

River Raec - Drenovo Interchange
Road Project
Republic of Macedonia
Biodiversity Management Plan

Final Report - September, 25th 2015

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I. Introduction

The Republic of Macedonia Public Enterprise for State Roads (PESR) proposes to construct a 10.2 km section of the A1 road, between the 'River Raec Bridge' and the 'Drenovo Interchange' (hereafter referred to as "the Project"), as part of the overall plan for improvement of the national road network outlined in the Republic of Macedonia's National Transport Strategy (2007-2017).

The road will be built in the Drenovo Gorge, a National Monument under Macedonian law which also harbors threatened species of animals and rare types of vegetation. Given these circumstances, the project is considered as a Category A Project in accordance with the European Bank for Reconstruction and Development's Environmental and Social Policy (ESP) of 2008. The EBRD's requirements are therefore that all elements of the project will meet national environmental, social, health and safety laws and regulations, and be carried out in compliance with relevant EU environmental and social standards, as well as the EBRD's Environmental and Social Policy (ESP) and Performance Requirements (PRs) of 2008.

In this context, PESR identified the need for a Biodiversity Management Plan (BMP) as part of the Environmental and Social Impact Assessment (ESIA) process and associated Critical Habitats Assessment (CHA). PESR's commitment to developing and implementing a BMP is contained within an Environmental and Social Action Plan (ESAP). This Biodiversity Management Plan (BMP) is an outcome of the Environmental and Social Impact Assessment (ESIA) and the Critical Habitat Assessment (CHA).

The BMP provides an instructional working document for management of biodiversity impacts during Project design and implementation, and will be used by PESR and its contractors to ensure that necessary measures are implemented to comply with national laws and lender policies, and to address stakeholder concerns relating to biodiversity and ecosystem services, as identified in the ESIA. The BMP describes mitigation and management measures, identifies the parties responsible for their implementation (e.g., company, contractor, government) and specifies the required monitoring and monitoring schedule.

This BMP is a "live" document, and is expected to evolve and to be enhanced as necessary throughout the Project's detailed design, construction, and operation phases, as part of project monitoring.

I.1 Objectives of the BMP

The sensitivity of the Project's affected area and the need, under the PR6 of EBRD, to demonstrate No Net Loss (NNL) or preferably a Net Gain for certain biodiversity features mean that a Biodiversity Management Plan (BMP) is required. The BMP is to set out the detailed plan of how the recommendations arising from the ESIA and CHA will be implemented over time and identifies the actions that will be taken by PESR and its contractors to ensure that they are followed in accordance with:

- EBRD's Environmental and Social Policy and Performance Requirements (PRs), in particular PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- The Project is required to comply with national and European legal requirements including

those contained within the EU Habitats and EU Birds Directives¹ by ensuring that species protected at the EU level are maintained at favourable conservation status and that Annex I, and Annex I Priority habitats are maintained in favourable condition.

- The BMP is key to ensuring that any conditions imposed by the Republic of Macedonia's Ministry of Nature Protection are addressed through appropriate interventions.

The objective of the BMP is to ensure that all actions required as part of the Project's Mitigation Strategy, are clearly understood by all parties and that there are provisions in place to ensure that they are implemented in an appropriate timeframe. Implementation of the BMP will endeavour to ensure that residual impacts on natural and CH will be minimised.

In the context of this Project, the BMP will also specify a requirement to develop a biodiversity monitoring and evaluation plan for natural and critical habitat and other priority habitats and species that are protected at national or EU level or are recognised as designated features of the protected areas and key biodiversity areas affected by the Project.

1.2 Scope

This BMP applies to management of biodiversity issues during Project implementation. The core of the document is a tabulated list of mitigation and management measures, arising from the ESIA, which have been agreed to by PESR.

The BMP needs to provide a framework for delivering:

- On-site mitigation and management of a high standard commensurate with the biodiversity importance of the Project's location to avoid and minimise impacts as specified in the ESIA and CHA.
- Adherence to the mitigation hierarchy with respect to impacts on natural and critical habitat as per EBRD's PR6. This means an emphasis on avoidance at all stages and scales where possible and including identification of further opportunities to minimise impacts during detailed design and construction planning and implementation.
- Specific control measures and procedures to ensure that invasive species are not introduced or spread by the Project.
- An adaptive management approach that allows for development of any new control measures that may be needed if monitoring reveals that unforeseen impacts are occurring, or impacts of greater significance than envisaged in the ESIA. This will require rigorous monitoring of outcomes for biodiversity in general and for natural and critical habitat in particular.
- Outcomes and standards of design and construction that are commensurate with the high importance of the area for biodiversity, natural habitats and the landscape at and EU levels.

¹Council Directive 92/43/EEC May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora, as amended.

II. Legislative, Regulatory and Policy Framework

II.1 Macedonian law

The legal basis for nature protection in the Republic of Macedonia is contained within the Constitution, the Law on Nature Protection (O.G. Nos. 67/04, 14/06 and 84/07, 93/2013, 187/2013, and 42/2014), the Law on Environment, and in international agreements signed or ratified by the Country and other laws regulating the use of certain natural resources.

- **The Law on Environment** (OGRM No. 53/05, 81/05, 24/07, 159/08, 83/09, 123/12, 93/13, 187/13 and 42/14) transposes the requirements of various EU requirements, including those of Directive 2003/35/EC²; Council Directive 96/61/EC³; Directive 2001/42/EC⁴; and Council Directive 82/501/EEC⁵.
- **The Law on Nature Protection** (O.G. Nos. 67/04, 14/06 and 84/07, 93/2013, 187/2013, and 42/2014) transposes the following Directives: Council Directive 92/43/EEC⁶, Council Directive 79/409/EEC⁷, Council Regulation (EC) No 338/97⁸ etc. This law sets out principles of protection, restrictions regarding use of nature and natural resources, impact assessment, planning, compensation measures, protection of biodiversity, protection of internationally important species, wildlife conservation, genetic diversity, habitats and ecosystems, ecological networks, minimum environmental release¹⁰, restrictions for construction activities in riparian habitats and littoral areas, restriction of fishing in certain conditions, protected areas, management plans for protected areas, rangers, landscape diversity, organisation of nature protection including management of protected areas, financing inspection and supervision, penalties and final and transitional provisions.

The Law provides a good framework for developing a network of protected areas in line with the IUCN categorisation. In Article 53, it stipulates the establishment of a coherent ecological network. The obligation to set a national ecological network, (as part of the Pan-European Ecological Network - PEEN) derives from the fact that Macedonia is a signatory party of the Pan - European Biological and Landscape Diversity Strategy (PEBLDS, 1996).

² Directive 2003/35/EC of the European Parliament and Council providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC

³ Council Directive 96/61/EC concerning integrated pollution prevention and control;

⁴ Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment

⁵ Council Directive 82/501/EEC on the major-accident hazards of certain industrial activities

⁶ Reference is made to the Law on water which needs to set a methodology for minimum environmental release.

⁷ Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

⁸ Council Directive 79/409/EEC on the conservation of wild birds

Also, several international environmental and conventions are relevant are listed below:

- **Convention on Biological Diversity (CBD)**
- **Berne convention on the Conservation of European Wildlife and natural Habitat**
- **Bonn Convention: Conservation of Migratory Species of Wild Animals**
- **Convention on Wetlands of International Importance;**
- **Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES);**

II.2 Lender policies, EBRD requirements and Standards

The EBRD recognises the need for the protection and conservation of biodiversity, in the context of projects in which it invests, and supports a precautionary approach to the conservation and sustainable use of biodiversity and the management of impacts upon it in line with the Rio Declaration and the CBD.

With regards to biodiversity management, the Performance Requirement (“PR”) on “Biodiversity Conservation and Sustainable Management of Living Natural Resources” sets the following objectives:

- to protect and conserve biodiversity
- to avoid, minimise and mitigate impacts on biodiversity and offset significant
- residual impacts, where appropriate, with the aim of achieving no net loss or a net gain of biodiversity

This PR applies to projects in all types of habitats, irrespective of whether they have been disturbed or degraded previously, or whether or not they are protected or subject to management plans.

In order to ensure the adequate protection of these resources, a Critical Habitats Assessment (CHA) was undertaken in 2014. The CHA identified, mapped and described the natural habitats affected by the project, determined whether critical habitat were present according to the criteria in PR6, following international best practice and the EU habitat and Bird Directives, The CHA also described the potential effects arising from the construction and operation of the proposed road scheme, and developed a mitigation strategy based on appropriate use of avoidance, minimisation, restoration or offsetting measures as needed to ensure that there is no net loss (or preferably a net gain) of biodiversity as appropriate.

II.2.1 Natural habitats

According to Performance Requirement 6, natural habitats are defined as land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area’s primary ecological functions. In areas of natural habitat, there must be no significant degradation or conversion of the habitat to the extent that (i) the ecological integrity and functioning of the ecosystem is compromised or (ii) the habitat is depleted to the extent that it could no longer support viable populations of its native species, unless:

- there are no technically and economically feasible alternatives;
- the overall benefits of the project outweigh the costs, including those to the environment and biodiversity;
- appropriate mitigation measures are put in place to ensure no net loss and preferably a net gain of biodiversity value in the habitat concerned, or, where appropriate, a habitat of greater conservation value.

II.2.2 Critical Habitats

Irrespective of whether it is natural or modified, some habitat may be considered to be critical by virtue of (i) its high biodiversity value; (ii) its importance to the survival of endangered or critically endangered species; (iii) its importance to endemic or geographically restricted species and sub-species; (iv) its importance to migratory or congregatory species; (v) its role in supporting assemblages of species associated with key evolutionary processes; (vi) its role in supporting biodiversity of significant social, economical or cultural importance to local communities; or (vii) its importance to species that are vital to the ecosystem as a whole (keystone species).

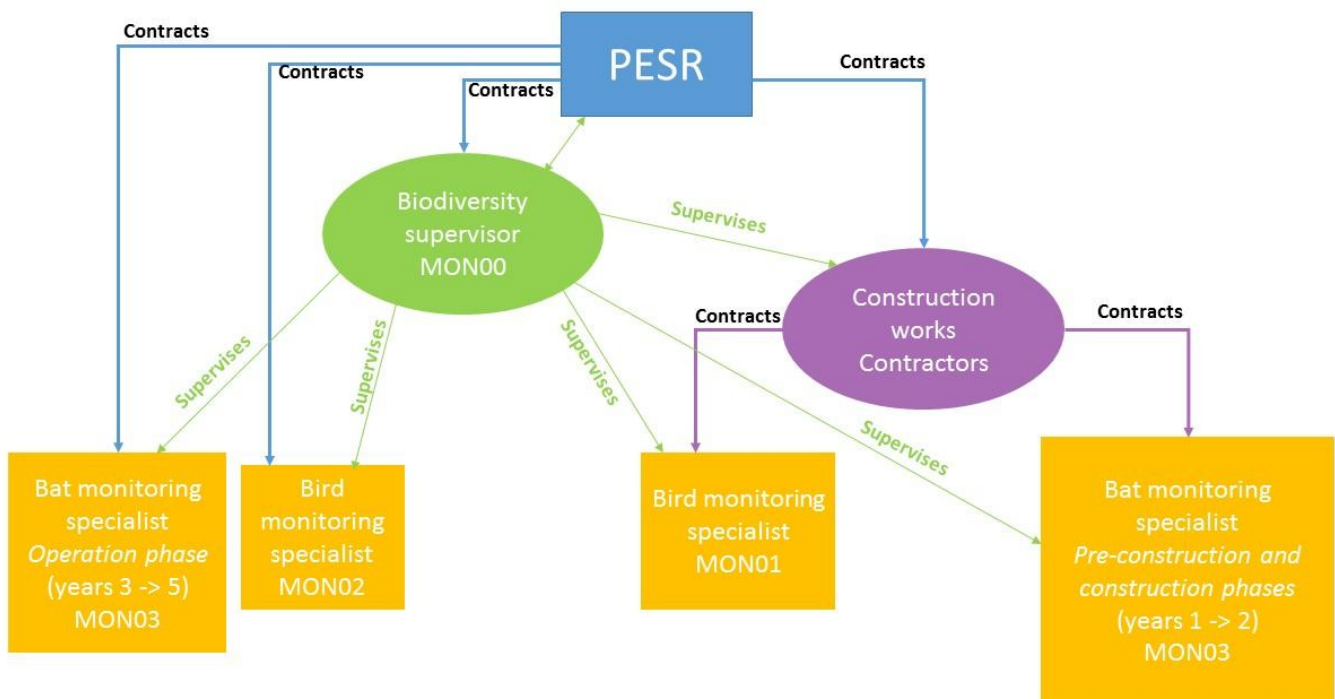
Critical habitat must not be converted or degraded. Consequently, in areas of critical habitat, the client will not implement any project activities unless the following conditions are met:

- Compliance with any due process required under international obligations or domestic law that is a prerequisite to a country granting approval for project activities in or adjacent to a critical habitat has been complied with.
- There are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its ability to function in the way(s) outlined in paragraph 13.
- Taking a precautionary perspective, the project is not anticipated to lead to a reduction in the population of any endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised.
- Notwithstanding the above, all other impacts are mitigated in accordance with the mitigation hierarchy.

III. Roles and Responsibilities

PESR has final responsibility for ensuring that the CHA’s commitments are met, and therefore that the BMP is implemented correctly. However, much of the day-to-day responsibility for ensuring the implementation of the management and mitigation measures outlined in this BMP will fall to the contractor or contractors engaged in the on-site works.

Below is presented a simplified chart that identifies the main chain of responsibilities for the BMP implementation.



EBRD will monitor PESR performance, thus contractors performance

III.2 Contractors

Contractors will be responsible for the implementation of all mitigation measures: from MIT01 to MIT10.

Contractors will be contracted by PESR, and will be supervised by PESR and by the Biodiversity Supervisor (independent consultant contracted by PESR).

Contractors will be responsible for monitoring measures implementation that have to be undertaken during the pre-construction phase and during construction phases: MON01 and MON03 for years 1 to 2. Short-term contracts will be signed between contractors and specialists to ensure the work, supervised by PESR and by the Biodiversity Supervisor.

III.3 Biodiversity Supervisor

Biodiversity supervisor will be contracted by PESR and will be responsible for supervising all mitigation and monitoring measures of the BMP, during the whole construction work period.

The biodiversity supervisor will supervise the work of the contractors, and the work of all fauna monitoring specialists (contracted either by PESR either by contractors). The biodiversity supervisor will refer to PESR that all measures of the BMP are correctly implemented.

III.4 Bird monitoring specialist

MON01 - Construction phase

A bird monitoring specialist will be contracted by contractors and will be responsible for the implementation of MON01 during construction phase (during 1 year). .

The bird monitoring specialist will be supervised by contractors and by the biodiversity supervisor. .

MON02 - Operation phase

A bird monitoring specialist will be contracted by PESR and will be responsible for the implementation of MON02 during operation phase (during 5 years). .

The bird monitoring specialist will be supervised by the biodiversity supervisor and by PESR. .

III.5 Bat monitoring specialist

MON03 - Pre-construction and construction phases (Years 1 and 2)

Bat monitoring specialist will be contracted by contractors and will be responsible for the implementation of MON03 during pre and construction phases (during 2 years). . The bat monitoring specialist will be supervised by contractors and by the biodiversity supervisor. .

MON03 - Operation phase (Years 3 to 5)

The bat monitoring specialist will be contracted by PESR and will be responsible for the implementation of MON03 during operation phase (during 3 years). .

The bat monitoring specialist will be supervised by the biodiversity supervisor and by PESR. .

IV. Biodiversity Management Plan

IV.1 Description of plan structure

The BMP is a "live" document, to be adapted and enhanced as the Project progresses. In the event that impacts not anticipated by the ESIA arise during the Project, and require mitigation, then they should be added to the BMP. Mitigation should always be devised in line with the mitigation hierarchy: avoid, reduce/minimise, restore, offset.

It should be noted that a fundamental assumption of the BMP is that suitably qualified and trained staff will be present on site and constantly engaged in checking and verifying that the various mitigation measures are being implemented correctly.

The BMP is tabulated in the following pages. A key to the content of the tables is provided below.

IV.2 Table of environmental measures

Column heading	Description
ID	The commitment's unique reference number. All commitments from the Biodiversity and Critical Habitat Assessment (2014) are included.
Commitment/Action	Description of the commitment or action as it appears in the Biodiversity and Critical Habitat Assessment (2014).
Detail	Additional description of the commitment or action, if required.
Project Phase	P - Pre-Construction (Detailed Design); Const - Construction; Ops - Operations; Clo - Closure (reclamation, rehabilitation and aftercare).
Documentation	Identifies documentation that will guide implementation and/or indicate compliance.
Cross-reference to other MPs	In some cases, commitments apply to one or more other subjects (e.g. a commitment designed to safeguard surface water quality might also benefit biodiversity).
Frequency of action	An indication of the appropriate frequency of action and/or monitoring, as appropriate.
Responsibility	An initial appraisal of whether primary responsibility for the action will fall to PESR or its contractor(s).
Verification indicator	An indication of how successful implementation of the commitment might be demonstrated. As noted in the table, it is the responsibility of PESR to verify and monitor implementation of the commitments

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ID	Commitment/Action	Detail	Project Phase	Documentation	Cross-reference to other MPs	Frequency of action	Responsability	Verification indicator
MIT01	In the Drenovo gorge and on natural habitats, including critical cliffs and rocky slopes with rare chasmophytic (specialized rock-dwelling) vegetation, and critical habitat for the endemic snail (<i>Carinigera drenovoensis</i>) that is only found in Drenovo Gorge, minimize the footprint of construction activities through appropriate location of access roads and other work related facilities in modified habitats.	<p>In the design of the construction works, existing access roads and other works related facilities will always be preferred.</p> <p>Works, access roads and related facilities will be on agricultural land rather than on natural habitats.</p> <p>To avoid vehicles or staff wandering out of designated areas, a temporary visible limit will be erected around the perimeter designated as the construction site, whenever it comes into contact with natural habitats (no painting on rocks).</p> <p>Access to the petrifying spring will be closed off with a fence, and an explanation sign. The location of all access, facilities and fences will be assessed by a trained ecologist and enforced by a supervisor who will be responsible for maintaining these visible limits throughout the construction phase.</p> <p>Construction, vehicles and people will be prohibited from going beyond the designated limit.</p> <p>Contracts with contractors will include monetary sanctions to be applied in case their vehicles or staff penetrate rocky habitats and rocky slopes, including the cave above the river where bats roost, beyond the visible limits of the construction site.</p>	P ; Const; Op. (10 years)	B-CHA, 2014 Atlas mapping attached to the BMP	MON00	Continuous during construction	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Monitor the number of people and vehicles observed outside the project fences
MIT02	<p>This measure targets the globally endangered Egyptian vulture for which Drenovo gorge is a critical habitat.</p> <p>In Drenovo gorge, strictly avoid loud preparation (blasting) / construction works when the Egyptian Vulture is breeding. It aims to minimize disturbance to breeding pairs of Egyptian vultures in Drenovo Gorge. If vultures are breeding in the gorge, noise, vibrations and activity must not exceed that of the existing road.</p>	<p>If vultures are breeding in Drenovo Gorge, then avoid loud operations, mainly blasting and excavation, from March 15th to September 15th.</p> <p>Strict avoidance of blasting and excavation from March 15th to the end of July.</p> <p>This measure does not apply if monitoring shows that the vulture has not returned to the nesting site.</p>	Const.	B-CHA, 2014	MON01; MON00	Annual	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	<p>Breeding results of Egyptian Vulture in Drenovo gorge</p> <p>(see MON01 and MON02 - Monitoring by a bird specialist)</p>

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ID	Commitment/Action	Detail	Project Phase	Documentation	Cross-reference to other MPs	Frequency of action	Responsability	Verification indicator
MIT03	<p>In Drenovo gorge, elimination of Ailanthus altissima prior to the start of construction works.</p> <p>This measure targets critical natural habitat: cliffs and rocky slopes, including critical habitat for the endemic snail (<i>Carinigera drenovoensi</i>) that is only found in Drenovo Gorge.</p>	<p>Tree-of-heaven is an invasive plant species originated in Asia that is currently degrading the bottom of rocky habitats in Drenovo gorge. Construction works, by moving soil and plant parts around, could increase this degradation by spreading the plant to new locations in the gorge and river valley.</p> <p>All living individuals of <i>Ailanthus altissima</i> (including saplings) found in the expropriation area in Drenovo Gorge must be uprooted before the beginning of construction works.</p> <p>Removal of individual specimens of <i>Ailanthus altissima</i> must not be done with machinery.</p>	P., Const.	B-CHA, 2014	MON00	Before begining of construction work	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Visual inspection on site
MIT04	<p>In the Drenovo gorge, implement dust suppression measures to reduce dust deposits on nearby natural habitats</p> <p>This measure targets critical natural habitat: cliffs and rocky slopes, including critical habitat for the endemic snail (<i>Carinigera drenovoensi</i>) that is only found in Drenovo Gorge. These habitats could be impacted by dust deposits during construction.</p>	<p>Apply dust surpression measures during windy/dry conditions : sprinkle water on uncovered soils and construction materials, on a regular basis, to stop dust formation.</p>	P.; Const.	B-CHA, 2014	MON00	Continuous during construction	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	<p>Visual inspection on site</p> <p>The contractor has to purchase appropriate resources for applying dust suppression measures on site</p>
MIT05	<p>In the Raec river, restore the profile and substrate of the river to its original condition after construction of pillars, bridges, and embankments affecting the riverbed.</p> <p>This measure targets natural habitats in Drenovo gorge (river), and aims to achieve appropriate post-construction of the river's structure and hydrology.</p>	<p>Work in river will be minimized through limited diversions of water flow and the use of minimal size coffer dams / sheets around piling works.</p> <p>At and near the planned structures, photographs of the river will be taken before construction, and measurements will be taken of its profile (width/depth/slope) and of the granulometry of sediments.</p> <p>Any materials or equipment used in diverting water away from construction areas will be removed once construction is complete.</p> <p>After construction is completed, restoration will be undertaken to achieve a profile and granulometry similar to that documented prior to construction.</p>	P.; Const.	B-CHA, 2014	MON00	Prior to and after construction	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Visual inspection on site

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ID	Commitment/Action	Detail	Project Phase	Documentation	Cross-reference to other MPs	Frequency of action	Responsability	Verification indicator
MIT06	<p>In the riparian forest, along the Raec river, remove <i>Robinia pseudoacacia</i> trees (an exotic invasive) to enhance the conservation status of the habitat in the vicinity of the project</p> <p>This measure targets a natural habitat: the riparian forests along the Raec river. Stands of <i>Robinia pseudoacacia</i>, an invasive tree species, degrade the natural riparian forest habitat and this measure aims to enhance the forest by removing them.</p>	<p>Within the expropriation area (about 10 ha), all individual trees and saplings of <i>Robinia pseudoacacia</i> will be located and cut, with the stumps killed. Fallen trunks and branches will not be removed, to provide micro-habitats to specialized species.</p> <p>This work will be overseen by a trained ecologist.</p>	Const;	B-CHA, 2014	MON00	Before beginning of construction work	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Visual inspection on site
MIT07	<p>No concrete / shotcrete projections on cliffs and steep slopes.</p> <p>This measure targets natural habitats in Drenovo gorge (riparian forest), and the critical rocky habitats where a large breeding and wintering bat roost has been found.</p>	<p>Appropriate substitutes include wire nets and adequate removal of dangerous rocks, boulders and stones during operations.</p>	Const.	B-CHA, 2014			<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Visual inspection on site
MIT08	<p>In Drenovo gorge, on the bridge below the case, install a continuous high palisade along each side of the bridge, to prevent collisions with bats travelling between their roost in the cave and feeding grounds in the riparian forest.</p>	<p>Install a set of continuous high palisades, at least 2m above the bridge rails, will be built (during construction) and maintained (during operations). The palisades can be built of any long-lasting and vibration and wind resistant material (including but not limited to wood panels, some plastics, and metal mesh within metal frames).</p> <p>Similar structures could be built on the other 4 bridges in Drenovo Gorge if monitoring (MON03) shows significant impacts on the bats population.</p>	Const.	B-CHA, 2014	MON00	During construction	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Constructed high palisade
MIT09	<p>Design road structures so as to ensure animals can use the banks of the Raec river throughout the gorge, with stepped ledges along abutment of 5 bridges.</p> <p>This measure targets natural habitats in Drenovo gorge (riparian forest), to ensure continuity of habitat for mammal species such as the European otter (<i>Lutra lutra</i>).</p>	<p>Road structures, including bridges, pillars, and embankments must not block impair movement, on land, of small mammals, including in periods of high water. River banks will be avoided during construction.</p> <p>When river banks are destroyed or lose their function (due to an obstacle), an appropriate substitute will be put in place. This can consist of tiered banks made of large boulders located at the base of built structures. A continuous route must be available for small mammals even in high water</p>	P. ; Const.	B-CHA, 2014	MON00	During construction	<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Constructed structures

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ID	Commitment/Action	Detail	Project Phase	Documentation	Cross-reference to other MPs	Frequency of action	Responsability	Verification indicator
MIT10	In Drenovo gorge, ensure that any cliffs and slopes that remain after construction are stabilized, without any soil or planting contribution	<p>Ensure that as much rocky habitat can be created during road construction. Slopes above and below the road, including cliffs and walls, must be designed to facilitate colonization by rock-dwelling vegetation: exogenous material, including concrete (see MIT07) or soil must be used, and no planting must be undertaken.</p> <p>Small cracks and crevices (<5cm wide), and small ledges, must be favoured whenever possible for example in stabilizing slopes or designing the outside surface of retaining walls and other vertical structures (no smooth concrete).</p> <p>Invasive alien species, in particular <i>Ailanthus altissima</i>, must be controlled in Drenovo Gorge through regular roadside maintenance operations</p>	Const	B-CHA, 2014	MON00		<ol style="list-style-type: none"> Contractor/s Supervising engineer Public Enterprise for State Roads 	Visual inspection on site
MON 00	<p>Supervision of works by a trained and experienced ecologist during the construction phase.</p> <p>This measure targets all natural habitats, including critical habitat, along the proposed road project. Supervision necessary for the effective implementation of all mitigation measures, and to ensure compliance of contract terms by workers.</p>	<p>A trained/experienced ecologist will advise on the limits of the construction site when natural habitats may be affected, and make them visible through e.g. tape or other means (no paint on rocks) - as required in MIT01.</p> <p>Weekly visits to the works, during construction, in Drenovo Gorge, will be carried out to check compliance with MIT01, in particular.</p> <p>Monitoring of dust deposits on rocky habitats and of air quality will be undertaken during construction.</p> <p>A detailed mapping of impacts will be produced, and a final synthesis report on residual impacts (including areas of critical and natural habitats lost) will be communicated to EBRD.</p>	Const.	B-CHA, 2014	MIT01 to MIT10 MON01 to MON03		<ol style="list-style-type: none"> Trained ecologist (supervising engineer) Public Enterprise for State Roads 	

Blodiversity Management Plan

ID	Commitment/Action	Detail	Project Phase	Documentation	Cross-reference to other MPs	Frequency of action	Responsability	Verification indicator
MON 01	In Drenovo gorge, regular monitoring of Egyptian vulture presence and behaviour will be undertaken by an experienced ornithologist from March 15th to September 15th, during the construction phase	<p>As per MIT02, work susceptible to disturb a breeding pair must be avoided between March 15th and September 15th.</p> <p>Between March 15th and September 15th, during construction, 1-day observation sessions, twice a week, will determine whether or not a pair (or several pairs) of Egyptian vultures settle(s) in Drenovo gorge upon return from migration (early spring, from March 15th onwards). If not, MIT02 does not apply. I</p> <p>If so, then MIT02 applies and construction work will be informed of its effects on the behaviour, and breeding success or failure, of the Egyptian vulture, including the date of departure for outwards migration, after which work can resume. In case the nest remains unoccupied or is abandoned, offset measures will be implemented.</p> <p>A contract with an independent ornithologist (to be approved by EBRD) will be required in the tender documents for construction</p>	Const.	B-CHA, 2014	MIT02 MON00	Regular (twice a week) from March 15 th to September 15th	<ol style="list-style-type: none"> 1. Trained/experienced ornithologist 2. Contractor/s 3. Supervising engineer 4. Public Enterprise for State Roads 	<p>CV of ornithologist, approved by EBRD before works.</p> <p>Breeding results of Egyptian Vulture in Drenovo gorge</p>
MON02	In Drenovo gorge, monitoring by an experienced ornithologist of Egyptian Vulture breeding the first 5 years of operation	This monitoring aims to control that the new road in operation phase does not disturb the breeding success of Egyptian Vultures in Drenovo gorge. If not, the monitoring would be stopped after 5 years. If the traffic disturbance is supposed to have damaging effect on Vulture breeding, offset measures would be carried out (see offsetting strategy).	Operation	B-CHA, 2014	MIT08 MON00	Once a week during breeding season (6 months) over 5 years	<ol style="list-style-type: none"> 1. Trained/experienced ornithologist 2. Supervising engineer 3. Public Enterprise for State Roads 	<p>CV of ornithologist, approved by EBRD before works.</p> <p>Breeding results of Egyptian Vulture in Drenovo gorge</p>
MON03	<p>In Drenovo gorge, monitoring of impacts on the bat population using the cave above the road.</p> <p>The road will hinder bat movements between the cave and the road, and along the river valley. To establish whether additional mitigation is required (see MIT08), monitoring by an experienced bat specialist of actual impacts is required, to identify any likely causes of population fluctuations and barriers to movement.</p>	<p>This monitoring involves:</p> <ul style="list-style-type: none"> -Assessment of population levels in the cave before and during construction, and in the first 5 years of operation -A study of the movements of bats between the cave and the river valley, and along the river valley, using 2D or 3D acoustic trajectography, during the first year of operation. Ultrasound recorcing devices and Sonobat acoustic analysis software can be used for this purpose. 	P., Const., Op.	B-CHA, 2014	MIT08 MON00		<ol style="list-style-type: none"> 1. Trained/experienced bat specialist 2. Contractor/s 3. Supervising engineer 4. Public Enterprise for State Roads 	Breeding results of bats colony

V. BMP atlas map

See atlas attached

VII. Methods statement

Each mitigation measure is presented below, with a form per measure providing the following description elements:

- Target habitats and species: critical and natural habitats and/or species targeted in the CHA;
- Objectives and technical principles: global aim of the measure, main actions to be undertaken;
- Location: in link with constraint maps, specifying of where the measure has to be implemented within the study area;
- Responsible of the implementation: contractor (s), PESR, Biodiversity Supervisor;
- Period of implementation: pre-construction phase / Construction phase / Operation phase;
- Technical detail: description of detailed actions and operations that have to be implemented ;
- Cost information / BoQ elements : quantitative data (surface or length to be treated), equipment and machinery needed, cost/unit per item of the measure.
- Associated measures : possible interaction with other mitigation or monitoring measures of the BMP;
- References;

VII.2 MIT01 : In the Drenovo gorge and on natural habitats, minimize the footprint of construction activities through appropriate location of access roads and other work related facilities in modified habitats.

Target habitats and species

This measure targets all natural (including critical) habitats found in the vicinity of the road project and associated species, including critical cliffs and rocky slopes with rare chasmophytic (specialized rock-dwelling) vegetation, and critical habitat for the endemic snail (*Carinigera drenovoensi*) that is only found in Drenovo Gorge. It aims to limit the project's footprint on natural habitats, during construction and operation, and in particular on cliffs and rocky habitats.

Objectives and technical principles

- Avoiding habitat degradations/destructions and fauna disturbance and mortality during the project construction works
- Prohibiting works, access and wandering (vehicles and staff) in natural (including critical) habitats

Location

On the whole project construction works area, particularly in Drenovo gorge

[See atlas of constraints map](#)

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Technical details

In the design of the construction works, existing access roads and other works related facilities will always be preferred.

Whenever feasible, works, access roads and related facilities will be on agricultural land (modified habitat) rather than on natural habitats. Footprint will be strictly minimized on cliffs and rocky habitats in Drenovo gorge.

“Access roads” mean all roads and pathways going to the construction project area.

“Other works related facilities” mean all installations related to the construction of the road: base camp(s), vehicle maintenance and washing places, vehicle parking places, materials and construction equipments storage areas...

To avoid vehicles or staff wandering out of designated areas, a temporary visible limit will be erected around the perimeter designated as the construction site, whenever it comes into contact with natural habitats (no painting on rocks). Access to the petrifying spring (north-western entrance of Drenovo gorge) will be closed off with a fence, and an explanation sign.



Examples of visible temporary fence or sign to close working area and avoid vehicles or staff wandering © BIOTOPE

The location of all access, facilities and fences will be assessed and validated by a trained ecologist and enforced by a supervisor who will be responsible for maintaining these visible limits throughout the construction phase.

Construction, vehicles and people will be prohibited from going beyond the designated limit. Contractors and staff will be trained about the meaning of these limits, and their justification.

Contracts with contractors will include monetary sanctions to be applied in case their vehicles or staff penetrate rocky habitats and rocky slopes, including the cave above the river where bats roost, beyond the visible limits of the construction site.

BoQ elements

Project management measure included in contractor proposal. No supplementary cost.

Equipment required:

- Temporary fence;
- Wooden stakes ;
- 1 painted information sign made of wood;
- 1 temporary liftable barrier

Assessment (highest value) of total length of temporary plastic fence needed:

- road project length x 2 (both sides of the road project construction corridor) ;
- 1,5 x road project length to provide spare fence ;
- road project length x20% (access roads, temporary storages...)

= 15 000 x 2 x 1,5 + 3000 = 48 000m

Assessment (highest value) of number of wooden stakes needed: every 8 m all along the fence = 6000

Technical requirements for the plastic fence:

- UV-Stabilised polypropylen plastic mesh
- High resistance to traction
- 1 m high

Implementation indicators

Implementation on the field during the whole construction phase (photo and map report to PESR and EBRD)

Performance indicators

Number of natural habitats units impacted with access roads and works related facilities

Number of wandering or outside the fence going vehicles observed during ecologist supervision

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

SETRA, 2005 (translated 2007). Technical Guide. Facilities and measures for small fauna. 261 p.

VII.4 MIT02: In Drenovo gorge, strictly avoid loud preparation (blasting) / construction works when the Egyptian Vulture is breeding

Target habitats and species

Egyptian Vulture (and other rupicolous bird species) in Drenovo gorge

Objectives and technical principles

- Construction schedule mitigation in order to avoid disturbance and associated breeding failure of Egyptian Vulture (and other rupicolous bird species)

Location

Drenovo gorge area.
See constraint map.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Technical details

This measure targets the globally endangered Egyptian vulture for which Drenovo gorge is a critical habitat. It aims to minimize disturbance to breeding pairs of Egyptian vultures in Drenovo Gorge. If vultures are breeding in the gorge, noise, vibrations and activity must not exceed that of the existing road.

This measure does not apply if monitoring shows that the vulture has not returned to the nesting site (result of monitoring MON01).

If vultures are breeding in Drenovo Gorge, then avoid loud operations, mainly blasting and excavation, from March 15th to September 15th. Strict avoidance of blasting and excavation from March 15th to the end of July. See schedule proposal below.

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<p>Strict avoidance of loud working operations, mainly blasting, mining and excavations.</p>							<p>Beginning of all construction works only after migration start depending on the results of continuous monitoring (MON01)</p>				

Cost informations

Supplementary cost included in contractor proposal

✎ IMPORTANT: the schedule presented above will create strong contingencies in the undertaking of the first work operations in the gorge. Eventually the most suitable period to preserve both Vulture and bats is the end of the summer and in autumn. If first work operations are not finished during this short time the first year, working operations will have to be undertaken during the next suitable period the next year. The contactor and all technical stakeholders must take those contingencies into account in their technical proposal.

Implementation indicators

Actual construction works period, with particular attention in Drenovo gorge

Performance indicators

Breeding results of Egyptian Vulture in Drenovo gorge (dedicated report to PESR and EBRD): number of breeding pairs, breeding success

Associated measures

- MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase
- MON01 Live-monitoring of Egyptian Vulture during breeding season the year(s) the works are planned in the Drenovo gorge

References

VELEVSKI, 2014. Report from the survey on presence of the Egyptian Vulture (*Neophron percnopterus*) in the corridor of the express road, section Raec - Drenovo. 14 p.

VII.6 MIT03: In Drenovo gorge, elimination of Tree of heaven (*Ailanthus altissima*) - an exotic invasive - prior to the start of construction works.

Target habitats and species

This measure targets critical natural habitat: cliffs and rocky slopes, including critical habitat for the endemic snail (*Carinigera drenovoensi*) that is only found in Drenovo Gorge.

Objectives and technical principles

Tree-of-heaven is an invasive plant species originated in Asia that is currently degrading the bottom of rocky habitats in Drenovo gorge. Construction works, by moving soil and plant parts around, create bare grounds and disturbed areas, sometimes with supplementary fillings (embankments) or topsoil coverage, and could increase this degradation by spreading the plant to new locations in the gorge and river valley.

The aim of this mitigation measure is to reduce the colonization potential of local invasive plants Tree-of-heaven (*Ailanthus altissima*). All living individuals of *Ailanthus altissima* (including saplings) found in the expropriation area in Drenovo Gorge must be uprooted before the beginning of construction works.

Location

Drenovo gorge area.



Tree-of-heaven young individuals (white arrows) at the bottom of the cliffs in western entrance of Drenovo gorge (©Biotope)

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

Before construction.

Technical details

This measure will be undertaken in:

- Quick training about target-species recognition;
- Marking of main stands;
- Selective elimination by mechanical or manual removal.

Target species: Tree-of-heaven (*Ailanthus altissima*)

IMPORTANT: concerning Tree-of-Heaven (*Ailanthus altissima*) clearings, impervious gloves is imperative to avoid contact with the sap of the tree.

Selective elimination by physical method

Hand pulling - Very young seedlings are fairly easy to pull or dig out, depending on soil conditions. Seedlings are easily distinguished from root sprouts by their more slender stems, trifoliate leaflets, and cotyledons (if still present). Pull when soils are moist and be sure to remove the entire root.

Grubbing - For saplings or young trees, hand grubbing or mechanical extraction of roots may be effective. Prefer mechanical grubbing for the biggest strains (mature trees or dense stands). Removal of the entire root is necessary for control of individual trees.

Hand pulling and grubbing of suckers and seedlings have to be repeated frequently to exhaust the strain.

☞ Note that the action expected is more a clearing action than a real tree cutting action, most of the plants are young specimens. Also note that density of *Ailanthus* is quite low, even if widespread in the expropriation area in Drenovo Gorge.

☞ Regardless of the strategy used, the key to successful long-term control of tree-of-heaven is to monitor treated areas for several years after initial treatment. Always be prepared to remove any new plants quickly. Failure to perform follow-up monitoring and treatment could result in a return to pretreatment density levels.

BoQ elements

Assessment (highest value) of the surface to treat: 75% of the rocky habitats in Drenovo gorge = $75\% \times 80\,000\text{ m}^2 = 60\,000\text{ m}^2$ (=6ha)

NB: Within this area to treat, most of the plants are young specimens. Also note that density of *Ailanthus* is quite low, even if widespread in the expropriation area in Drenovo Gorge

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Number of sections where preliminary clearings were not undertaken

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

LEVY et al., 2011 - Plantes exotiques envahissantes du nord-ouest de la France, 20 fiches de reconnaissance et d'aide à la gestion. Conservatoire Botanique National de Bailleul. 88p. Bailleul.

USDA, 2014. Field Guide for Managing Tree-of-heaven in the Southwest.



VII.7 MIT04: In the Drenovo gorge, implement dust suppression measures to reduce dust deposits on nearby natural habitats

Target habitats and species

This measure targets critical natural habitat: cliffs and rocky slopes, including critical habitat for the endemic snail (*Carinigera drenovoensi*) that is only found in Drenovo Gorge. These habitats could be impacted by dust deposits during construction.

Objectives and technical principles

Construction works will create dust pollution in the air. This dust will deposit on nearby vegetations or habitats and could degrade them

In dry and/or windy weather, sprinkle water on uncovered soils and construction materials, on a regular basis, to stop dust formation.

Location

Drenovo gorge area

[See atlas of constraints map](#)

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Dust suppression measures are year round. Winter traction measures shall take into account the potential for dry season dust generation, as discussed above.

Dry season measures shall take into consideration weather forecasting for wind and dry spells that will require the implementation of frequent road and exposed soil / crushed rock watering program.

Technical details

A dust suppression plan will include the following elements for implementation during the construction phase of the project:

Summer dry season measures

All visibly dry disturbed soil and road surfaces shall be watered to minimize fugitive dust emissions. Watering may be used in combination with binders or palliatives. If binders are used, they must consider runoff impacts to waterways and wildlife.

- If binders/palliatives are used, products must be approved for low toxicity. Sodium chloride is not suitable due to environmental impacts.
- Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water of dust palliative/binders to the project.
- If reclaimed water is used, the sources and discharge must meet EU standards for potable water quality. Non-potable water shall not be conveyed in tanks or drain pipes that will be used to convey potable water and there shall be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances shall be marked "NON-POTABLE WATER - DO NOT DRINK" in English and in the language of the local population with an accompanying universal pictogram.
- Dust producing earth moving and stone crushing activities shall be watered to reduce dust emissions.
- Re-application of water to road surfaces shall adapt to the prevailing weather and vehicle frequency to ensure suppression of fugitive dust emissions.
- Access to water source(s) for dust suppression shall consider impacts to aquatic resources including habitat

protection. Authorization from a project ecologist shall be obtained to determine access and pumping protocols.

In areas not expected to handle vehicle traffic, vegetative stabilization of exposed soil will be implemented. Vegetative cover provides coverage to surface soils and slows wind velocity at the ground surface, thus reducing the potential for dust to become airborne. A dust suppression plan must include methods of reducing exposed soils through vegetation preservation and/or establishment.

- Short term soil cover for smaller areas may use mulch and/or tarps to provide cover until vegetation can be established.

Vehicle size and speed on unpaved roads contributes directly to dispersion of dust. All unpaved areas shall have a posted speed limit of 40 km/h. Slower speeds for the larger vehicles shall be used to further reduce dust emissions during high dust risk periods as determined by the project ecologist.

Wind breaks are barriers (either natural or constructed) that reduce wind velocity through a site and, therefore, reduce the possibility of suspended particles. Wind breaks can be trees or shrubs left in place during site clearing or constructed barriers such as a wind fence, snow fence, tarp curtain, hay bale, crate wall, or sediment wall.

- If bare soil subject to wind generates dust, then, in the absence of measures to mitigate with vegetation/mulch/cover, a wind break shall be employed. Note that vegetation is the preferred option.

Earth or other material tracked onto neighbouring paved roads shall be removed promptly.

- Project entry / exits onto paved roads shall include measures to reduce tracking of mud onto public roadways; this can include tire wash and/or stabilized construction entrance.

Dust generating activities shall be limited during periods of high winds (over 25 km/h) unless water sprinkling is used on the dust generating source.

Access of unauthorized vehicles onto the construction site during non-working hours shall be prevented.

Dump trucks carrying dust generating loads will employ covers to reduce dust emissions.

Gravel surfacing of high use dust generating road sections will be considered. If gravel surfacing is employed, use of durable aggregates that are less likely to breakdown during road use will be favoured over softer, less durable materials. This will reduce the production of dust particulates.

A daily log shall be kept of fugitive dust control activities.



Examples of dust mitigation systems during construction works

Winter season and all-season unsurfaced (temporary gravel roads) road use planning

Winter vehicle traction needs will be met by using sand or aggregate that has been screened or washed to reduce the fine particle fraction.

Winter traction materials with angular particles (i.e. crushed) shall be used for improved traction and is better able to embed into the road surface and thus contribute less to dust production and frequency of reapplication.

If gravel surfacing is employed, use of durable aggregates that are less likely to breakdown during road use will be favoured over softer, less durable materials. This will reduce the production of dust particulates.

Spring cleaning of accumulated winter traction materials will be implemented to suppress the availability of dry season fugitive dust.

Use de-icing compounds in late winter / early spring on specific sections of road (permanent or temporary access) that are located in sensitive habitat areas. Consult with the project ecologist to identify these road portions.

Ensure appropriate road sweeping and collecting equipment is available, well maintained and functioning for the spring road cleaning season (depending on the local climate, up to 10 weeks).

BoQ elements

Cost estimates will vary widely depending upon prevailing climate during the project, linear extent of unsurfaced haul roads, capital equipment expenditures, equipment operating costs, material costs, activity-related costs (watering frequency, vegetation establishment, and distances to and from water sources).

Equipment - Dust mitigation systems including:

- 1 sprinkler truck ;
- 1 water tank

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Number of blasting and mining operations without watering operation in Drenovo gorge

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

VII.8 MIT05: In the Raec river, restore the profile and substrate of the river to its original condition after construction of pillars, bridges, and embankments affecting the riverbed.

Target habitats and species

This measure targets natural habitats in Drenovo gorge (river), and aims to achieve appropriate post-construction of the river's structure and hydrology. This measure complements MIT11 on river bank continuity.

Objectives and technical principles

The construction & operation footprint will be minimized, in particular during construction and the associated channelling of water flow within the river-bed to allow access or construction (e.g. using coffer dams around piling works); and the riverbed will be cleaned (evacuation of waste materials and equipment) and the riverbed's level and substrate granulometry restored to its state prior to construction (as documented in photographs and measurements).

Location

Raec River.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During and after construction

Prefer low water level period: 15th of July to 30th of October.

Technical details

Work in river will be minimized through limited diversions of water flow and the use of minimal size coffer dams / sheets around piling works.

1/Implementation of a hydrological/sedimentary baseline study prior to construction

At and near the planned structures, photographs of the river will be taken before construction, and measurements will be taken of its profile (width/depth/slope) and of the granulometry of sediments.

2/After construction is completed, restoration will be undertaken to achieve a profile and granulometry similar to that documented prior to construction (photographs, hydrological and sedimentary baseline study).

Any materials or equipment used in diverting water away from construction areas will be removed once construction is complete.



Interesting facies of Raec River to be conserved or restored after construction

BoQ elements

Estimated length of river to be restored: 2,5 km (section of Raec River within the gorge)

Construction machinery including:

- 1 jaw crusher;
- 1 mini-excavator

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Length of restored riverbed river.

Performance indicators

Comparison of profile and substrat before and after construction works.

Associated measures

MON01 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

<http://www.eaurmc.fr/lobservatoire-des-couts/preservation-et-restauration-des-milieus-aquatiques/couts-de-restauration-hydromorphologique-des-cours-deau.html>

http://www.onema.fr/IMG/Hydromorphologie/24_4_rex_r4_trec_vbat.pdf

<http://www.therrc.co.uk/manual-river-restoration-techniques>

VII.10 MIT06: In the riparian forest, along the Raec river, remove Locust Tree (*Robinia pseudoacacia*) - an exotic invasive - to enhance the conservation status of the habitat.

Target habitats and species

This measure targets a natural habitat: the riparian forests along the Raec River.

Objectives and technical principles

Stands of *Robinia pseudoacacia*, an invasive tree species, degrade the natural riparian forest habitat and this measure aims to enhance the forest by removing them.



Alignment of Robinia pseudoacacia along Raec River bed (©Biotope)

Within the expropriation area (about 10 ha), all individual trees and saplings of *Robinia pseudoacacia* will be located and cut, with the stumps killed. Fallen trunks and branches will not be removed, to provide micro-habitats to specialized species.

This work will be overseen by a trained ecologist.

Location

Raec river riparian forest within expropriation area.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

Before construction.

Apply stump treatments mid-July to the end of December. Application in late summer, early fall or the dormant season has proven effective. Avoid using herbicides prior to rain events.

Technical details

This measure will be undertaken in:

- Quick training about target-species recognition;
- Marking of main stands;
- Selective elimination by mechanical or manual removal associated with chemical and biological method.

Target species: Locust Tree (*Robinia pseudoacacia*)

Mechanical control techniques that entail mowing, cutting or burning provide only temporary abatement of this species as they spread vegetatively through the root system as well as from stump sprouting. Note that this is a hardy plant and there are reports of survival even following chemical treatment. Whatever control measure is adopted, a follow-up treatment plan is necessary. Chemical treatments are often coupled with other methods (mechanical and biological). Many chemical control protocols exist. Foliar application or stem, bark impregnation with different active substances at different periods the year have been tested and implemented by many managers with varying degrees of success.

A brushing saplings or cut stem at ground level gives satisfactory results in the following assay and specific period of treatment. The saplings/suckers treatment brushing their leaves is also recommended in operations followed to limit the number of years of surveillance.

Glyphosate (trade name Roundup) can be foliar-sprayed on black locust leaves as a control when trees are actively growing. For good control, all leaves on all shoots should be treated. Roundup should be applied by hand sprayer at a 0.5- to 1.5-percent solution (0.6 to 2 ounces of Roundup per gallon of clean water). Spray coverage should be uniform and complete. Do not spray so heavily that herbicide drips off the target species.

Black locust stems can be cut at the base with brush-cutters, chainsaws or hand tools, followed by treating the stump with a 20-percent solution of Roundup (Glyphosate). While the Roundup label recommends a 50- to 100-percent concentration of herbicide for stump treatment, a 20-percent concentration has proven effective. The herbicide should be applied either by spraying individual stumps using a hand held sprayer or by wiping each stump with a sponge applicator. Treatment should occur immediately after cutting for best results. Application in late summer, early fall or the dormant season has proven effective.

Glyphosate is a nonselective herbicide, so care should be taken to not let it come in contact with non-target species. Foliar spray of glyphosate should not be used in high quality areas because of problems with spraying non-target species.

Any herbicide should be applied while backing away from the treated area to avoid walking through the wet herbicide. By law, herbicides only may be applied according to label directions. As mentioned earlier, follow-up treatments are usually necessary because of black locust's prolific sprouting and rapid growth.

Note: Mention of specific pesticide products in this document does not constitute endorsement. Chemical control is regulated and strict adherence to dosage, handling, application and disposal protocols must be adhered to.

These actions (mechanical + chemical method) will be associated with **biological methods**. The Locust Tree fears competition and does not tolerate shade. In relation with offset measure OFF03, indigenous trees will be planted and will participate to the Locust Tree elimination.

Pre-construction and construction phases

Additional considerations for this measure are below:

The ecologist will conduct field surveys within the project boundaries, including material stockpile sites, temporary field installation sites, site access and parking areas to identify and map existing concentrations of Black locust.

Black locust infestations will be clearly marked on planning documents as well as in the field. If clearing of these areas is to occur, the vegetative material and top soil must not be mulched and spread or transported off site and spread as ground cover.

Marking of Black locust in the field should include seed pod drop zones. Once the seed pods have dropped, surface soil mulching and spreading are prohibited. If clearing of these areas is to proceed, the surface vegetative layer containing seed pods must be stockpiled and either completely tarped to prevent germination or burned to kill seeds.

If non chemical control measures are used, repeatedly cuttings of all shoots and suckers will be required over several years to achieve some degree of control.

BoQ elements

Included in contractor proposal

Costs will be dependent upon degree of infestation, area to be treated, choice of treatment and employment of a certified pesticide technician.

Assessment (highest value) of the surface to treat: about 10 ha (= 100 000 m²)

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Number of sections where preliminary clearings were not undertaken

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

LEVY et al., 2011 - Plantes exotiques envahissantes du nord-ouest de la France, 20 fiches de reconnaissance et d'aide à la gestion. Conservatoire Botanique National de Bailleul. 88p. Bailleul.

VII.12 MIT07: No concrete / shotcrete projections on cliffs and steep slopes

Target habitats and species

This measure targets critical natural habitat: cliffs and rocky slopes, including critical habitat for the endemic snail (*Carinigera drenovoensi*) that is only found in Drenovo Gorge

Objectives and technical principles

These habitats would be lost if covered in exogenous material such as concrete / shotcrete.

No concrete / shotcrete projections on cliffs and steep slopes will be undertaken.

Location

Drenovo gorge area.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Technical details

No concrete / shotcrete projections on cliffs and steep slopes will be undertaken.

Cost informations / BoQ elements

Supplementary cost included in contractor proposal

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

No concrete projection in Drenovo gorge

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

<http://www1.geobruigg.com/contento/fr-fr/Home/Barri%C3%A8respare-pierres/tabid/2266/Default.aspx>

VII.14 MIT08: In Drenovo gorge, on the bridge below the cave, install a continuous high palisade along each side of the bridge, to prevent collisions with bats travelling between their roost

Target habitats and species

This measure targets bats species. A large breeding and wintering bat roost has been found in the vicinity of natural habitats in Drenovo gorge (riparian forest), and the critical rocky habitats.

Objectives and technical principles

Avoiding bats mortality by mitigating the crossing of natural flight paths on the bridge below the case.

To reduce bat collisions while they forage in riparian forest in the closest zones to the exit/entrance of the cave in Drenovo gorge, a set of continuous high palisades, at least 3m above the bridge rails, will be built (during construction) and maintained (during operations). The palisades can be built of any long-lasting and vibration and wind resistant material (including but not limited to wood panels, some plastics, and metal mesh within metal frames).

Location

Drenovo gorge area, on the bridge below the cave.

Responsible of the implementation

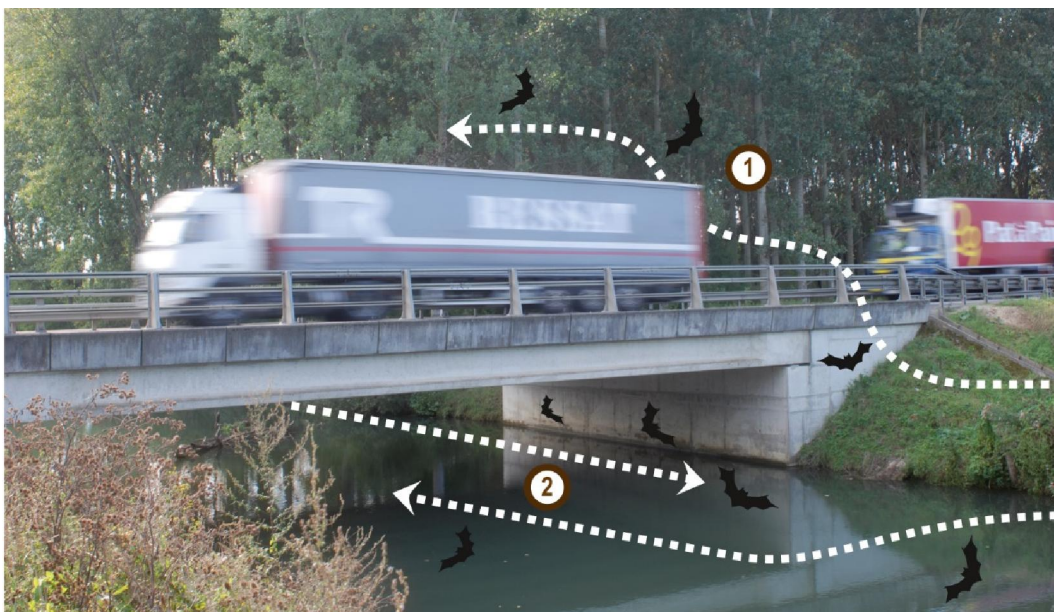
Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

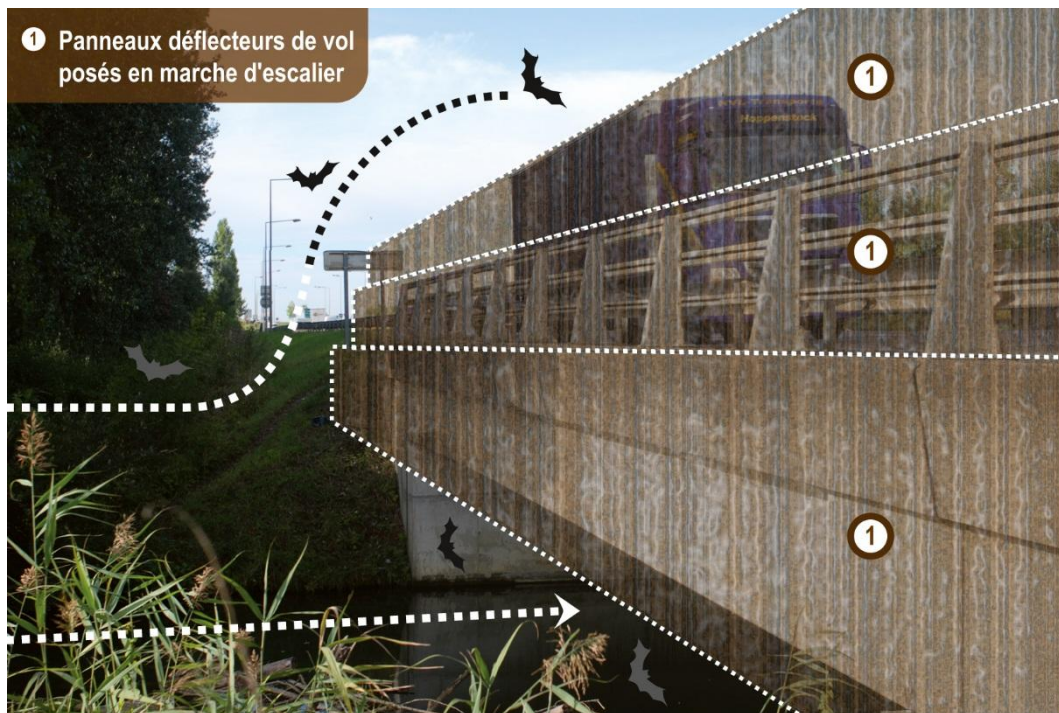
During construction

Technical details

Illustrations of overall concept: schematic flight path of bats above (1) and under (2) an unprotected bridge:



Schematic flight path of bats above and under a bridge protected by Wooden palisades (1) preventing bat collisions with vehicles:



Note that the palisades must be high enough to prevent collisions with large vehicles such as trucks that cause most of the fatalities.

Use palisades at least 3 meters high. Use wire mesh which is lighter and less sensitive to wind.

The wire mesh will be set between the vertical poles (one every 2 or 3 m: 100 poles minimum).

Technical requirement:

- Width of wire: 5 mm
- Diameter of open part: 40 mm
- Material: steel (square or hexagonal) + anticorrosion protection (zinc/aluminium).



Examples of types of appropriate mesh



Example of a surrelevated road equipped with a wire mesh palisade to prevent flying fauna from collisions with vehicles

Cost informations / BoQ elements

Estimation of palisade area required: length of the bridge (in m, both sides: estimated at 200m) x target height of 3m = 600 m²/bridge.

The mesh can be purchased “off the shelf” as 3 m wide strips of mesh, with the cost dependent on the quality of the construction of the mesh, and the durability of the material used (corrosion resistance).

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Evolution of bats populations in the main cave of Drenovo gorge (dedicated report to PESR and EBRD)

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

Arthur, L. & M. Lemaire 2010 Les Chauves-souris de France, Belgique, Luxembourg et Suisse. Biotope / Publications scientifiques du Muséum, 544 pp.

VII.15 MIT09: Design road structures so as to ensure animals can use the banks of the Raec river throughout the gorge

Target habitats and species

This measure targets natural habitats in Drenovo gorge (riparian forest), to ensure continuity of habitat for mammal species such as the European otter (*Lutra lutra*).

Objectives and technical principles

Road structures, including bridges, must not block or impair movement, on land, of small mammals, including in periods of high water. When river banks are destroyed or lose their function (due to an obstacle), an appropriate substitute will be put in place. This can consist of tiered banks made of large boulders located at the base of built structures. A continuous route must be available for small mammals even in high water.

This work will be overseen by a trained ecologist.

Location

Raec river throughout the gorge: 5 bridges are planned to be built.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Technical details

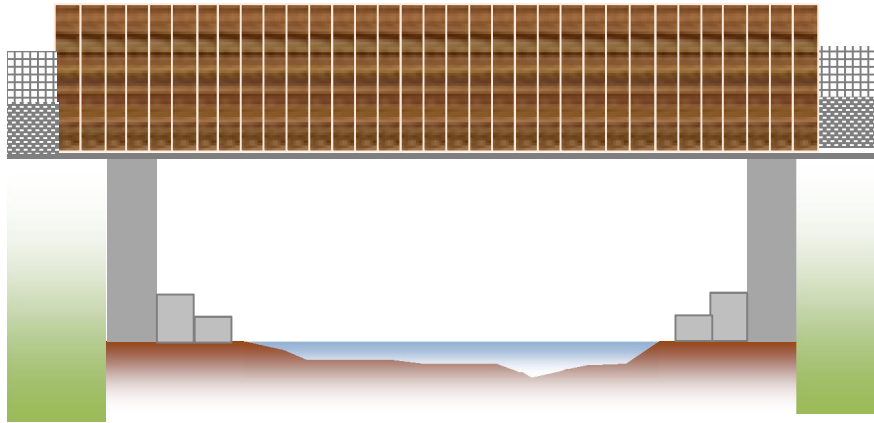
The enhancement of ecological functionality of bridges aims to facilitate fauna crossing during flood period by avoiding it to pass by the road. This will be undertaken in complementary ways:

- Equipment of one abutments of the bridge (concrete frames) by two tiered (stepped) ledges 0.4 m wide;
- Connections between stepped ledges and natural river banks: exterior ramp (made of concrete) without vegetation; connected to the bank or easily accessible, even in flood

Type of material for the ledges and exterior ramps: made of concrete (Reinforced concrete C30 M100 1.5m³/m', please see as well Technical Specifications, part 7.455467)

Exterior ramps: gently sloping (30 °), with rough coating.

Effectiveness of the connection between the tiered ledges and the natural banks will be ensured by a natural landscaping.



Outline. Bridge (or square section culvert) abutments equipped with tiered river-banks (2 x 0.40 m wide ledges). © BIOTOPE



Illustrations of suitable ledges for fauna crossing



Illustrations of effective connections from ledges to the natural river bank

BoQ elements

Length of the stepped ledges = length of the bridge that is planned to be equipped x 1 because only one abutment per bridge needs to be equipped + 2x5m (each side of the bridge) for concrete ramps to connect the ledge to the natural bank

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Number and variety of fauna crossings (photo report from photo control units installed under the 5 bridges)

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

SETRA, 2005 (translated 2007). Technical Guide. Facilities and measures for small fauna. 261 p.

VII.17 MIT10: In Drenovo gorge, ensure that any cliffs and slopes that remain after construction are stabilized, without contribution of soil or planting

Target habitats and species

This measure targets critical habitats in Drenovo gorge (cliffs and rocky slopes),

Objectives and technical principles

This measure aims at ensuring that as much rocky habitat can be created during road construction. Slopes above and below the road, including cliffs and walls, must be designed to facilitate colonization by rock-dwelling vegetation: exogenous material, including concrete (see MIT07) or soil must be used, and no planting must be undertaken.

Small cracks and crevices (<5cm wide), and small ledges, must be favored whenever possible for example in stabilizing slopes or designing the outside surface of retaining walls and other vertical structures (no smooth concrete).

Invasive alien species, in particular *Ailanthus altissima*, must be controlled in Drenovo Gorge through regular roadside maintenance operations.

Location

Drenovo gorge area.

Responsible of the implementation

Contractor - Supervised by supervising engineer (Biodiversity supervisor)

Period of implementation

During construction

Technical details

/

Cost informations / BoQ elements

Supplementary cost included in contractor proposal

Implementation indicators

Implementation on the field during construction works (photo and map report to PESR and EBRD)

Performance indicators

Chasmophytic vegetation recolonization.

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

References

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VIII. Biodiversity Monitoring and Evaluation Plan

VIII.1 MON00: Supervision of works by a trained and experienced ecologist during the construction phase

Target habitats and species

This measure targets all natural habitats, including critical habitat, along the proposed road project.

Objectives and technical principles

Supervision necessary for the effective implementation of all mitigation measures, and to ensure compliance of contract terms by workers.

A trained and experienced ecologist will advise on the limits of the construction site when natural habitats may be affected, and make them visible through e.g. tape or other means (no paint on rocks) - as required in MIT01.

Weekly visits to the works, during construction, in Drenovo Gorge, will be carried out to check compliance with MIT01, in particular.

Monitoring of dust deposits on rocky habitats and of air quality will be undertaken during construction.

A detailed mapping of impacts will be produced, and a final synthesis report on residual impacts (including areas of critical and natural habitats lost) will be communicated to EBRD.

Location

On the whole project construction works area

Responsible of the implementation

Supervision engineer (Biodiversity supervisor) - PESR

Period of implementation

During construction

Technical details

Supervision of works during the construction phase of the project must be by an individual with the following training and experience :

- Previous experience with construction projects, in particular linear projects (roads, rail, transmission lines, pipelines...).
- Experience in at least one of environmental monitoring, impact assessment, or ecological field work.
- Training or experience in construction mitigation measures, pollution intervention and clean-up practice,s stream restoration practices, and erosion and sediment control practices.

The role of the ecologist will encompass the following skills, activities and deliverables:

- Management plan preparation, report writing and presentations.
- Project environmental risk and mitigation presentations, staff / worker environmental awareness and best

practices presentations, environmental awareness updates.

- Supervision of works underway, communications with worksite personnel, communications with the local population and stakeholders groups.

Equipment needs will encompass, but not be limited to:

- Personal construction safety attire (boots, gloves, protective glasses, hard hat, reflective vest).
- Degradeable marking tape and/or non-toxic biodegradeable marking paint.
- Cellular phone.
- Calendrier

The role of the project ecologist will encompass the following time-based preparation:

Pre-construction phase

Pre-construction site familiarization to identify and locate environmentally sensitive areas (ESA) as well as to photograph / GPS locate habitats as needed for planning needs.

Pre-construction mitigation measure implementation planning with project directors and engineers to ensure environmental measures are integrated into the planning process.

Construction phase

Regular visits to the works in progress to ensure compliance with authorizations, pre-project environmental planning, implementation of environmental mitigation measures, best practices for construction site risk factors:

- *Presence of the project ecologist every day during working operations in Drenovo gorge*
- *Presence of the project ecologist two times a week on the project construction area outside of the Drenovo gorge*

Assessment of, implementation and maintenance of mitigation measures prior to and during the active work phase at ESA sites.

Collection of data, information, and evaluations that will be used to report on actual work phase impacts and residual impacts (if any) following mitigation measures.

Post-construction phase

Production of a final report summarizing the impact reduction measures employed, their relative strengths, success, weaknesses. This report will provide quantitative evaluations of total areas of critical and natural habitat areas lost, degraded, and protected during the construction phase period.

Employment costs for an ecologist during the construction phase including pre-construction planning preparation and post construction reporting phase

VIII.3 MON01: In Drenovo gorge, regular (twice à week) monitoring of Egyptian vulture presence and behaviour will be undertaken from March 15th to September 15th, during the construction phase.

Target habitats and species

This measure targets the Egyptian Vulture

Objectives and technical principles

This measure targets the critical habitat of the Egyptian vulture. Disturbance is a key risk to the breeding success of the Egyptian vulture in Drenovo gorge. As per MIT02, work susceptible to disturb a breeding pair must be avoided between March 15th and September 15th. This monitoring measure aims to guide the implementation of MIT02.

Presence in Drenovo gorge of a bird specialist familiar with the Egyptian Vulture, with experience of nest watching with telescopes, once a week from mid-March to mid-July and every day from mid-July until the beginning of post-nuptial migration

The aims of this live-monitoring are:

- To ensure that the Egyptian Vulture still breed in Drenovo gorge the year(s) the work are planned;
- To ensure that there is no disturbance from the working operations outside of the Drenovo gorge, and to alert the operators if it is not the case;

To determine when Egyptian Vultures have left the place in order to allow the beginning of working operations in the gorge as soon as possible in late summer

Location

Drenovo gorge and breeding site of Egyptian Vulture.

Responsible of the implementation

Contractor - Supervising engineer (Biodiversity supervisor)

Period of implementation

From march 15th to September 15th (breeding season) the year(s) the works are planned in the Drenovo gorge.

Technical details

Between March 15th and September 15th, during construction, 1-day observation sessions, twice a week, by an independent and trained ornithologist will determine whether or not a pair (or several pairs) of Egyptian vultures settle(s) in Drenovo gorge upon return from migration (early spring, from March 15th onwards). If not, MIT02 does not apply. If so, then MIT02 applies and construction work will be informed of its effects on the behaviour, and breeding success or failure, of the Egyptian vulture, including the date of departure for outwards migration, after which work can resume. In case the nest remains unoccupied or is abandoned, offset measures will be implemented.

A contract with an independent ornithologist (to be approved by EBRD) will be required in the tender documents for construction.

Cost informations

Supplementary cost included in contractor proposal

Twice a week during 24 weeks

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

MON02 On In Drenovo gorge, monitoring of Egyptian Vulture breeding during the first 5 years of operation



VIII.4 MON02: In Drenovo gorge, monitoring of Egyptian Vulture breeding during the first 5 years of operation

Target habitats and species

This measure targets the Egyptian Vulture

Objectives and technical principles

This monitoring aims to control that the new road in operation phase does not disturb the breeding success of Egyptian Vultures in Drenovo gorge. If not, the monitoring would be stopped after 5 years. If the traffic disturbance is supposed to have damaging effect on Vulture breeding, offset measures would be carried out (see offsetting strategy).

Monitoring driven by a bird specialist.

A simple presence/absence protocol of the species during breeding season and estimate of breeding success.

The aim of this protocol is to check the non-disturbance of breeding conditions for the Vulture after the road construction.

Location

Drenovo gorge and breeding site of Egyptian Vulture.

Responsible of the implementation

PESR

Period of implementation

This work will be carried out every year during the five first years following the construction.

From march 15th to September 15th (breeding season).

Technical details

An independent trained birdwatcher will undertake observations once a week, during a full day, over 5 breeding seasons, and report on the breeding behaviour of the vultures, and identify any likely causes of unsuccessful breeding.

This monitoring measure will only be undertaken if the vulture is present (as established through MON01). This means that a 2-step contract will be necessary: (1) first assess whether vultures are breeding, and if so (2) monitor breeding success

Cost informations

Supplementary cost included in contractor proposal

Once a week during 5 breeding seasons (5x24 = 120 weeks) and associated reporting.

Associated measures

MON00 On the whole project construction works area, constant supervision of an ecologist during all construction phase

MON01 In Drenovo gorge, regular (twice à week) monitoring of Egyptian vulture presence and behaviour will be undertaken from March 15th to September 15th, during the construction phase



VIII.6 MON03: In Drenovo gorge, monitoring of impacts on the bat population using the cave above the road

Target habitats and species

This measure targets the bats species which roost in the cave above the road, i.e. *Rhinolophus ferrumequinum*, *R. blasii*, *R. euryale*, *R. hipposideros*, *Miniopterus schreibersii*, *Myotis myotis*, *M. mystacinus*, *Pipistrellus pipistrellus*, *P. nathusii*.

Objectives and technical principles

The objective of this monitoring measure is to control that the new road will not have a negative impact on the bat populations trend, and that the mitigation measures proposed here will allow minimizing bat fatalities around the bridge over the Drenovo River.

The cave that hosts the bat colony will be visited twice a year (once for the breeding period in early summer; once for hibernating populations in winter) by bat specialists, in order to identify the species and count the number of individual per species. We will then be able to document the population trend over a period of five years.

In addition, an acoustic survey will take place during five years in order to monitor bat activity around the roost cave, especially in the vicinity of the river, where the new road may have an impact. These acoustic survey will be conducted three times a year, for three consecutive nights, using three automatic ultrasound recorders (ex. SM2 bat). The important amount of data collected will have to be process using automatic identification software. Both qualitative and quantitative analyses will be performed to monitor the amount of bat activity, for each bat species, in the project's area.

At each field work session, the bat specialists will check for bat corpses around the bridge to document possible bat fatalities.

A draft report will be communicated to EBRD every year. A final report, including maps, population trend analysis and recommendations to improve the mitigation measures, will be communicated to EBRD at the end of the fifth year of monitoring.

Location

Into the cave that host the bat populations for the breeding and hibernation monitoring; and around the bridge for night activity and bat fatalities monitoring.

Responsible of the implementation

PESR

Period of implementation

Five years. The monitoring should ideally start before the construction phase, if not as soon as possible.

Technical details

Bat colonies in cave

Bat counts in cave must be carried out by a skilled and experienced bat specialist, to ensure successful research of isolated individuals and groups of bats, and a correct identification of the species, with limited perturbation (especially in summer when the bats are active). Keeping the perturbation as limited as possible during the field surveys is essential as recurrent perturbations can cause desertion of the bats, introducing a major bias in the monitoring process. However, counting bats in the cave remains the most reliable way to estimate the population trend and has to be implemented.

For bat swarms in winter, the count will be done from pictures, taken with a suitable camera, making possible posterior check of species identifications and numbers. Taking pictures is the less disturbing way to count hibernating bats as it limits the time spent in the cave. The best period for winter survey is when temperature is the coldest, generally january or february.



Counting hibernating bats from pictures limits the disturbance and is more accurate.

For breeding colonies, the best period should be between June and July, but the date can be adapted depending on the results of the first surveys. A visit at night, just about an hour after dawn, allows estimating the number of juveniles left when most of the adults are foraging outside. Taking pictures of breeding colonies is not recommended, excepted at night when most adults are out of the cave. Breeding adults may be counted during the day, from a distance, with binoculars, to limit perturbation.

Bat activity acoustic survey

Bat activity acoustic surveys will be performed at fixed dates in spring, summer (when it can be coupled with breeding colonies cave survey) and autumn. Three automatic ultrasound recorders will be used, positioned at the same place each time. Data will be processed using automatic species identification software; atypic records will have to be checked specially by a bat specialist.



Automatic ultrasound recorders allow collecting valuable data

Bat fatalities

During each field session in spring, summer and autumn, a quick check for bat corpses will be done around the bridge. The places where dead bats may be found will be recorded using GPS. Corpses will be collected for identification at the lab and may be given to museums or kept in a private collection.

Identification of corpses will rely on classic characters (face, ears, fur color...) or, if the corpses are damaged, skull and teeth remains, forearm or tibia measurements... for which plenty of data is available in the literature. Any occurrence of a bat corpse has to be precisely referenced and located on a map.

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