the physical and socio-economic environment following the construction and operation of the project.

Identification of effects

Phase	Intervention code	Intervention	Main activities	Effects of the intervention
Construction	I.C.1	Ground clearing	Removal of vegetation, ground levelling	Reduction of vegetated area, disturbance of soil, soil surplus
Construction	I.C.2	Creation of access roads	Removal of vegetation, ground levelling, excavations, fillings	Elimination of vegetation, increased dust emissions, fragmentation of natural habitats
Construction	I.C.3	Construction works	Excavations, ground levelling, fillings	Occupation of land, elimination of vegetation, increase in dust emissions, increase in noise levels
Construction	I.C.4	Construction of bridges	Temporary working platforms, temporary river deviation, excavations, concrete levelling, drilling	Occupation of land, changes in riparian vegetation, increased turbidity in water, changes in hydrological conditions, increase in noise levels
Operation	I.O.1	Road traffic	Facilitation of the road traffic on the new infrastructure	Increase of mortality of fauna
Operation			Spread of invasive plant species	Changes in the natural vegetation in the area of the project (decrease of structural connectivity)

Quantification of effects

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The quantification of effects can be done through:

- Measurements of the project proposals;
- Assessment of the permeability of the proposed infrastructure (number and openness of structures);
- Numerical estimations and calculations for air emissions or other components where this is required;

Quantification of effects

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The quantification of effects can be done through:

- Modelling of projected changes, such as noise levels during the operation phase of the project;
- Other estimations based on the existing knowledge or outcomes of similar projects, such as number of individuals representing victims of collision with road traffic;

A specific indicator has to be established for each quantified effect.

Quantification of effects

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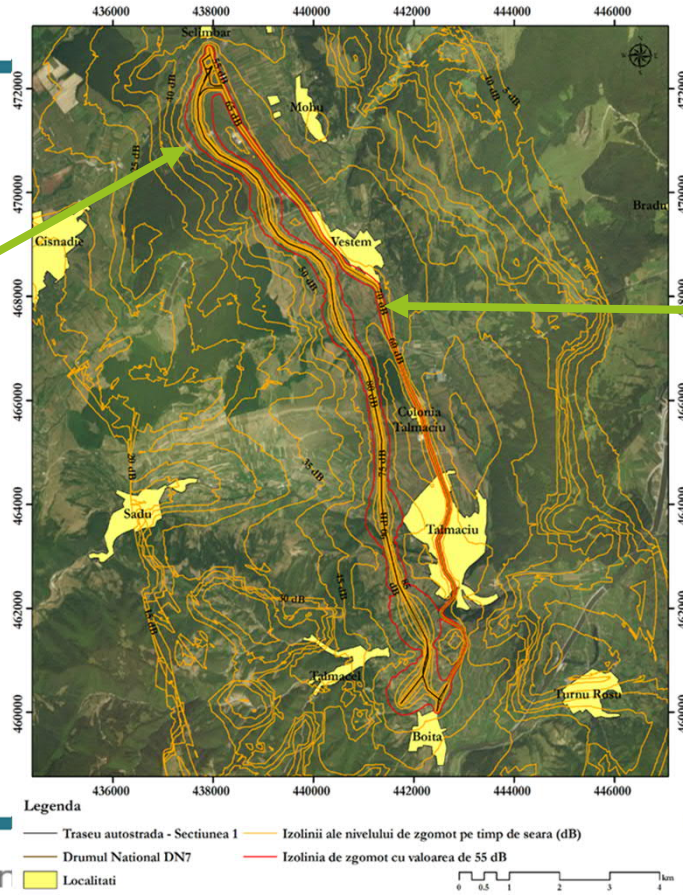
Sibiu - Piteşti motorway

National Road 7



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Quantification of effects

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Types of effects (examples)	Indices for calculation	Measurement units
Natural surface occupied	Calculations	km^2 or ha
Interruption of ecological corridors	Calculations	Number of corridors
Soil compaction	Calculations	m^2 or ha
Soil contamination	Numeric modelling	m^3
Removal of vegetation	Spatial analysis	m^2 or ha
Pollutant emissions	Calculations	mg/s
The concentration of atmospheric pollutants	Numeric modelling	mg/m^3
Noise level	Numeric modelling	dB(A)
Risk of landslides	Spatial analysis / Numeric modelling	ha
Collision of fauna with traffic	Calculations	Number of individuals
Changes in the river banks	Spatial analysis	m^2 or ha

Identification of impacts

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The identification of impacts:

- Has to be based on the previously identified effects;
- Should identify the likely changes at the level of the analysed environmental parameters, following the appearance of an effect;
- Should follow a cause -> effect -> impact relationship.

Identification of impacts

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For identifying impacts it is necessary to:

- List all of the proposed project interventions;
- List all of the associated effects;
- Identify all of the expected impacts on environmental components.

Identification of impacts (abiotic component)

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In the case of abiotic components, impacts can be related to:

- Requirements to fulfill certain targets
- Legislative thresholds for pollutant concentrations
- Targets established in the conservation objectives for the protection of habitats and species

Identification of impacts (abiotic component)

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In the case of abiotic components, impacts can be related to:

- Loss of financial resources or any other material assets;
- Threats to human health, well-being or cultural heritage;

Identification of impacts - example

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Type of intervention		Causes (Activities)	Environmental factors	Effects/Risks	Direct impacts
I.C.6	Bridges, viaducts, tunnels	Construction of bridges and viaducts	Surface water	Removal of riparian vegetation	Ecological status decline for water bodies
		Construction of bridges, viaducts and passages	Surface water	Hydro-morphological changes due to the construction of piles in the minor riverbed	Ecological status decline for water bodies
		Construction of bridges, viaducts and passages	Surface water	Partial temporal deviation of the watercourse	Ecological status decline for water bodies
		Construction of bridges, viaducts and passages	Soil	Soil compaction	Altering the soil's productive capacity
		Construction of bridges, viaducts and passages	Soil	Soil removal	Losing the soils' productive capacity
		Construction of bridges, viaducts and passages	Geology	Structural changes due to the construction of foundations	Alteration of the geological substrate
		Construction of bridges, viaducts and passages	Biodiversity	Removal of riparian vegetation	Habitat loss
		Construction of bridges, viaducts and passages	Biodiversity	Emergence of physical barriers for wildlife (only during construction)	Habitat fragmentation
		Construction of bridges, viaducts and passages	Human health	Increasing the noise level	Noise-generated discomfort
		Construction of bridges, viaducts and passages	Human health	Emission of air pollutants	Increasing the risk of diseases
		Construction of bridges, viaducts and passages	Human health	Vibrations	Impact on real estate
		Construction of bridges, viaducts and passages	Cultural heritage	Construction works inside archaeological sites	Affecting the cultural heritage
		Construction of bridges, viaducts and passages	Landscape	Creating massive artificial structures	Reducing the aesthetic value of the landscape

Identification of impacts (biotic component)

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Loss of wildlife habitat


Habitat fragmentation (the barrier effect)


Fauna traffic mortality


Disturbance and pollution


Creating new habitats on transport verges

Identification of impacts (biotic component)

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- The identification of impacts on biodiversity can be done with the same table presented previously;
- It is important to note that impacts might occur on protected areas (such as Natura 2000 sites) or on protected habitats and species outside Natura 2000 sites;
- In the case of protected habitats and species located outside Natura 2000 sites, the European Commission has a series of specific requirements.

Exercise. Identification of impacts

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Quantification of impacts

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- A quantification of impacts should be performed to the greatest extent possible for all of the environmental components analysed and for all of the project phases;
- For the abiotic component, quantifications should be based on:
  - spatial analysis (via GIS tools);
  - statistical analysis.

Quantification of impacts - habitat loss and alteration

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- Should be carried out with the use of a spatial (GIS) analysis;
- Habitat loss includes:
  - The areas where the project proposes permanent interventions;
  - Significantly altered habitat areas;
  - Areas of species displacement;

Quantification of impacts - habitat loss and alteration

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Intervention		Natura 2000 site	Habitat / favourable habitat affected	Surface lost (ha)	Surface altered (ha)
I.C.1	Developing construction site	ROSCI0297	9170	3.6	2.1
I.C.2	Construction of temporary access roads	ROSCI0297	91E0*	0.5	0.15
		ROSPA0028	*Alcedo atthis*	1.3	0.6
I.C.3	Relocation of utility networks	ROSCI0297	6430	0.4	0.1
I.C.4	Road relocation	ROSPA0028	*Ciconia ciconia*	0.5	0.2
I.C.5	Construction of motorway (earthworks)	ROSCI0297	6430	0.45	1.2
I.C.6	Bridges, viaducts, tunnels	ROSCI0297	91E0*	0.04	0.3
I.C.7	Consolidation works	ROSPA0028	*Alcedo atthis*	0.02	0.15
		ROSCI0297	91E0*	0.5	0.25
I.C.8	Hydro-technical works	ROSCI0297	91E0*	0.2	0.05
I.C.10	Restoration works	ROSCI0297	91E0*	0	0.4
...	...	...	...	...	...

Quantification of impacts - habitat fragmentation

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- The quantification of habitat fragmentation should take into consideration two main components:
  - Changes in ecological connectivity at landscape level;
  - Permeability of the proposed infrastructure.

Analysis of changes in ecological connectivity at landscape level

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- Should assess the changes in ecological connectivity at the level of the landscape;
- Should take into consideration impacts which occur at a distance, as well as existing pressures and possible threats;
- Should consider all the potential cumulative impacts at the level of the landscape.

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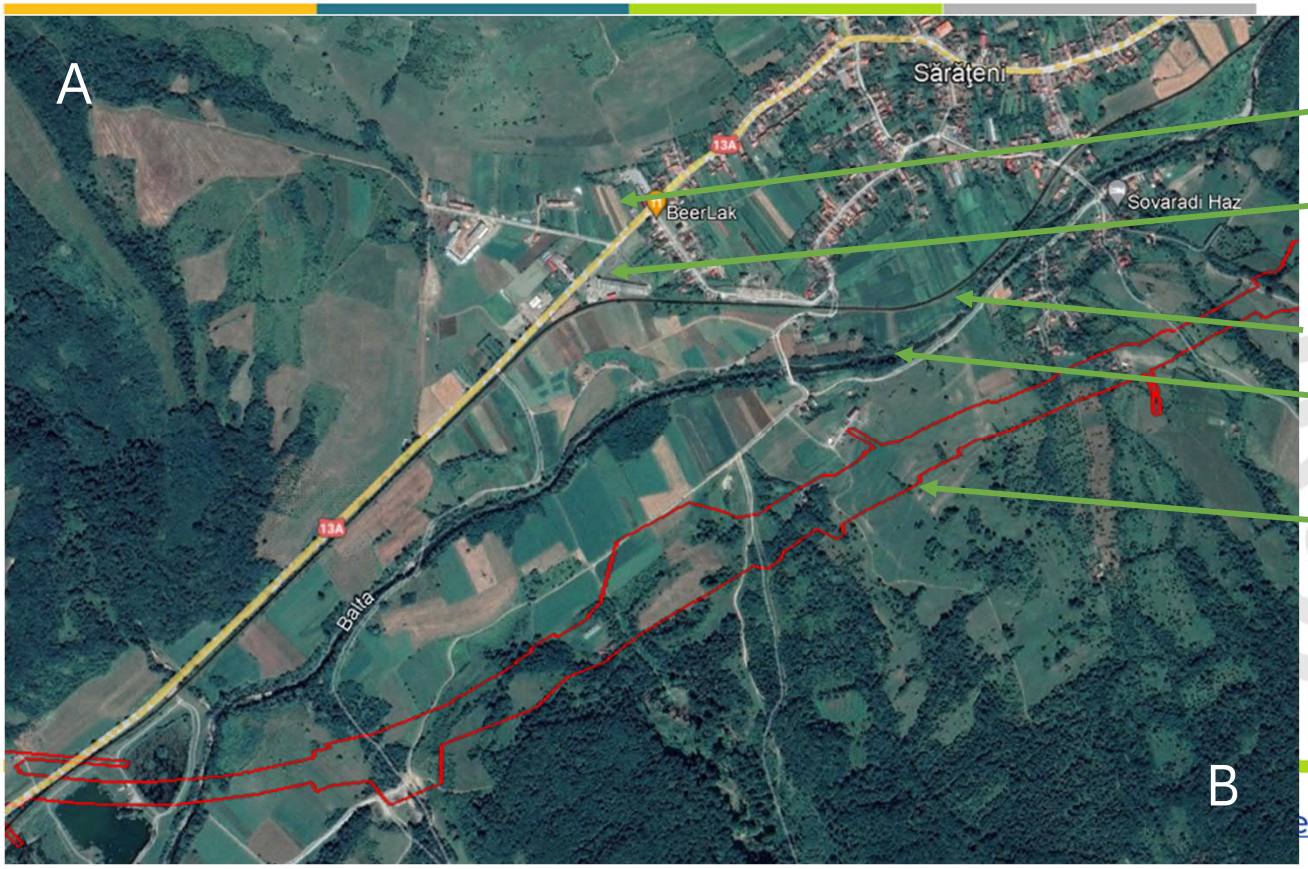
Analysis of changes in ecological connectivity at landscape level



Urbanisation

Railway

Railway

River

Proposed motorway

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5 Another example can be included, if necessary.
Silvia Borlea, 29/10/2022

Analysis of changes in ecological connectivity at landscape level

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For transport infrastructure (especially motorways), it is necessary to analyse the impact on connectivity from changes in the traffic level on the roads adjacent to the proposed infrastructure development.

This requires the existence of a traffic study, or at least of numerical estimations of the expected traffic on the motorway adjacent roads.

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Analysis of changes in ecological connectivity at landscape level

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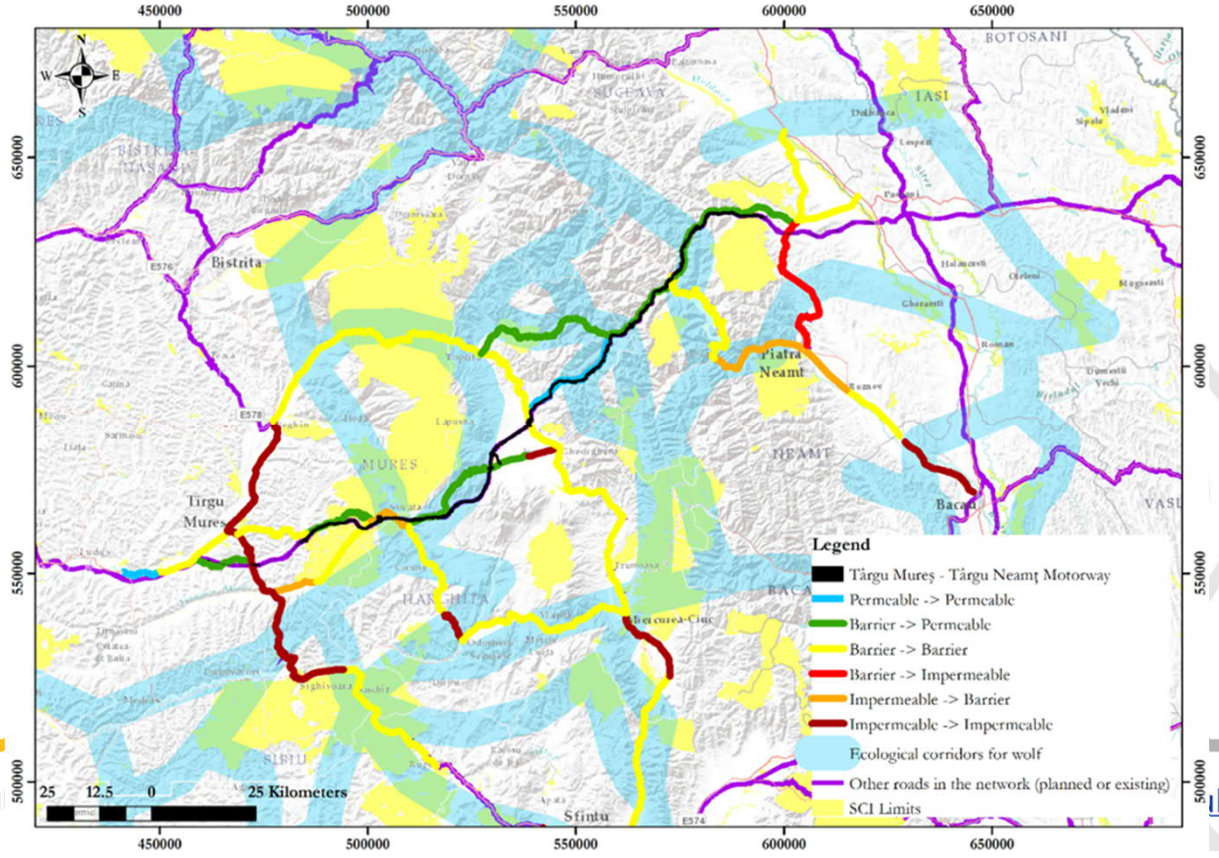

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Analysis of the permeability of the proposed infrastructure

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The analysis of the permeability of the proposed infrastructure can show how it will fit into the landscape from an ecological connectivity standpoint.

Two aspects should be considered:

1. Permeability of the proposed infrastructure;
2. Behavioural fragmentation.

Analysis of the permeability of the proposed structures (bridges, viaducts, etc)

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This analysis is aimed at showing if the structural connectivity requirements are fulfilled by the proposed infrastructure project.

It is based on two main parameters:

1. The size of the proposed structures and their Openness Index (OI)

   OI = width x height / length

Analysis of the permeability of the proposed structures (bridges, viaducts, etc)

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OI interval	Example of dimensions	Functionality for terrestrial mammals up to the size of fox and badger	Functionality for medium-sized mammals (roe deer, wild boar)	Functionality for large mammals (red deer, moose, large carnivores)
0.1 – 0.7	3 x 2 : 30	Minimal	NO/Blockage	NO/Blockage
0.7 – 1.5	10 x 3 : 30	Medium	Minimal	NO/Blockage
1.5 – 2.0	13 x 4 : 30	Good	Medium	Minimal
2.0 – 4.0	20 x 5 : 30	Very good	Medium	Minimal
4.0 – 8.0	30 x 6 : 30	Very good	Good	Medium
8.0 – 40.0	50 x 20 : 30	Very good	Very good	Good
Above 40.0	70 x 25 : 30	Very good	Very good	Very good

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2. The frequency (or density) of functional structures

The recommended frequency varies depending on the fauna groups and can range from 1 km in the case of small mammals, amphibians and reptiles to 5 km or more in the case of large mammals.

Analysis of the permeability of the proposed structures (bridges, viaducts, etc)

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Forest habitats

Animal category	Recommended average distance between functional passages
Mammals up to the size of fox and badger	1 - 2 km
Medium-sized mammals	2 - 5 km
Large mammals: in areas of permanent occurrence	3 – 5 km
Large mammals: outside of permanent occurrence areas	Only on migration corridors or in linkage areas (see Chapter 6.4)

Grasslands and shrubs

Animal category	Recommended average distance between passages
Mammals up to the size of fox and badger	1 - 2 km
Medium-sized mammals	3 - 8 km
Invertebrates and small mammals (the European ground squirrel)	3 – 5 km (adapted overpasses with steppic vegetation)
Large mammals	Only on migration corridors or in linkage areas (see Chapter 6.4)

Agricultural landscape

Animal category	Recommended average distance between passages
Mammals up to the size of fox and badger	1 - 2 km
Medium-sized mammals	5 - 10 km
Large mammals	Only on migration corridors or in linkage areas (see Chapter 6.4)

Analysis of the permeability of the proposed structures (bridges, viaducts, etc)

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In order for the proposed infrastructure to be considered permeable, it should fulfil the requirements for functionality and for distance to the next functional structure.

Based on the results of the analysis, proposals for additional underpasses, overpasses or ecoducts can be made.

Analysis of the permeability of the proposed structures (bridges, viaducts, etc)

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This is an example of a method for analysing the permeability of the infrastructure.

Area sensitivity	Natural protected area	Km of structure start	Km of structure end	Type of structure	Length (m)	Obstacles for movement	Number of openings	Other movement limitations (m)	Total movement limitations (m)	Length corrected for obstacles (m)	Average height (m)	Width (m)	OI	Functionality			Distance requirements					
														Large mammals	Medium mammals	Small mammals	Distance to the next functional structure (km)	Large mammals	Distance to the next functional structure (km)	Medium mammals	Distance to the next functional structure (km)	Small mammals
High		916	1+031	**Bridge**	115	Canal	3	60	66	49	3	26	6.28	Medium	Good	Very good	1.947	Yes	1.947	Yes	0.974	Yes
High		2+978	3+158	**Bridge**	180	River	5	48	60	120	5	26	24.31	Good	Very good	Very good	0.806	Yes	0.806	Yes	0.278	Yes
High		4+825	4+863	**Bridge**	38	Canal	1	23	23	15	2	26	0.88	No functionality	Minimal	Medium	2.117	Yes	0.141	Yes	0.141	Yes
High		5+004	5+034	**Bridge**	30	Canal	1	9	9	21	3	26	2.21	Minimal	Medium	Very good	1.946	Yes	1.946	Yes	1,964	No
High		6+980	7+088	**Bridge**	108	Canal	**3**	12	18	90	4	26	12.69	Good	Very good	Very good	5.412	Yes	2.447	Yes	0.157	Yes
High		9+535	9+590	**Bridge**	55	Creek	1	18	18	37	2	26	2.85	Minimal	Medium	Very good	2.91	Yes	1.412	Yes	0.285	Yes
High		**12+500**	**12+600**	**Ecoduct**	**100**		**1**	**0**	**0**	**100**	**0**	**26**	-	Very good	Very good	Very good	3.5	Yes	0.776	Yes	0.265	Yes
High		13+376	13+425	**Bridge**	49	Creek	1	15	15	34	3	26	3.31	Minimal	Medium	Very good	2.675	Yes	2.675	Yes	0.04	Yes
High		**16+100**	**16+200**	**Ecoduct**	**100**		**1**	**0**	**0**	**100**	-	-	-	Very good	Very good	Very good	4.361	Yes	2.157	Yes	0.08	Yes
High		18+357	18+406	**Bridge**	49	Creek	1	9	9	40	2	26	3.69	Minimal	Medium	Very good	2.155	Yes	2.155	Yes	0.424	Yes
High		**19+806**	**19+820**	**Mammal underpass**	**14**		**1**	**0**	**0**	**14**	**2**	**26**	**1.08**	No functionality	Minimal	Medium	6.362	Yes	0.741	Yes	0.741	Yes

Analysis of behavioural fragmentation

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- It is the second component of the analysis of infrastructure permeability;
- To analyse behavioural fragmentation an assessment related to the total time of the day during which the proposed project structure is impermeable for fauna should be carried out.

Analysis of behavioural fragmentation

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- In the case of roads, values of >10.000 vehicles / day are considered impermeable for most species.

Traffic density	Permeability
Road with traffic below 1000 vehicles/day	Permeable to most wildlife species
Roads with 1000 to 4000 vehicles/day	Permeable to some species but avoided by more sensitive species.
Roads with 4000 to 10000 vehicles/day	Strong barrier, noise and movement will repel many individuals. Many trying to cross the road become road casualties.
Motorways with traffic levels above 10000 vehicles/day	Impermeable to most species.

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Analysis of behavioural fragmentation

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- For railways, a different approach has been proposed.
- It uses a simple calculation for estimating the amount of time in a day when the infrastructure is not permeable for animals due to the presence of human activity (in this case running trains).
- Based on the existing literature related to behavioural fragmentation due to railroads, a significant impact (completely impermeable infrastructure for most terrestrial animals) occurs on multiple lane railroads with a traffic of more than 15 trains per hour.

Analysis of behavioural fragmentation

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Table 12 *Estimation of the percentage of time in which a railway can act as a barrier before a railway rehabilitation project (2023 scenario)*

2023									
Hourly interval		Number of hours / interval	Total no. of minutes per interval	Total no. of trains per interval	Barrier effect before train pass (minutes)	Barrier effect during train pass (minutes)	Barrier effect after train pass (minutes)	Total no. of barrier minutes	Percentage of time in which there is a barrier effect (%)
6:00	18:00	12.00	720	20	1	0.5	1	50	6,94
18:00	22:00	4.00	240	14	1	0.5	1	35	14,58
22:00	6:00	8.00	480	14	1	0.5	1	35	7,29

Table 13 *Estimation of the percentage of time in which a railway can act as a barrier after a railway rehabilitation project (2040 scenario)*

2040									
Hourly interval		Number of hours / interval	Total no. of minutes per interval	Total no. of trains per interval	Barrier effect before train pass (minutes)	Barrier effect during train pass (minutes)	Barrier effect after train pass (minutes)	Total no. of barrier minutes	Percentage of time in which there is a barrier effect (%)
6:00	18:00	12.00	720.00	25	1	0.5	1	8,7	8,7
18:00	22:00	4.00	240.00	40	1	0.5	1	41,7	41,7
22:00	6:00	8.00	480.00	60	1	0.5	1	31,3	31,3

Quantification of species disturbance

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Species disturbance can be caused by two main issues:

1. Species displacement - removal of species from certain areas due to increased disturbing effects;
2. Species mortality - death of individuals due to the proposed project interventions.

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Displacement

Displacement:

- Quantification should be done by modelling the effects with the potential to cause displacement
- The most likely effect that can lead to displacement is the increase of noise levels in the case of linear infrastructure projects, especially due to traffic.
- Increase in light pollution or human presence can also lead to a displacement of species.

Mortality

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- Can be considered a type of disturbance to a species due its potential impact on the entire species population;
- To quantify species mortality in the case of linear infrastructure projects, it is particularly important to analyse the risk for roadkill or railkill during operation, as this is the situation in which this type of impact is most likely to occur.
- There are multiple ways to quantify potential mortality of species.

Mortality - literature data

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Quantification based on literature data:

- Risk of mortality for an individual of a given species can be estimated based on roadkill / railkill rates recorded in the literature on the subject;
- The scientific literature indicates average values for roadkill risk associated with different species;
- These values can be used with a risk area defined for the analysed project.

Mortality - literature data

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Category	Species	Average roadkill rate (number of individuals / km / year)	Length of species habitat crossed by road (km)	Estimated mortality of individuals (number of individuals per year)
Birds	*Strix aluco*	2.32	45	104.40
...	...	...	...	...

Mortality - Field data

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Quantification based on field data:

- This methodology is preferable to the one based on existing literature in situations when there is time for monitoring and when the funds are sufficient to allow for detailed field data collection.
- It can work in situations where infrastructure already exists and the project proposes an upgrade.

Mortality - Field data

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The methodology involves the following steps:

- Collection of fieldwork data;
- Estimation of collision risk with the help of specific calculations.

Mortality - Field data

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Group	Species	Species' active period (no. months)	Individuals / minute	Yearly no. of crossings of the risk area*	Probability of collision	Deadly area (m)	Collison rate	Potential yearly no. of victims (with avoidance rate)	Avoidance rate
Invertebrates	*Lycaena dispar*	5	0,0002	45	0,0006	3	0,02	0,37	70%
	Coenagrion ornatum	3	0,006	810	0,0006	3	0,39	96,53	
	Cerambyx cerdo	5	0,0002	45	0,0006	3	0,02	0,37	
Amphibians	*Bombina bombina*	6	0,0015	388,8	0,0008	0,2	0,27	32,28	70%
	Hyla orientalis	6	0,0005	129,6	0,0008	0,2	0,10	3,98	
	Pelophylax esculentus	6	0,002	518,4	0,0008	0,2	0,35	54,5	
Reptiles	*Lacerta viridis*	6	0,001	259,2	1,3E-05	0,2	0,003	0,27	
	Natrix tessellata	6	0,0015	388,8	0,0001	0,2	0,05	6,13	
	Emys orbicularis	6	0,0005	129,6	0,0008	0,2	0,10	3,98	
Birds	*Alcedo atthis*	7	0,0005	173,7	9,3E-05	3	0,01	0,14	95%
	Circus aeruginosus	9	0,0001	74,4	8,6E-05	3	0,006	0,02	
	Nycticorax nycticorax	9	0,0001	74,4	8,7E-05	3	0,006	0,02	
Mammals	*Sus scrofa*	12	0,0003	376,3	0,0002	3	0,08	6,75	80%
	Canis aureus	12	0,0001	124,3	0,0002	3	0,03	0,76	
	Pipistrellus nathusii	9			0,0001	3	0,24	21,8	

* Risk area = 5 m height x width of railway

Number of months when the species is active

Number of individual crossings / minute (calculated as number of crossings divided by the total observation time in minutes)

Calculated as number of crossings X total number of days of species activity

Calculated based on the train density X animal movement velocity / deadly area. It shows the probability of collision for an individual in the defined deadly area.

Area where animals can die on the railway (either by being crushed by wheels or hit by the railway car)

Calculated as: 1-(1-probability of collision)^yearly no. of crossings in the risk area

Calculated as collision rate X yearly no. of crossings X avoidance rate

Avoidance rate taken from literature data

Exercise. Assessment of long distance and long term cumulative impacts

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Example on how to analyse the long term and at-distance impacts:

- *Literature based findings (recent articles)*
- *Example from the Târgu Mureş - Târgu Neamţ PA*
- *Exercise with participants - identification of at-distance impacts based on traffic changes in the future + proposal of a new railway line parallel to the motorway*

Assessment of impact significance

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The assessment of impact significance should take two main criteria into consideration:

- The sensitivity of the area and the environmental components under analysis;
- The magnitude of the proposed project interventions.

Sensitivity

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	Surface water
Very high	• Protected areas for water intakes • Natural water bodies with good ecological and chemical status • Highly modified water bodies with good ecological potential and good chemical status
High	• Natural water bodies with moderate ecological status and good chemical status • Natural water bodies with good ecological status and without good chemical status • Highly modified water bodies with very good ecological potential and without good chemical status • Highly modified water bodies with moderate ecological potential and good chemical status
Moderate	• Natural water bodies with moderate ecological status and without good chemical status • Natural water bodies with poor ecological status and with good chemical status • Highly modified water bodies with moderate ecological potential and without good chemical status • Highly modified water bodies with poor ecological potential and good chemical status • Permanent water courses that are not defined as water bodies
Low	• Natural water bodies with poor ecological status and without good chemical status • Natural water bodies with bad ecological status and with good chemical status • Highly modified water bodies with poor ecological potential and without good chemical status • Highly modified water bodies with bad ecological potential and good chemical status • Irrigation channels
Very low	• Natural water bodies with poor ecological status and without good chemical status • Highly modified water bodies with bad ecological potential and without good chemical status • Non-permanent water courses

Magnitude

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		Surface water
Negative	**Very high**	Modifications that directly contribute to preventing the improvement of the chemical status and/ or changes to other quality criteria of the water body leading to deteriorations of the status of the water body (area/ length of changes ≥ 25% of the area/ length of the water body)
	High	Changes in quality criteria over a length/ area between 15-25% of the length/ area of the water body
	Moderate	Changes in quality criteria over a length/ area between 5-15% of the length/ area of the water body
	Low	Changes in quality criteria over a length/ area between 2-5% of the length/ area of the water body
	Very low	Changes in quality criteria over a length/ area < 2% of the length/ area of the water body
No change		There are no sources of water contamination or their contribution is indeterminable
Positive	**Very low**	Modifications that improve water body quality criteria over a length/ area <2% of water body length/ area
	Low	Modifications that improve quality criteria over a length/ area between 2-5% of the length/ area of the water body
	Moderate	Modifications that improve quality criteria over a length/ area between 5-15% of the length/ area of the water body
	High	Modifications that improve quality criteria over a length/ area between 15-25 % of the length/ area of the water body
	Very high	Actions leading to the improvement of the chemical status and/ or ecological potential status of the water body Modifications that improve the status of one or more quality criteria over a length or area ≥ 25% of the length/ area of the water body

Assessment of impact significance

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The levels of significance which can be used are:

- Significant impact (negative / positive);
- Non-significant impact (negative or positive);
- No impact (where it is estimated that there will be no changes regarding the environmental component.

Assessment of impact significance

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Significance of impacts		Magnitude of changes										
		Negative very high	Negative high	Negative moderate	Negative low	Negative very low	No change	Positive very low	Positive low	Positive moderate	Positive high	Positive very high
Receptor sensitivity	Very high	Significant negative	Significant negative	Significant negative	Significant negative	Non-significant negative	No impact	Non-significant positive	Significant positive	Significant positive	Significant positive	Significant positive
	High	Significant negative	Significant negative	Significant negative	Non-significant negative	Non-significant negative	No impact	Non-significant positive	Non-significant positive	Significant positive	Significant positive	Significant positive
	Moderate	Significant negative	Non-significant negative	Non-significant negative	Non-significant negative	Non-significant negative	No impact	Non-significant positive	Non-significant positive	Non-significant positive	Non-significant positive	Significant positive
	Low	Non-significant negative	Non-significant negative	Non-significant negative	Non-significant negative	Non-significant negative	No impact	Non-significant positive	Non-significant positive	Non-significant positive	Non-significant positive	Non-significant positive
	Very low	Non-significant negative	Non-significant negative	Non-significant negative	Non-significant negative	Non-significant negative	No impact	Non-significant positive	Non-significant positive	Non-significant positive	Non-significant positive	Non-significant positive

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Appropriate Assessment

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- If a project is likely to have a significant impact on Natura 2000 sites, it is required to undergo an Appropriate assessment (AA).
- The AA is a separate study, but its conclusions should be included in the EIA done for the project.
- This requirement comes as a provision of the Habitats Directive.

Appropriate Assessment

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„(3) Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4 , the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and , if appropriate, after having obtained the opinion of the general public.

(4) If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature , the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.".

European Commission, Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Appropriate Assessment

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This Appropriate assessment process has three main stages, according to European Commission guidelines:

1. Screening stage
2. Appropriate assessment;
3. Derogation from art. 6 paragraph (3), in certain conditions.

Each stage of the procedure is influenced by the previous stage. The order in which these stages are followed is essential for the correct application of art. 6, paragraphs (3) and (4) of the Habitats Directive

Screening stage

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- The importance of the screening stage is in the identification of potentially significant impacts;
- One of the most important steps in this stage to establish whether any Natura 2000 sites are potentially affected by the analysed project
- The identification of potentially affected sites should be done following a series of steps:

Screening stage

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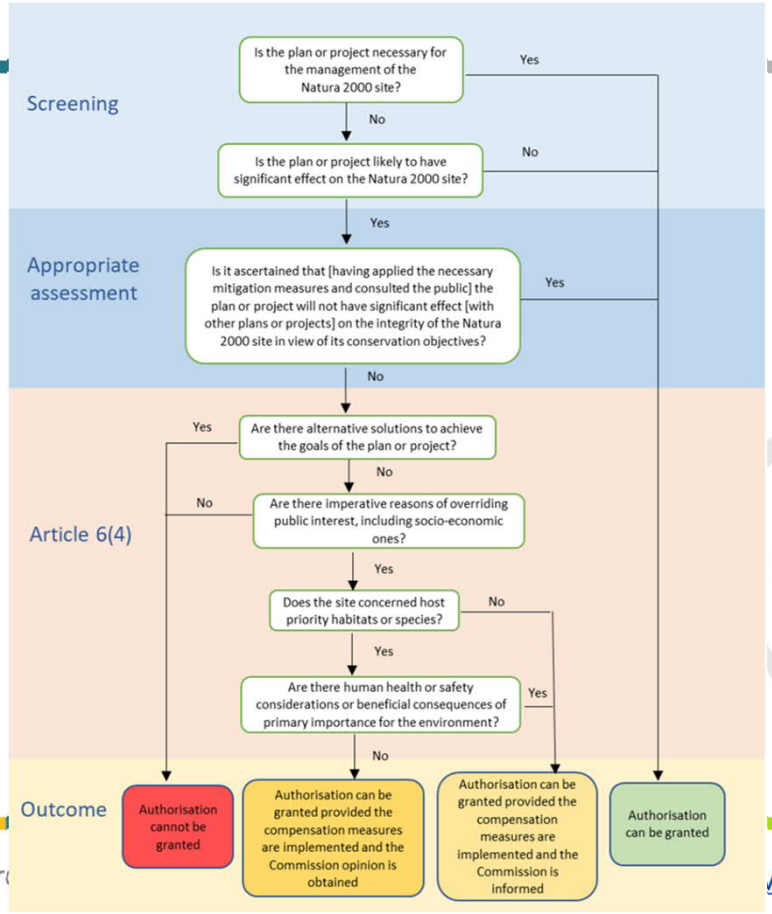
- Identification of Natura 2000 sites intersected by the project.
- Identification of Natura 2000 sites in the project's zone of influence;
- Identification of Natura 2000 sites hosting fauna species that can move to the project area and that can be affected outside of the site limits;
- Identification of Natura 2000 sites whose connectivity or ecological continuity can be affected.

Appropriate Assessment



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Assessment of significance of impacts in Natura 2000 sites

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- For Natura 2000 sites, an impact can be considered significant if it affects the integrity of the sites.
- According to the EC, the integrity of a site "is considered as a quality or condition of being whole or complete. (…) The integrity of the site can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated"

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Assessment of significance of impacts in Natura 2000 sites

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- The integrity of a site is directly related to the site's conservation objectives, its key natural features and the ecological structure and functions they create.
- If the conservation objectives are not considered to be significantly affected (undermined, or prevented from being achieved) by the plan or project, the integrity of the site is also not considered to be affected.

Site-specific conservation objectives

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- The site-specific conservation objectives are the most important component in the assessment of impacts of a plan or project on a Natura 2000 site.
- The SSCO have to be established by the Natura 2000 management authorities.
- Conservation objectives are set for each habitat type and species and are related to their conservation status in that particular Natura 2000 site.

Site-specific conservation objectives

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9130 Asperulo – Fagetum beech forest

The surface of this habitat in ROSCI0122 is 6311 ha and its conservation status is **favorable** (conservation status from the point of view of surface favorable, structure and function favorable, perspectives favorable). The site-specific conservation objective for this habitat is to **maintain its favorable conservation status**, as defined by the following parameters and target values:

Parameter	Unit of measurement	Target value	Additional information
Surface area / size of the habitat	ha	At least 6.311	These central european beech habitats, without regional Carpathian endemic species, often distributed as a mosaic in the landscape, were identified on the Northern slope of the Făgăraș, where they extend on the valley slopes until an altitude of around 1000 meters, from which they are replaced (gradually, the limit is never clear) by the acidophilic and alkaliphilic varieties of habitat 91V0. Habitats 9110 and 9130 are more rare on the Western, Eastern and Southern slopes of the site ROSCI0122, where beech forests are associated more with habitats 91V0 and 91K0 (Baseline study on forest habitats). The surface occupied by the forests included in this habitat in the Northern part of the site is considerable and very close to the maximum potential for this type of habitat.
Characteristic tree species	Percent cover / 1000 m2	At least 70%	*Fagus sylvatica , Carpinus betulus, Quercus petraea, Acer pseudoplatanus, Cerasus avium , Sorbus torminalis, Ulmus glabra, U. minor, Tilia cordata*
Characteristic species for herb layer	Number of species / 1000 m2	At least 3	During monitoring of the habitat 9130 the presence and population of the following taxons, typical for these beech forests, will be analysed: *Lamium maculatum, L. galeobdolon, Melica uniflora, Galium odoratum, G. schultesii, Dentaria bulbifera, Anemone nemorosa.*
Invasive and allochtonous tree species, including not corresponding ecotypes	Percent cover / 1000 m2	Less than 20%	The problem of invasive species is less relevant in the case of this habitat type, as it is very stable from the structural and functional point of view, according to baseline study. Artificial introduction of *Picea abies* should be avoided.
Deadwood volume	m3 / ha	At least 20 Current value should be evaluated in a 3-5 year period and target value reviewed accordingly	Baseline value not known. Should be evaluated within earliest possible period. Current level for this forest habitat type is not known and should be evaluated in a pilot study within a year in the site ROSCI0304 Hârtibaciu Sud-Vest and ROSCI0132 Oltul Mijlociu-Cibin-Hârtibaciu. Depending on funding availability a comprehensive evaluation of deadwood at the national level would be planned in 3-5 years.

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Site-specific conservation objectives

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- When assessing potential impacts on SSCO, it is important to consider other landscape level issues as well, such as the existence of other infrastructure elements, other pressures or potential threats.
- Some parameters also have the potential to be influenced by other stakeholders;
- The Appropriate Assessment should be based on the precautionary principle.

Site-specific conservation objectives

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- In the case of Romania, it has been observed that the specific conservation objectives established for Natura 2000 sites do not take ecological connectivity into consideration as a parameter;
- However, in the Appropriate Assessment, Article 10 of the Habitats Directive has to be taken into account and cohesion of the Natura 2000 network has to be secured.

Site-specific conservation objectives

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- The assessment of impact significance in the context of biodiversity can be achieved with the use of a table;
- This allows for the case-by-case analysis for each parameter established, a specific requirement of the European Commission.

Step by step approach to analysing the impact on the Natura 2000 SSCO

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Natura 2000 site	**Natura 2000 component**	**Natura 2000 code**	**Habitats / species**	**Type of presence**	**Location relative to the project**	**Directive Annex**	**Source of spatial data**	**Source of information**	**Conservation status**	**Conservation objectives**	**Parameter**	**Measuring unit for parameter**	**Current (minimum)**	**Current (maximum)**	**Target value**
ROSPA0001	Birds	A229	*Alcedo atthis*	R	The project is located at a distance of approximately 1.6 km from the species habitat. The species was sighted at a distance of approximately 500 m from the project.	Annex I	Field observations, distribution maps	Management Plan, Specific conservation objectives	Favourable	Maintain the favourable conservation status	Population size	Number of individuals	14	16	15
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Code and name of the site	*Category of biodiversity component*	*Code of habitat / species*	*Name of analysed habitat / species*	*Type of presence of species*	*Description of the location of the habitat / species habitat in relation to the project (is intersected / is not intersected). Distances to the closest habitat area from the project should be measured.*	*Annex in which the habitat / species is listed*	*Sources for the spatial data used for the assessment*	*Sources for the information regarding the habitat / species in the site*	*Conservation status of the habitat or species in the site*	*Conservation objective for the habitat or species in the site*	*List of parameters established for the habitat or species*	*Measuring units for each parameter established for the habitat or species*	*Current value for the parameter (minimum value)*	*Current value for the parameter (maximum value)*	*Target value established for each parameter*

Table 21 Example of a matrix which can be used for assessment of impacts on the specific conservation objectives of habitats and species (second half)

17	18	19	20	21	22	23
Likely to be affected by the project?	**Reasoning behind attributed likelihood to be affected**	**Quantification of impacts (units of measure)**	**Potential impact (without measures)**	**Reasoning behind estimated impact**	**Proposed measures**	**Residual impact**
Yes	While the project will not intersect the favourable habitat of the species, individuals have been sighted at a small distance from the project area. There is therefore a risk for mortality during the operation phase of the project, due to collision with road traffic.	Maximum 6 individuals per year	Significant	The level of impact is high, considering the size of the species population in the site. While the species has a favourable conservation status in the site, the estimated level of mortality is high enough to endanger the population in the site and contribute to its significant decline within the space of a few years once the project becomes operational.	M20 (anticollision panels), M21 (additional warning panels)	Non-significant
...	...	...	...	...	...	...
Conclusion on whether the parameter can be affected by the project. Should be completed with a „Yes" or „No" answer. The assessment should be done on a case-by-case basis, considering the project effects on each parameter.	*Supportive arguments for the conclusion presented in column 17. The arguments should be clear, based on verifiable evidence and, if possible, should provide numeric evidence (e.g. for the distance to a certain habitat patch).*	*Clear value of the quantified impact on each parameter considered to be affected by the project.*	*Conclusion on whether the parameter is affected in a „Significant" or „Non-significant" manner by the project.*	*Supportive arguments for the conclusion presented in column 20. The estimated impact should be assessed without the proposed impact avoidance or mitigation measures. The arguments in this column should present clear and concise explanations for the conclusion regarding impact significance, based on the characteristics of the species population in the analysed site and bioregion.*	*List of measures proposed for avoiding or mitigating the assessed impacts.*	*Conclusion on whether the residual impact (after the implementation of the measures) is „Significant" or „Non-significant".*

Step by step approach for AA

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- Each type of identified impact can act on one or multiple conservation parameters, as established for each habitat and species;
- The assessment has to be done on a case by case basis, taking into consideration all the different types of impact that can affect a parameter;

Locating habitats and species

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- Locating the habitats and species in relation to the project location is an important step in the analysis of impact.;
- The analysis details the location in which the habitat, species or the species favourable habitat was reported within the Natura 2000 site, in relation to the projects' components;
- The data to be used in this analysis can be publicly available data from the EEA, other databases, etc.

Identification and assessment of impacts

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- The identification and assessment of the impact on Natura 2000 sites, taking into consideration SSCO, must consider all project components and stages;
- The identification and assessment of impacts should include:
  1. Analysis of the objectives, parameters and targets set for each habitat and species;

Identification and assessment of impacts

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2. Case by case analysis for each site and habitat/species;

3. Justifying how each SSCO parameter could be affected;

4. Estimating/quantifying the impact;

5. Assessing impact significance, without considering the impact avoidance and reduction measures;

6. Proposing measures designed to avoid/reduce impacts.

Assessment of impact significance

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- The assessment of impact significance is one of the most important components in the impact assessment process.
- The impact must be described as either significant and non-significant.

Assessment of impact significance

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Establishing the degree of significance can be based on the following parameters:

1. Quantitative - percentage of target value that is affected;
2. Qualitative
3. Ecological functions
4. Parameters of the types of impact (permanent, local, etc.)

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Assessment of impact in a transboundary context

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- The assessment of impacts in a transboundary context should also focus on the identification of significant impacts according the Espoo Convention;
- It should focus on determining whether there is a chance for significant impacts on environmental components (including Natura 2000 sites) in another country.
- The assessment should also take into consideration transnational movement of fauna.

Tools for designing prevention, avoidance, mitigation and / or compensation measures

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- The identification of a significant impact implies the need to propose avoidance, mitigation and / or compensation measures;
- The proposed measures must be specific and applicable to the significant impacts identified;
- For establishing the appropriate measures, a series of steps should be followed:

Tools for designing prevention, avoidance, mitigation and / or compensation measures

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1. Identification of prevention measures. These have the role of preventing the occurrence of an impact, by eliminating the cause of its occurrence.
2. Identification of avoidance measures.These measures do not prevent the occurrence of an impact, but they avoid a significant level of the impact.

3. Identification of mitigation measures. To be implemented if neither prevention nor avoidance measures are applicable.

4. Identification of compensatory measures. If, after the application of the previously mentioned measures, the level of impact cannot be reduced to a non-significant level

Tools for designing prevention, avoidance, mitigation and / or compensation measures

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The measures proposed have to be formulated using a SMART methodology. They have to be Specific, Measurable, Achievable, Realistic and Time-bound, addressing the parameters considered to be affected by the analysed project.

Measure	Habitats	Plants	Inverte-brates	Ichtyo-fauna	Herpeto-fauna	Birds	Bats	Other mammals	Recommendations
M1. Installation of anti-collision panels	N/A	N/A	+	N/A	-	+	+	-	Implementation of the measure can lead to habitat fragmentation. It is necessary to provide gateways for allowing fauna to traverse the linear infrastructure.
...	...	...	...	...	...	...	...	...	...

Introduction to the Handbook of best practices

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- *Scope & objectives of the deliverable*
- *Outline of the structure*

Necessity for landscape level connectivity

Examples of good practices for maintaining connectivity from different domains (literature-based)

Case studies (?) - requires input from PP

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Introduction to the Cross-sectoral Operational Plans

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- *Scope & objectives of the deliverable*
- *Outline of the structure*
- *Common elements of the CSOPs developed in SaveGREEN*
- *Why it is important to ensure integration of connectivity in different landscape elements*
- *What does it mean for the different authorities to implement a CSOP (from local to national level)*

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Exercise. Travelling through a landscape

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Example species 1 - Roe deer

Needs to go from point A to point B

What does it meet on the way?

The exercise:

- should be done in Google Earth

- should include examples from different countries (will require PP input)

- should include multiple species of different types: a herbivore, a large mammal, fish, birds, etc.

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Tools for monitoring

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- Monitoring has to be carried out to ensure the effectiveness of the proposed measures, as well as for assessing the residual impacts;
- Monitoring should cover all the biodiversity components, as well as the parameters for which measures have been proposed;

Tools for monitoring

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The monitoring activities should cover three stages:

1. Before construction (data of the baseline conditions);
2. During construction;
3. After construction.

Affected component	Form of impact	Indicator	Measuring unit	Monitoring frequency	Thresholds / Targets	Monitoring locations	Other observations
Birds	Species disturbance	Equivalent noise level during daytime	dB(A)	Monthly	48	Km 256+500	Long-distance measurements in at least 3 locations
(...)	(...)	(...)	(...)	(...)	(...)	(...)	(...)

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