TRANSGREEN. Integrated Transport and Green Infrastructure Planning in the Danube-Carpathian Region for the Benefit of People and Nature

January 2017 – June 2019

The phases of linear transport infrastructure planning and recommended implementation of environmental measures

Project co-funded by the European Regional Development Fund (ERDF).

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Planning and preparation of transport infrastructure = long term process
Intentions are step by step specified from transport policies and
delimiting main transport corridors through route selection evaluation of
variants to final detailed project of implementation.

Phases not strictly separated: continuous process with progressive
specification
Specific processes in individual phases of preparation: each concept has to go through these processes in order to get to the next phase.

Processes given by international legislation and performed as mandatory in all Carpathian countries → two directives of the European Union regarding assessment of impacts on the environment:

- Strategic Environmental Assessment (SEA Directive 2001/42/EC)
- Environmental Impacts Assessment (EIA Directive 2014/52/EU)

+ evaluate the impacts of concepts on Natura 2000 network, etc.
European directives relating to SEA and EIA: **assessment of impacts on the entire environmental area**

According to article 3 of the directive: EIA shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- (a) population and human health;
- (b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- (c) land, soil, water, air and climate;
- (d) material assets, cultural heritage and the landscape;
- (e) the interaction between the factors referred to in points (a) to (d)
Aim: describe different tools that should lead to protection of biodiversity, especially the ones to avoid fragmentation of habitats as a result of building linear transport infrastructure

→ assert requirements on wildlife protection in all phases of the long process

Individual phases and corresponding processes with nine specific tools (T1 – T9):
apply ecological requirements

- Recommended for individual preparation phases and related processes, so that requirements to minimize fragmentation of the environment are applied in a complex way in the entire process of preparing the construction

- The time frame of using these tools can be in each country slightly different. However, it is very important that all of them are implemented, because they include the entire process in its complexity, from transport concepts all the way to getting feedback

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Transport policy: delimiting transport corridors

- **Phase characteristics**
  - **National transport policy**: basic document that predestines the development of transportation for the long-term perspective; based on socio-economic needs and determines the representation of individual transport modes, proposals for building new roads and their categories.

- **Main transport corridors**: delimited based on the transport policy. Transport corridors are initial resources for incorporating a transport intention into spatial planning, especially at national and regional levels.

- **Transport corridor** = linear structure between the beginning and the end of a planned intention. After the transport corridor is approved, variants for final route selection are searched in this area. Placing transport corridors into spatial plans is a basic step to check the intention with respect to protection of fauna and landscape connectivity. Strategic Environmental Assessment (SEA) is the evaluation process. Strategic Migration Study is recommended to be an obligatory part of SEA.
- Mutual interaction between spatial planning and road preparation does not end at the “strategic” level, it will be repeated in the next phase while selecting the final variant.

- Biological survey (focused on impacts of proposed infrastructure on fauna, flora and ecosystems) recommended

Beginning the biological survey in form of screening the whole area of the transport corridor prolongs the time of data acquisition and allows subsequential survey of individual variants in better quality.
Data on protected areas according to both European and national legislation (Natura 2000, national parks, natural reserves, etc.) are commonly available, but a complex elaboration regarding the entire ecological network and securing its cohesion, mutual interconnection of protected areas in the landscape and delimiting of long-distance migration corridors and linkage areas for some species of large mammals are often missing. Network of core areas and migration corridors of large mammals are currently under preparation as part of ConnectGREEN project and it will be available for the entire Carpathian region.
Tools

Tool: SMS - Strategic migration study (T1)

A. Goal
To prepare a resource material for the analysis of problems between planned transport corridors/constructions (grey infrastructure) and natural areas (protected areas, Natura 2000 sites, core areas of target species) and long distance migration corridors of some species (green infrastructure).

B. Placement in the process
A phase of transport policies, studies for selection of transport corridors. SMS is recommended to be obligatory part of Strategic Environmental Assessment (SEA).

C. Initial resource materials
Natura 2000 network, national register of protected areas, migration corridors of large mammals, surveys themselves, etc.

D. Principles
• Migration corridors for large mammals have to connect places of permanent occurrence continually without an interruption and they need to have a long-term sustainability
• SMS is worked out in cooperation of a zoologist and a designer of the technical part or of the spatial plan and with the author of SEA documentation
• Preparing a categorization of the area of interest with respect to migration of wildlife
• Checking in advance for places where migration barriers could potentially emerge

E. Note
SMS is a part of the SEA and is focused on the issue of permeability of landscape for animals.
A. Goal

• To find out real occurrence, population state and migration routes of target species, distribution of selected habitats and to work out an overall background material for selecting the final alignment, for proposals of mitigation measures and for proposal of follow-up monitoring. The whole survey should be done in a complex ecosystem approach (besides fauna also flora and ecosystems are assessed).

B. Placement in the process

Considering the variability of natural conditions it is necessary to carry out the survey in a longer time period (minimum of 1 year, optimum 3-5 years). Recommended incorporation into the process (subsequentialy following phases with permanently increasing specification of results):

a) phase of transport corridors' assessment – screening survey of the entire corridor
b) phase of route selection – basic survey of all proposed variants (part of EIA)
c) phase of preparing planning decision – detailed survey of localities in the final alignment

Biological survey is followed by monitoring focused purposefully on observing the impacts of transportation on biota. Biological survey is acquired by the investor.

C. Initial resource materials

Distribution maps of habitats, results from previous surveys, research from literature, databases of occurrence data of target species.

D. Principles

• Survey has to be directed at all defined target groups of animals (11 groups) and selected habitats (7 basic types, Chapter 6).
• Biological survey has a multidisciplinary character and individual taxonomic groups must be elaborated by corresponding experts.
• Survey of habitat distribution – distribution map of target habitats should be updated. If there is a good reason, more detailed classification and division of habitats into lower units (for example categorization of forest habitat) should be carried out. In case habitat is substantially heterogeneous with regard to preservation and natural quality, it should be categorized and its most valuable parts should be delimited. Results need to be compiled in form of map resources.
• Specifying the list of representative species – based on research from literature and analysis of habitats.
• Specifying distribution areas of representative species and their main migration routes, delimiting migration corridors at local level.
• Specialized surveys of occurrence and migration of endangered groups (for example amphibians, reptiles).
• Where purposeful for selected species, carry out an assessment at population level (population size, trends in natality and mortality, links to surrounding populations – source and sink populations).
• Background information for proposal of follow-up monitoring is one of resulting outputs.

E. Note

Biological survey at the EIA level always contains botanical survey as well. This is not further described here given the focus of the guidelines.
Route selection

Phase characteristics

Key phase: determines final impacts of a road/railway on fauna and landscape connectivity. The decision about final route should always be based on evaluations of more variants of solution.

Evaluation of variants: part of the EIA assessment, while in other countries the process of EIA is carried out for already selected variant.

EIA deals with the environment in a complex way and therefore is devoted to a wide spectrum of natural elements (human population, air, water, soil, rock environment, flora, fauna, ecosystems, landscape, archeological localities, cultural monuments, etc.) \(\rightarrow\) makes compromises between impacts on these individual elements of the environment. Requirements on minimizing fragmentation must always be applied in the phase of route selection and must be taken into account during the selection.

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• **Framework migration study** (FMS): recommended tool used to put into effect requirements to limit fragmentation in the phase of route selection. Designed in analogy to other components of the environment (acoustic study, dispersion study, study of impacts on human health, etc.) = complex material that summarizes given issue from initial analysis of starting state all the way to proposal of measures. FMS is based on intensive field survey.

• **Monitoring program** is an important tool that is recommended to be prepared within the process of EIA. Monitoring program has to be part of EIA documentation and of final statement. In practice however, this resource material is often missing or is worked out insufficiently


Tool: FMS - Framework migration study (T3)

A. Goal

The goal of a FMS is to prepare a complex material on the issue of protecting fauna and landscape connectivity for the process of EIA. It should assess overall permeability and acceptability of proposed variants and set basic placement and types of fauna passages and other protective measures.

B. Placement in the process

The study is carried out at the level of EIA process. It is acquired by an investor.

C. Initial resource materials

FMS integrates technical, biological and spatial resource materials. To the basic ones belong: technical documentation used in EIA phase, map of green infrastructure, strategic migration study, biological survey, local and regional plans, map resources regarding individual habitats, results from field surveys, statements of state authorities to SEA process or other relevant proceedings.

D. Principles

- Based on all available data (occurrence of target species, identified animal movement/migration corridors, existing spatial plans, etc.) and field surveys, FMS works out a detailed local map containing data on animal movements: known migration corridors, landscape elements supporting migration (forests, watercourses, etc.) and elements threatening migration (settlements, transport and industrial infrastructure, planned construction, etc.). This map then becomes a background material for evaluating individual variants and for determining all places that have to be solved with respect to permeability.
- FMS assesses all proposed variants with respect to impacts on fauna and landscape connectivity, including measures necessary to be implemented in order to ensure permeability. It determines basic placement and type of fauna passages, fencing and other measures (selection of places of fauna passages is described in more detail in Chapter 10).
- FMS carries out selection from proposed variants with respect to protection of fauna and landscape connectivity in two steps:
  a) It determines variants that are completely unacceptable even in case of implementing certain measures. This is an essential step from the viewpoint of the EIA process, because there are usually preferences for different variants as the most suitable ones for various components of the environment. Any variant marked as completely unacceptable from the standpoint of just one component of the environment should not be implemented.
  b) It determines optimal variant from the ones considered acceptable and ranks also the rest of them based on level of acceptability. This then forms background material for final selection of recommended variant in the EIA process with respect to the environment as a whole.
- The author of FMS takes part in the final variant selection together with other experts from the authorized team.
- Besides placement and type of fauna passages, FMS also determines basic proposal of accompanying measures (for example guiding vegetation adjustments, fencing, barriers for amphibians, solution of area under a bridge, and others). Technical and ecological viewpoints are considered equally. Detailed procedure of proposing these measures is solved in a Detailed migration study.
- FMS works out a basic proposal for monitoring plan, which is further presented as a separate methodological document.
- FMS prepares a basic proposal of areas that should be protected in spatial plan as part of migration corridors and surroundings of fauna passages. This proposal is further specified after definitive route placement (Planning permit) and is released as a separate methodological document.
- FMS prepares a proposal of conditions and measures for fauna protection during construction phase. These conditions should be included in final EIA statement.
- FMS is worked out by a zoologist together with a designer.

E. Note

When EIA is worked out at the level of a technical study (not a detailed project), all requested technical conditions should be presented as framework ones, because in subsequent steps of project preparation, parameters of objects are changed with further specification of the route. Exact object parameters are indicated in Detailed migration study and in planning decision.
A. Goal
To create a comprehensive concept of gaining relevant data regarding the impacts of implemented road/railway on fauna and landscape connectivity and regarding the effectiveness of fauna passages as resource for feedback in the form of post-project analysis.

B. Placement in the process
Basic proposal of monitoring plan is worked out in the EIA phase and has to be part of its final statement. In further steps of planning and building permits the monitoring plan can be partially updated and has to be included in binding conditions of corresponding proceedings. Monitoring plan and monitoring itself are acquired by investor, monitoring plan and resulting reports are approved by nature protection authority.

C. Initial resource materials
Biological survey, Framework migration study.

D. Principles
• Detailed analysis of monitoring issues, recommended methods and periods are described in Chapter 12
• Monitoring is a mandatory part of preparing the operation of a new road/railway and can be methodologically divided into 3 basic types:
  (a) monitoring the state of biota – so-called three-phase monitoring (before construction, during construction, during operation)
  (b) monitoring the impacts of transportation – during construction and during operation
  (c) monitoring effectivity of implemented measures – fauna passages, fences, etc.
• Individual types of monitoring mutually complement each other and all three types should always be carried out in needed extent on new road/railway constructions. Where purposeful, a combination of monitoring the state of biota with monitoring abiotic factors (contamination, noise, emissions) is recommended.
• Monitoring program sets for each type of monitoring: list of localities, list of assessed species, recommended monitoring methods, time schedule.
Monitoring forms background material for the elaboration of a comprehensive post-project analysis, which then becomes basic feedback tool for optimization of measures in construction of roads/railways.

E. Note
Preparation of a detailed project

Phase characteristics

The phase of detailed project preparation comes after selecting the final route variant. It usually happens in several steps:

- Documentation for decisions on the placement of the building
- Documentation for Building permit – base for Building Permit Proceedings
- Documentation for construction work – base for selection of a contractor
In different construction types and based on different national legislations the number of these steps can vary. They can be either joined together or others can be added. The entire phase of detailed projects' preparation is characterized by two main facts:

- Continuous specification of documentation and solving details
- Gradual processing of comments from administrative authorities – the centre of legislative debate lies in this phase in individual so-called component acts on protection of the environment (act on protection of nature, air, waters, soil, forest, human health, cultural monuments, etc.). For this reason more individual proceedings can be conducted at the same time for one construction.
Decreasing involvement of ecologists into road/railway preparation: unfavourable aspect of this phase → after the SEA and EIA steps, often happens that they are not invited to further cooperate in the phase of detailed project. As a consequence, many approved conditions to protect biota are gradually limited or even left out.

The tool supposed to solve all the above mentioned facts is **Detailed migration study** (DMT).

Phase of planning decision: route of future road/railway is definitively fixed in the area + solving protection of migration corridors and places in the surroundings of fauna passages by means of spatial planning.

The tool designed to help with it is **incorporation of the migration corridor near the fauna passage into the corresponding spatial plan**.

Monitoring activities start in the phase of project preparation, namely three-phase monitoring of the state of biota. It has to begin optimally 3 years before start of construction work, in order to sufficiently capture the “Zero state”, including consideration of seasonal variability.

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Tool: DMS - Detailed migration study (T5)

A. Goal
To propose final detailed technical solution of all measures to protect fauna and landscape connectivity and to check other parts of prepared construction from this point of view. DMS forms an overall background material for statements of administration authorities and for preparing organization of the construction.

B. Placement in the process
1. This is the phase of preparing a detailed project. DMS should be included in all levels of project documentation that are in this phase being elaborated (documentation for decisions on the placement of the building, documentation for building permit, etc.). DMS is acquired by investor.

C. Initial resource materials
To the basic initial resource materials belong: Framework migration study (FMS), statements of administration authorities (first of all from the EIA process, but also according to component laws), technical project documentation of a given level, biological survey, eventually its further additions, field surveys, etc.

D. Principles
DMS solves especially the following points:
• Comparison of proposed state with requirements coming out of the EIA process and other proceedings.
• Definitive placement and detailed technical solution of fauna passages (including details such as surface adjustment of the object, solution of the area under a bridge, vegetation adjustments near the object, means of conveying a watercourse, installation of hiding spots for small animals).
• Detailed technical solution of fencing, guiding barriers, permanent and temporary barriers for amphibians and reptiles, ensuring continuity with the surroundings.
• Detailed solution of measures to protect birds and bats (non-transparent noise protection walls, vegetation adjustments on overpasses, etc.)
• Checking the effects of other technical objects of the construction (noise protection walls, drainage ditches, sedimentation and balancing ponds, protection of slopes against erosion, vegetation adjustments, accompanying constructions).
• Proposals to optimize vegetation adjustments of slopes, using road verges for increasing biodiversity (especially of invertebrates).
• Preparing background materials for Plan to protect biota during construction.
• Preparing background materials for Incorporation of migration corridor(s) near fauna passage(s) into spatial plan.
DMS is worked out by a zoologist in cooperation with a designer.

E. Note
The detail and exact content of a DMS will differ based on the level of project documentation, at which it is being prepared.
A. Goal

To ensure protection of migration corridors in the surroundings of fauna passages in spatial plans, to prevent changes in land use that would limit the access of animals to the fauna passages.

B. Placement in the process

Proposal is being prepared already from the SEA level (permeability of supra-regional migration corridors is solved in SMS), further at the EIA level (local migration corridors and placement of fauna passages are solved in FMS) and consequently in DMS. Final form is bound to definitive placement of construction including fauna passages in the phase of decisions on the placement of the building. The proposal is acquired by investor.

C. Initial resource materials

Strategic, framework and detailed migration studies, local and regional plans, statements and declarations of administration authorities to the EIA process and other proceedings according to particular laws.

D. Principles

• Proposal of protection zones is worked out in the form of one comprehensive material, which sums up and unifies all earlier presented requirements for protection of fauna passages and migration corridors from devaluation by construction or transformation of habitats in the future.
• Proposal of protection zones is elaborated for individual localities and is presented with maps in the scale corresponding to the scale of the given spatial plan.
• Text of the report contains a proposal for required regulations.
• The proposal is worked out by a zoologist in cooperation with an expert on spatial planning.

E. Note

Although legislative support for this protection is in many cases very weak, it is necessary to have one separate comprehensive material available to gradually work with.
Phase characteristics

Greatest direct negative effects on habitats, plants and animals → conditions aimed at minimizing these negative effects

Work out a comprehensive, detailed plan to protect biota:

- Contractor of the construction needs to have a plan of protective measures available at the same level of detail as other parts of the construction
- Localities that must not be affected by the construction have to be precisely defined and clearly marked

Project followed by a control system of its compliance. It can be carried out at the level of contractor (internal check), investor (as the contracting authority) and administration authorities. This control activity is marked as ecological supervision.

Monitoring activities are going on during the construction phase in compliance with plan of monitoring, that means three-phase monitoring (phase of construction and monitoring the impacts of construction activities).
**A. Goal**

To work out a detailed plan of technical and organizational measures for minimizing negative impacts of construction on natural habitats and wildlife.

**B. Placement in the process**

Plan to protect biota during construction is usually elaborated within the EIA process, but sometimes also in later phases of preparation (e.g. documentation for building permit or detailed implementing documentation).

**C. Initial resource materials**

Set conditions in previous proceedings (planning, building, EIA, expert background materials from FMS and DMS, field surveys. Technical project documentation at given levels.

**D. Principles**

- The plan solves specific measures to protect habitats and fauna during construction. It has to be worked out in cooperation of a designer and a zoologist.
- Division of the plan into building sections and the detail of drawing documentation has to be at the same level as in other objects of the construction.
- A list of localities where measures will be implemented, basic characteristics of the measures and their exact spatial specification (drawing in drawing documentation) is worked out for each building section.
- Extra attention is given to the surroundings of fauna passages.
- Additional information is used – for example a list of specially protected species that can be expected near the construction site, methodology on how to proceed in case of their entry into the construction site.

Examples of measures:

- Temporary fencing of valuable localities as a protection from construction activities – drawing of placement, length, type of fence.
- Protection of selected full-grown trees by wooden barriers.
- Barriers against entry of amphibians into the construction site – drawing of placement, length, type of barriers.
- Estimated number of traps – for each trapping locality including preliminary placement (by a drawing in a background map) and a working mark.
- Localities for transfer of animals – must be approved by nature conservation authority
- Time schedule of construction activities must take into account species protection – for example migration of amphibians, nesting period of birds etc.

**E. Note**
A. Goal

Ecological supervision is performed by a professionally qualified person who oversees compliance with the interests of nature protection during the entire time of construction all the way to its final inspection. This person is responsible for compliance with the conditions laid down by the nature conservation authority and is controlled by that authority. Main objective is to minimize negative impacts on the environment during construction.

B. Placement in the process

Phase of construction implementation. Ecological supervision is part of technical supervision of investor.

C. Initial resource materials

Plan to protect biota during construction, project documentation for conductor of the construction and other building documentation.

D. Principles

The following belongs to the main functions of ecological supervision:

• Checking proper implementation of all measures in Plan to protect biota during construction
• Coordinating construction activities that could cause negative effects on biota (for example time schedule of tree felling).
• Monitoring the occurrence of specially protected animal species in the area of the construction site and ensuring their rescue transfer if needed.
• Keeping a detailed documentation about all captures and rescue transfers. The documentation should contain a list of found species, numbers of individuals, means of capture and transfer, description of both original and substitute locality.
• The right to stop activities of the construction company for a necessary time period in case specially protected species are urgently endangered by the building activities.

E. Note
Operation and maintenance

○ Phase characteristics

Final stage: construction influences its surroundings by noise, emissions from combustion processes, scattering salts and other substances used in maintenance + all measures to protect fauna and landscape connectivity should stay functional.

- The first 3 – 5 years = initial phase of operation: testing (or temporary) operation, in which some technical details are still being finished and defects found during final inspection are being fixed. The third phase of monitoring is carried out intensively in this phase (monitoring the impacts of transportation on fauna in operation phase), as well as monitoring the effectivity of implemented measures.

- Post-project analysis recommended to ensure feedback (EIA directives). The operation period for which a post-project analysis should be worked out is a compromise between the need to gather sufficient representative data from monitoring and the effort to gain feedback for other constructions as fast as possible: recommended here after 3-5 years of operation.
A. Goal
To summarize in one complex document basic experience with implementing the construction and with the road/railway operation including protection of fauna and landscape connectivity. The report then becomes background material for investor, administration authorities, designers and public, with the possibility to use the gained experience in other constructions.

B. Placement in the process
The operation phase of a construction, prepared cca 3-5 years after the start of operation. The analysis is acquired by investor.

C. Initial resource materials
Statements of administration authorities to the EIA process, planning proceedings, building permit and final inspection. Technical documentation in its last valid version. FMS and DMS, original biological survey, results of three-phase monitoring of the state of biota, monitoring the impacts of construction during construction and during operation, monitoring the effectivity of implemented measures.

D. Principles
• The analysis evaluates separately the following basic range of issues:
  a) procedural component – respecting and fulfilling the conditions given in statements of administration authorities
  b) impact on selected representative species – changes in populations from construction preparation to its operation
  c) impact on landscape connectivity – state and changes in migration corridors
  d) contamination of surrounding environment – changes in concentrations of indicator substances in soils, biota and water
  e) change in surrounding habitats – means of ensuring protection of migration corridors and the surroundings of fauna passages
  f) effectivity of proposed measures – results from monitoring and experience with object maintenance
• For each range, according to given possibilities, the entire time period from preparation through construction all the way to operation of the construction should be assessed.
• For each range, a detailed analysis of the given issue is carried out and specific measures are proposed for application in other constructions.
• The obligation to work out a post-project analysis has to be set already in the EIA statement and repeated in other subsequential proceedings.
• Proposal of monitoring plan for another time period should be worked out and submitted to discussion.

E. Note
It would be purposeful in large motorway constructions to work out an analogical post-project analysis immediately after finishing construction. It would shorten the time for getting feedback and using the new findings from the construction phase.
• The specifics of individual constructions need to be considered when using the above mentioned tools. For example in case of building lower class roads, it has to be taken into account that such constructions usually do not represent a migration barrier, but the main problem is high mortality. This is similar in case of railways, where mortality is again the key issue. Barrier effect should be considered and solved in case of high-speed tracks, where its impact is comparable to fenced motorways.

• Upgrading of existing roads/railways is another specific situation. Using the above mentioned tools depends on the extent of the upgrade. Some upgrades can include measures to increase speed or slight widening of an existing road, others represent extension from a two-lane road to a four-lane motorway, or from a single-track to a multi-track railway. It has to be decided based on the extent of the upgrade and according to the law, which processes will take place (SEA, EIA, planning decision, building permit). Given the processes, corresponding tools then have to be used.
Some important points regarding upgrades:

- Even roads/railways of lower classes have to be assessed. Ex: a bad bridge on a local road can cause high mortality of otters, which can in turn threaten local population.

- Additional construction of a fence or a protection wall can fundamentally affect mortality (both in positive and negative manner) and barrier effect of the road/railway. For this reason, a migration study at corresponding level should always be performed in these cases. Construction of a fence or a protection wall on an existing road can cause the need to build new fauna passages.

- The impact of an upgrade from a two-lane road to a four-lane road is comparable to the impact of building a new motorway, so all available tools must be used in such a situation.

- The extent of assessment should take into account characteristics of habitats, through which the assessed infrastructure leads.

- A special case is represented by building fauna passages on existing roads/railways. Such intentions should be always based on migration studies, incorporation of migration corridor(s) near fauna passage(s) into spatial plan is a necessity as well.
Recapitulation for ensuring protection of wildlife in the process of preparing linear transport infrastructure

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<td>Protection of fauna during construction</td>
<td>Basic principles</td>
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<tr>
<td>Monitoring program</td>
<td>Basic proposal</td>
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<tr>
<td>Monitoring the state of biota (three-phase)</td>
<td>Basic proposal</td>
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<tr>
<td>Monitoring the impacts of operation</td>
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<tr>
<td>Monitoring the effectiveness of proposed measures</td>
<td></td>
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<tr>
<td>Post-project analysis</td>
<td></td>
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</table>
Thank you!