



REPUBLIC OF NORTH MACEDONIA
PUBLIC ENTERPRISE FOR STATE ROADS

EXPRESS ROAD KRIVA PALANKA – RANKOVCE

ENVIRONMENTAL AND SOCIAL MEASURES

**FOR STABILIZATION OF SLOPES OF THE PROJECT CONSTRUCTION OF
EXPRESS ROAD A2, KRIVA PALANKA – RANKOVCE, ON THE TWO
SUBSECTIONS KRIVA PALANKA-DLABOCHICA DLABOCHICA-STRACIN**

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1. Project Overview

The new express road between Kriva Palanka and Rankovce is a green field road, situated north of the existing alignment. It is part of the Corridor VIII and is planned as an ultimate four-lane divided motorway. Currently the underway construction is carried out in two lanes to express road configuration, with aim at a later stage the other half to be built thus achieving the motorway standard. The express road is being constructed on a hilly terrain, encompassing 16 bridges and viaducts. The length of the new express road is approximately 23 km. The subject section Kriva Palanka to Rankovce is divided into two sub-sections:

- (1) Kriva Palanka to Dlabochica (km 3+062 – 10+308), in length of app. 7.25 km (Lot 2 – blue line), and
- (2) Dlabochica to Stracin (Chatal) (km 10+308 – 25+850), in length of 15.55 km (Lot 1 – yellow line).

The Construction of Express Road A2 is being implemented by the Public Enterprise for State Roads of the Republic of N. Macedonia (PESR) as a key implementing body for carrying out the investments for state roads. The project implementation is financially supported by the World Bank under the Road Upgrading and Development Project (RUDP)¹.

Due to the identified instabilities in the large excavations during the construction phase, the adjustments of the route were considered as necessary. The adjustments were required to ensure the stability of the terrain via cut-slopes mitigation and erosion control, **which consequently resulted in the need for widening of the project scope and expropriation line**. The new project designs – the adjustments for stabilization of slopes (Supplements to the Detailed Design) will contribute to preventing the failure of cuts on different sections along the route and thus provide conditions for future safe and continued traffic.

By Leaving this problem unresolved, the unstable cut-slopes would pose a constant financial burden, as additional costs for repairing/compensating of the caused damage will be required. This significant impact will be avoided through adjustment of the unstable cut-slopes that will be carried out in accordance with the CLIMATE RESILIENCE DESIGN GUIDELINES for designing of roads resistant to climate impact², thereby contributing to road users' safety and minimizing the constant risk of road damage and closure, usually accompanied with economic impacts.

2. The project area landscape

¹ Road Upgrading and Development Project (RUDP) is consistent with the National Transport Strategy (2007-2017), which sets out (1) the completion of motorway corridors, and (2) the efficient connection of the road network to the corridors as its short-term priorities. The proposed focus on east Corridor VIII will enhance the country's connectivity and will assist the country to fulfil its EU commitments to strengthen and further develop the Trans-European networks as well as address the national priority of developing an alternate upgraded access to seaports considering the past geopolitical disruption of their main access.

² Prepared for PESR as a beneficiary, within the World Bank Road Upgrading and Development Project (RUDP), in August 2019
<http://www.roads.org.mk/470/5151/climate-resilience-design-guidelines-for-the-public-enterprise-for-state-roads>

The Express Road Rankovce – Kriva Palanka is part of the National Road A2 and is situated in the north-eastern part of the Republic of North Macedonia and passes through the Municipalities of Kriva Palanka and Rankovce with landscape which is hilly and mountainous. The landscape along the proposed road alignment is represented by natural habitats, which include forests and shrubs, grasslands; as well as anthropogenic habitats that being represented by tree plantations, grasslands of anthropogenic origin, agricultural lands, and urbanized areas. All natural habitats have been under strong anthropogenic pressure for a long time, and currently most of them are at different stages of degradation.

The Environmental and Social Impacts Assessment Study (ESIA)³ prepared in the project design phase has analyzed the natural habitats and assessed the ecosystems value in the project area by defining a strip of 400 m (200 m each side of the proposed road axis). The ESIA itself identified several areas/landscapes within the study area, which bear various status of protection and ecological importance. The most significant ones are listed in following:

- The proposed protected landscape Osogovo Mountain – with closest distance being 2 km at chainage km 0+200. The road construction will not impact this landscape.
- The proposed protected area Osogovo-German Bio-corridor, which extends south-north from the Osogovo Mountain to the German Mountain (and more generally, connects the Osogovo Mountain with the range of mountains on the border with Serbia). The road alignment crosses this landscape corridor (which is part of the National ecological network of Macedonia MAC-NEN, 2011) at km 5+872 to km 9+290.
- The study area habitats are represented by oak forest, black locust plantation, conifer tree plantation, hill pastures, orchards and agricultural land.

The entire section of the road goes parallel with the Kriva River, with the closest to the river point (850m) being at km 10+000, and the farthest point (5 km) being at km 19+290.

3. Environmental and Social Impact Assessment Study and its applicability for the new cut-slopes

As previously stated, the instability of the terrain required a new design for mitigation and stabilization of the slopes along the entire route.

Guided by the fact that for the most part of the route, the project scope for implementation of the new cut-slopes design, will coincides with the strip of 400 meters wide land along the corridor (200 m at both sides of the express road alignment axis); as well as

In order to ensure that the required changes are in accordance with already detected environment and social (E&S) measures within the available Environmental and Social Impacts Assessment Study (ESIA);

³ Environmental and Social Impact Assessment (ESIA) Report and Environmental Management Plan for construction of state road A2, Section: Kriva Palanka – Rankovce was prepared in the project design phase (May 2015).

Before starting with the preparation of the Supplements to Detailed Design for cut-slopes remediation;

The Department on Environmental Protection and Social Aspects within PESR – Request of an Opinion on the validity of the Decision of the ESIA Study for the construction of the express road A2, Section: Kriva Palanka – Rankovce for the amended slopes design was submitted to the Ministry of Environment and Physical Planning (MoEPP) on 17.02.2022 (09-1588/1).

On 11.03.2022, the MoEPP has issued an opinion declaring that the widening of the excavations for mitigating the slopes will have no significant impact on the environment, so the ESIA Study Decision is valid for the mentioned changes and no additional documents with additional mitigation measures are required. The MoEPP responded declaring the relevance of the actual ESIA study as appropriate, i.e. the measures identified within the ESIA Study for minimization, mitigation and compensation of impacts during construction of the State Road A2 Section Kriva Palanka – Rankovce, also apply for the stabilization of cut-slopes.

4. Slopes Stability

During the project implementation phase, and more specifically in the last two years of intensive road construction activities, a series of unforeseen events occurred, including cut-slopes destabilization. The instability of the cut-slopes required adjustment of the Project Detailed Design, which resulted with Supplements to Detailed Design defining solutions for cut-slopes remediation.

The new Detailed Design for cut-slopes comprises new technical solutions for stabilization of 43 cut-slopes (23 for LOT1 and 20 for LOT2), gathered in the following technical documentation:

- Supplement to Detailed Design for remediation of cut-slopes km 3+278 to km 4+675 prepared by GEOHIDROCONSULTING LTD – SKOPJE (technical number 0103-68 from September 2022),
- Supplement to Detailed Design for remediation of cut-slopes km 4+675 to km 10+308 prepared by DETAILING LTD – SKOPJE (technical number GP_02/11/20 from September 2022),
- Supplement to Detailed Design for remediation of cut-slopes km 10+305 to km 25+850 prepared by GEOHIDROCONSULTING LTD – SKOPJE (technical number 0103-65 from November 2022).

The works on stabilization of and erosion control over 43 cut-slopes alongside the route encompasses two types of technical solutions: **A. Lowering of the slope inclination (with or without grassing)** or **B. Reinforcement of inclined slopes with anchors**, for:

- **23** unstable cut-slope within the **Lot 1** (sub-section Dlabochica to Stracin (Chatal)) (km 10+308 – 25+850)
- **20** unstable cut-slope within the **Lot 2** (sub-section Kriva Palanka to Dlabochica) (km 3+062 – 10+308).

The new technical design for cut-slopes at level of Detailed Design also proposes solutions for drainage, slope protection as well as technology of construction and technical solution. Appropriate (lower) inclination of the slopes and suitable anti-erosive protection will prevent accumulation of material at the

bottom of the slopes and filling of drainage channels, so the function of the road would not be compromised.

4.1. Type of works and technical specifications of slopes

All type of works and technical specifications for slopes stability are determined within the Detailed Design and Supplements to Detailed Design and they entail:

1. PREPARATION WORKS

- Marking and site insurance
- Clearing out of route from bushes, trees, and roots

2. ROADBED-Earthworks

- Additional excavation of topsoil with transport of material to depo site due to reduction of productivity and increased level of excavation difficulties in cut area
- Additional excavation for slope stability with transport of material to depo site due to reduction of productivity and increased level of excavation difficulties in cut area
- Addition for excavation in rock
- Slope Protection
- Topsoiling of areas
- Planning and grassing of slopes
- Composite of hexagonal wire mesh 80x100/2.7mm and 3D polymer mesh

3. Drainage

- Drain (de-watering) channels
- Performance and excavation
- Setting out of alignment
- Addition for excavation in rock
- Placing of prefabricated concrete segment channels

Three types of technical solutions were taken in consideration for cut-slopes stabilization as given in following:

A. Lowering of the slope inclination – In order to satisfy the global and local stability of the cuts and to perform an effective and long-term anti-erosive protection of the slopes, appropriate (lower) inclination of the slopes and the suitable anti-erosive protection was considered as an option. Namely, with aim to prevent the accumulation of material in the toe of the slope and filling of drainage channels, by reducing (lowering) of the inclination will result in reduction of maintenance costs and time for maintenance as well as contribute for the function of the road do not be compromised.

B. Reinforcement of inclined slopes with anchors and rock-fall netting – protection provided by installation of a geocomposite network, reinforced with steel mesh over the entire surface. It is

intended to be installed only where there is a risk of collapse or falling of larger blocks or wedges. The anchoring will be done by systematic self-drilling of anchors R32 with a length of up to 9.00 m. Where a block with larger dimensions is observed, the length and density of the anchors to be increased.

Also, along the above-mentioned technical solutions, **additional drainage along the crest of the slopes or along benches** will be done to ensure the stability of the slopes and reduction of the wet zone.

The activities to be executed for the slopes' stability will contribute to certain changes in relation to the project scope and the expropriation line as well as changes in the surfaces of the slopes and the surfaces on which measures should be implemented to protect against erosion and strengthen their stability. In that sense, the Table below reflects certain parameters of the slopes and the project scope, which will help to determine the potential environment and social impacts:

Table 1 – *Cut-slopes specification based on the new technical designs*

CUT-SLOPES		LOT 1		LOT 2		
		Technical solutions for cut-slopes		Technical solutions for cut-slopes		
				A. Lowering of the slope inclination		B. Reinforcement of inclined slopes with nets
		A. Lowering of the slope inclination (with or without grassing)	B. Reinforcement of inclined slopes with anchors	(With anchors)	(With nets)	
Number of cut-slopes:		17	6	12	2	6
Total		23		20		
1	Area [m2] of the slope according to the initial design:	228,177	/	190,000		/
2	Area [m2] of the slope with the new design:	320,405	/	260,000		/
3	Area [m2] to be grassed/planted for the prevention of erosion (according to the adopted technical solutions for slopes):	192,826	/	85,000		/
4	Area [m2] of the belt that is additionally occupied by the new expropriation line – <i>at the expense of the new technical solutions:</i>	92,228	/	82,291		/
5	The minimum and maximum width of the belt covered by the new design (with stationary):	max: 35.5m - km 21+395 min: 0.7 m - km 18+470	/	n.a.		/
6	Average width of the belt that is affected by the new design – <i>at the expense of the new technical solutions:</i>	6.32 m	/	n.a.		/
7	Quantity [m3] of additional expected earth material to be excavated/installed according to the new design (per types of technical solutions)	859,734	/	442,732		/

The implementation of technical solutions for stabilization of cut-slopes will additionally occupy a belt along the route compared to the initial design. According to the new design and the new defined expropriation line, the area of land to be additionally occupied, because of lowering the slopes' inclination, for LOT1 is estimated as 92,228 m2 (9.2 Ha). The same area for LOT2 is estimated as 82,291m2 (8.2 Ha).

The mitigated slopes resulted with extended area of the slopes itself that need to be grassed/planted for the prevention of erosion. For LOT1 the new area of slopes is 192,826 m² (19.3 Ha). The same area for the LOT2 is 85,000 m² (8.5 Ha).

As a result of cut-slopes remediation activities and according to the new design additional earth material will be excavated and installed for embankment, while the remaining will be disposed of at available and approved Depo Sites already in use by the Contractors on both LOTs. The quantities [m³] of additional expected earth material to be excavated (and/or installed for shaping of embankments) according to the new designs for cut-slopes is estimated as **859,734 m³**, while for the LOT 2 is estimated as **442,732 m³**.

The most part of the additionally excavated earth material for stabilization of the cut-slopes will be disposed at the Depo Sites. The total capacity of available Depo Sites approved by the project for use for the entire alignment is estimated enough to accept the total excavated earth material (for both lots). The remaining available capacity of Depo Sites (please see the Annex 1: Current capacity and assessment of the quantities to be disposed on Depot sites) is **3,353,745 m³** for **LOT 1** and **1,226,163 m³** for **LOT 2**, respectively. Based on the calculations done by the project team specialist from both LOTs (*Annex 1. Depo Sites capacities calculation*) considered that the remain available capacity determined based on the real ground conditions, is more than enough for accepting of the total earth material to be excavated by the end of the project, including the estimated earth material to be excavated for stabilization of the cut slopes.

4.2. Land acquisition status of slopes

As a result of the new technical design for cut-slopes, changes in the project scope and expropriation line have occurred. This resulted in the necessity of new plots of land occupation. The status of new parcels (private and state-owned) that are tackled by the new expropriation line are presented in the Table below.

Table 2 – Status of parcels with the new expropriation line

	LOT 1	LOT 2	GRAND TOTAL
Total number of parcels	537	259	796
Total m²	174,718	87,643	262,301
Private Parcels No	154	217	371
Private Parcels m ²	57,771	79,904	137,615
State Parcels No	383	42	425
State Parcels m ²	116,947	7,739	124,686

The area where the express road passes the location of affected land, is dominantly abandoned. Though it is incidentally used for production purpose near the footprint of the project nowadays, it is still

registered as a potentially fertile land that can be used for agricultural, forestry and other production. According to the Abbreviated Resettlement Action Plan (ARAP) for stabilization of slopes on both LOTs (sub-sections) Kriva Palanka – Dlabochica – Stracin, the land to be acquired is used for agricultural activities mainly for vegetables (potato, cabbage, onion, leek, etc), growing some fruit (plums, apricot, cherries, walnuts, etc). There are no households or any other buildings that need to be acquired and demolished. In addition, there will be no physical resettlement of people and households.

A summary of Project impacts is listed below.

Table 3 – Summary of expropriation impacts

No.	Impact	Unit	Quantity	
			LOT 1	LOT 2
1	Private parcels affected	No.	154	217
2	Private land area to be acquired	sqm. (m ²)	57,711	79,904
3	Number of owners losing land	No.	235	232
4	Number of parcels with unknown owners	No.	5	/

The privately owned land for both LOTs, cumulatively, is estimated as 13.76 Ha comparing to the state-owned land, which is estimates as of 12.47 Ha, meaning that the percentage of total affected privately-owned parcels (52.45 %) slightly exceeds the percentage of plots in state ownership (47.55 %).

The privately owned land to be expropriate according to the Law on expropriation (“Official Gazette of the Republic of Macedonia” No. 95/12, 131/12, 24/13, 27/14, 104/15, 192/15, 23/16, 178/16), which regulates the procedure for expropriation of land of projects that are of public interest and connected with rights for immovable properties.

The strip of land for the widened sections, which encompassing state-owned parcels, is mainly represented by forests or agricultural and/or pastures, and portions of meadows and/or orchards (which may or may not be under use by tenants). The procedures for conversion of state-owned land for public road needs are within different state institutions (Ministry of Agriculture, Forests and Water Economy, PE National Forests etc.) and Laws⁴; and PESR is following, accordingly.

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- Law on Nature Protection (Official Gazette Nos. 67/06, 16/06 and 84/07);
- Law on Agriculture & Rural Development (Official Gazette No. 49/10);
- Law on Agricultural Land (Official Gazette No.135/07);
- Law on Forests (Official Gazette No. 64/2009);
- Law on Vine (Official Gazette No. 69/2004);
- Law on Organic Agricultural Production (Official Gazette No.16/2004);
- Law on Agricultural Inspection (Official Gazette No.38/2004);
- Law on Plant Health (Official Gazette No.29/2005);
- Law on Seed and Seedling material (Official Gazette No.41/2000).

5. Potential impacts

The wide excavation activities for lowering the inclination of slopes will be undertaken to prevent the eventuate future slopes collapse and landslide of soil material. These activities will result with cut-slopes stabilization, but at the same time will cause certain impacts on the media of the environment (soil, air, surface and groundwater, the ecosystem as a whole: landscape, habitats, flora, fauna, protected and designated sites and cultural heritage) and exposure to noise, dust, vibrations, waste generation and wastewater discharge. The pressure on the environment will derive from regular work on site, the physical presence of workers and the construction machinery.

The impacts (of activities in pre-construction and construction phases) identified within the ESIA study in large part apply for the slopes' stabilization work activities. The below Table reflects the identified environmental and social (E&S) impacts associated with slope remediation activities.

Table 4 – E&S impacts in slope remediation

<i>1. Air Quality</i>	
<i>1.1</i>	<i>Dust Emissions</i>
▪	Dust impact from excavation of earthen material while lowering of slopes inclination
▪	Dust impact while embanking
▪	Dust impact from loading and unloading of trucks with earthen material to be disposed of at depo sites
▪	Improper storage of and/or handling with construction materials
▪	Dust from eroded soil material (wind erosion from exposed surfaces)
<i>1.2</i>	<i>Emissions of combustion gases from fuel powered machinery and vehicles (PM10, PM2,5, CO2, NOx, SO2).</i>
▪	Vehicles and construction machinery traffic at construction site
▪	Vehicles and construction machinery transportation routes towards designated depo sites, landfills, economic yard etc.
<i>2. Surface and Groundwater</i>	
<i>2.1</i>	<i>Wastewaters</i>
▪	Domestic type wastewater generated on site (in the construction camps)
<i>2.2</i>	<i>Exposure of surface and groundwaters during construction</i>
▪	Introduction of sediments of earth material, solid particles of debris from crashes, sand, solid particles from rubbing tires
▪	Washout of concrete trucks (mix-concrete and alkaline cement or residues)
▪	Leakage of fats and oils from fuels and lubricants
<i>2.3</i>	<i>Mechanical impurities</i>
▪	Loading of the beds and turbidity of the water courses from soil weathering, by heavy rainfall
<i>2.4</i>	<i>Accidental leaks and spills</i>
▪	Introduction of contaminants indirectly through leaching into the soil
<i>3. Soils</i>	
<i>3.1</i>	<i>Accidental leaks and spills</i>
▪	Risk of wet concrete leakage – washout of concrete trucks (mix-concrete and alkaline cement or residues)
▪	Risk of leakage of fuels and oils (from active machinery)

▪	Risk of leakage of fuels, oils, and other liquid compounds/chemicals, such as lubricants, paints, solvents, resins, or acids (during the construction activities and from storages at construction site)
3.2	<i>Mechanical impacts</i>
▪	Topsoil removal while restore cuttings
▪	Use of heavy equipment and techniques resulting in excessive soil disturbance
4. <i>Noise and Vibrations</i>	
4.1	<i>Impacts on population and sensitive species</i>
▪	Noise emissions and vibrations from active work of outdoor machinery and equipment
5. <i>Waste Management</i>	
5.1	<i>Impacts from waste management practices</i>
▪	Impact from non-hazardous communal waste from regular presence of workers (packaging and packaging waste, biodegradable/organic waste from discarded food, ...)
▪	Impact from inert waste materials (concrete, iron, rocks, ...)
▪	Impact from hazardous waste (motor oils, vehicle fuels, lubricants, additives, ...)
6. <i>Impact on Biodiversity</i>	
6.1	<i>Flora</i>
▪	Removing a strip of vegetation (moderately sensitive vegetation, including oaks): ✓ 3,450 m ² (0.345 Ha) for LOT1 and 7,800 m ² (0.78 Ha) ⁵ for LOT2, mostly represented with pine plantations, degraded oak forests and sporadically orchard trees as well as natural forests of mixed Quercus Frainetto Cerris, respectively.
6.2	<i>Fauna</i>
▪	Disturbance (from noise and vibrations) of breeding sites of sensitive species from machinery work
▪	Impact on breeding sites of sensitive species (birds nests, amphibians, mammals, ...) because of strip removal, by decreasing the animal populations
▪	Accidents resulting with animal carcasses from working activities with heavy machinery
7. <i>Impact on Landscape</i>	
▪	Visual change of the landscape due to the presence of new elements, terrain shapes, etc., either temporarily or permanently
	○ Temporary – associated with the physical presence of workers and construction machinery and materials during the construction phase
	○ permanent impacts – associated with the effects of construction activities.
8. <i>Impact on Protected and designated sites</i>	
▪	(Encompassing all stated above)
9. <i>Impact on the Community</i>	
▪	Exposure of the local population to the impacts that affect the environment, as well
▪	Land and assets acquisition process
▪	Restricted or suspended access
▪	Lack of safe pedestrians corridors across construction site
▪	Critical spots and inappropriate traffic signalization

⁵ Determined by the forest specialist from the PE National Forests during the site visit

6. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) WITH MITIGATION MEASURES

The Environmental and Social Impacts Assessment Study (ESIA) for the Expressway from Kriva Palanka to Rankovce provides among others, a comprehensive List of respective mitigation measures packed in Environmental and Social Management Plan (ESMP). The measures to be undertaken during the pre-construction and construction phase of the project implementation also suit the environmental mitigation of slope remediation activities. The measures recognized and elaborated within the ESMP for avoiding, minimizing and mitigation of impacts from slope remediation activities are represented in the Table below and comply with the World Bank standards⁶ for combatting environmental and social risks and impacts of the project.

Table 5 – Environmental and Social Mitigation Measures

1. Air Quality	<i>Appropriate measures for provide good air quality</i>
1.1	<i>Dust Emissions</i>
▪	Construction site at the spot of cut-slopes will be kept moist to reduce dust formation.
▪	Accesses and construction sites will be kept moist to reduce dust formation to minimize the spread of dust
▪	In windy and dry conditions, earth stockpiles will be moistened to prevent the lifting of dust particles. Dust-generating activities will be slowed down in days of strong wind.
▪	Truck dumpers carrying spoil or other dusty materials will be covered with tarps.
▪	Construction materials will be stored in appropriate places and covered to minimize dust.
▪	If an area is not going to be worked on in more than 45 days, it will be protected by erosion control mats.
▪	Erosion control methods: Seedling and mulching, installing erosion control blankets, vegetative buffer trips.
1.2	<i>Emissions of combustion gases from fuel powered machinery and vehicles (PM10, PM2.5, CO2, NOx, SO2).</i>
▪	No unnecessary idling of construction vehicles at the construction sites will be allowed.
▪	Construction truck traffic will be optimized so as to get a minimum number of trucks carrying the maximum volume of materials.
▪	Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards
2. Surface and Groundwater	<i>Appropriate measures to prevent surface and groundwaters from adverse impacts</i>
2.1	<i>Wastewaters</i>
▪	Domestic type wastewater generated on site (in the construction camps) will not be allowed to be discharged untreated into natural water courses. The construction sites will be provided with chemical portable toilets and the waste adequately managed.

⁶ ESS – Environmental and Social Standards <https://projects.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards>

2.2	<i>Exposure of surface and groundwaters during construction</i>
▪	Practicing erosion control methods to prevent the introduction of sediments of earth material, solid particles.
▪	Crushers should be located away from sensitive receptors to prevent debris (rocks and sand) from crashes.
▪	Regular maintenance of equipment and machinery to prevent the solid particles from rubbing tires.
▪	The placing of any wet concrete in or close to any watercourse should be controlled to minimize the risk of leakage of wet cement into the watercourse. The washout of concrete trucks (mix-concrete and alkaline cement or residues) to be made in the location of construction site/camp at a section designated for that purpose.
▪	Storage compounds for fuels, oils or other liquid chemicals should be sited away from surface water drains. They would have an impermeable base and would not drain directly into the surface water drains. Where practicable, drainage from storage compounds would be passed through oil interceptors prior to discharge.
▪	Implying spill kit over the greasy stains in case of leaks from equipment and machinery fuels and oils.
2.3	<i>Mechanical impurities</i>
▪	Stockpile of soil material should not be left unprotected; it will be protected by erosion control mats. The slopes that are susceptible to erosion should be protected by using erosion control methods: seedling and mulching, installing erosion control blankets, vegetative buffer strips.
▪	Drainage and runoff controls will be established before starting the site clearance and earthworks. The existing vegetation will be retained as much as possible.
2.4	<i>Accidental leaks and spills</i>
▪	All surfaces should be kept clean and tidy to prevent the build-up of oil and dirt that may be washed into a watercourse or drain during heavy rainfall. Introduction of contaminants indirectly through leaching into the soil. Availability of spill kits is required.
3. Soils	Appropriate measures for prevent soils from adverse impacts
3.1	<i>Accidental leaks and spills</i>
▪	The washout of concrete trucks (mix-concrete and alkaline cement or residues) uncontrolled on site is forbidden. Minimize the risk of leakage of wet cement on the soil and provide suitable place at construction site/camp, designated for that purpose.
▪	Vehicles and construction machinery will be required to be properly maintained to reduce the leakages of motor oils and dispersion of pollution in waters and soil (the maintenance should be provided by the professional service company).
▪	Avoid risk of leakage of fuels, oils, and other liquid compounds/chemicals, such as lubricants, paints, solvents, resins, or acids (during the construction activities and from storages at construction site). All surfaces should be kept clean and tidy to prevent leakages. Availability of spill kits is required to clean the greasy stains in case of leaks.
3.2	<i>Mechanical impacts</i>
▪	Topsoil will be reused to restore cuttings, embankments, wildlife crossings, construction and workers camps, landfills, and borrow pits. The layers of the stripped topsoil will be placed aside, on the established storage areas, in the same order as the original soil levels. Temporary storage areas will be located

	along the strip of land along the alignment, near the sites where the soil was removed from, so that it can be reused in those same areas.
▪	Use of heavy equipment and techniques resulting in excessive soil disturbance Minimize the extent of the disturbed area and the duration of exposure and stabilize disturbed areas as soon as possible. Minimization of the use of heavy equipment and techniques that will result in excessive soil disturbances or compaction of soils, especially on unstable slopes.
4. Noise and Vibrations	<i>Appropriate measures to prevent from noise and vibrations adverse impacts</i>
4.1	<i>Impacts on population and sensitive species</i>
▪	Good management practice to be used to avoid the cumulative effects of noise; Construction works shall not be permitted during the night (the operations on site shall be restricted to the period 07.00 -19.00 h); All vehicles and machinery used at the construction sites shall be subject to regular maintenance. The vehicles and machines that are excessively noisy due to poor engine adjustment or damaged noise control devices shall not be operated until corrective measures have been taken; The construction traffic plan shall establish speed limits for construction vehicles and machinery at the construction site and the haulage roads used.
5. Waste Management	<i>Measures for proper Waste Management</i>
5.1	<ul style="list-style-type: none"> ▪ <i>The waste management practices will be implemented according to the adopted procedures and principles for waste avoidance, minimization, selection, recycling, treatment and disposal, all in compliance with the national and EU requirements.</i> ▪ <i>The different waste streams generated on site (from the workers and/or operations performed on site) must be handled accordingly. All respective Contracts concluded with special waste streams handlers has to be valid (renewed, if necessary).</i> ▪ <i>The different waste types that could be generated at the construction site (due to the materials used and waste generated in different sections) shall be identified and classified according to the national List of Waste (Official Gazette no.100/05) on hazardous and non-hazardous waste streams.</i> ▪ <i>The separation of hazardous from non-hazardous waste streams is must.</i>
5.2	<ul style="list-style-type: none"> ▪ Communal like Solid Waste generated in the construction site and camps from regular presence of workers (packaging and packaging waste, biodegradable/organic waste from discarded food, ...) will be selected per waste commodity and separately collected, handled, and treated and finally disposed of in the municipal landfill.
5.3	<ul style="list-style-type: none"> ▪ The inert waste materials (concrete, iron, rocks, ...) generated on site to be selected per commodities for recycling and/or final disposal at landfill for inert waste. ▪ A significant part of the excavated earth material will be further used for shaping the embankments, while smaller part will end up at depot sites. All depot sites that will be used for disposing of excess earthen material excavated will be restored at the end of the construction works (replanted/grassed).
5.4	<ul style="list-style-type: none"> ▪ The hazardous waste (motor oils, vehicle fuels, lubricants, additives, ...) will be collected separately and authorized collector and transporter should be sub-

	<p>contracted to transport, recovery or finally dispose the hazardous waste at designated location for that type of waste;</p> <ul style="list-style-type: none"> ▪ The Temporary Hazardous Waste Storage Points should be established according the national legislation on handling, labeling, storage and management with hazardous waste; ▪ The hazardous waste management procedure should be established and followed ▪ The hazardous waste will be packaged and labeled showing the R and S phrases (risk and safety statements of the hazardous waste) and it will be temporary stored on safety storage facility equipped with adequate ventilation, fire resistant conditions especially if there are VOC emissions, mercury containing lamps; ▪ The access to these temporary hazardous waste storage points need to be allowed only for trained and equipped staff with prohibited entrance of workers and public; ▪ All waste spills will be promptly cleaned up.
<i>6. Biodiversity</i>	
<i>6.1</i>	<i>Flora</i>
	<p>Additional strip of land along the existing expropriation line with an area of 1.125 Ha pine plantation, degraded oak forest and natural mixed forest represented with Quercus Frainetto Ceris will be used for stabilisation/widening and climate resilient/erosion proof design of the disturbed cut-slopes. The widened segments of the new alignment will be carried out according to the Supplement to Detailed Design for remediation of cut-slopes at km 3+278 to km 4+675; km 4+675 to km 10+308; and km 10+305 to km 25+850.</p> <ul style="list-style-type: none"> ▪ The process of vegetation clearance will be agreed with and monitored by the Public Enterprise (PE) “National Forests” in accordance with the provisions of the Law on Forests (Official Gazette of RM No.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14, 160/14, 33/15, 44/15, 147/15, 7/16 and 39/16), which is in compliance with respective EU Directives. <p>These regulations envisage determination of compensatory plantation sites and planting trees suitable for the local ecosystems and upon agreement with PE National Forests, at the ratio 1:3. The further maintenance and financial compensation to PE ‘National Forests for the loss of timber, annual wood mass increment and trees functions is carried out according to the Law on Forests.</p>
<i>6.2</i>	<i>Fauna</i>
	<ul style="list-style-type: none"> ▪ No illegal hunting by construction workers is expected nor destruction of nests, burrows, and other animal sheltering/breeding structures. The workers were trained at the early beginning of construction works to keep away certain irregularities regarding the treatment of the surrounding wildlife.
	<ul style="list-style-type: none"> ▪ All equipment and personnel movements will be minimized to the level that no construction works at site will cause serious impacts to the animal wildlife. Construction period should be as short as possible to reduce the various impacts on the local fauna.
	<ul style="list-style-type: none"> ▪ Traffic of construction vehicles and machinery will be reduced to a minimum, with appropriate speed limitation of vehicles (30 km/h) in the area of construction works and with appropriate signage to remind drivers.
	<ul style="list-style-type: none"> ▪ Any animal crushing or collision of animals will be recorded in a logbook.

7. <i>Landscape</i>	The required widening of the scope of the road for the aim of stabilization of the disturbed slopes, will be done in a way that ensures the least damage to the forest belt and/or agricultural land. Aesthetic integration of the slopes and all structural parts of the road viaducts and bridges (e.g. deck, pillars) will be performed once the construction being completed. For making this properly, a suitable combination of the type of soil, the water regime, the selection of plant species, the slope steepness etc. will be taken in consideration.
8. <i>Protected and designated sites</i>	The maintenance and protection of the Osogovo-German bio-corridor, which is envisaged as future proposed protected area in the category <i>Protected landscape</i> is performed in line with the measures determined by the ESIA ⁷ .
9. <i>Communication with the Community</i>	For mitigation of impacts from: <ul style="list-style-type: none"> • Exposure to impacts that affect the environment • Land acquisition activities Social Safeguards Management Plan • Restricted and/or suspended access as well as critical spots and inappropriate traffic signalization, there are available/installed social safeguard measures according to WB Social Safeguard Polices.

Social Safeguards Management Plan

During the project preparation phase and later in the process of project implementation, all respective social aspects land acquisition / and potential resettlement issues were taken into consideration. Namely, all persons affected by the project were properly consulted, made available to affordable and accessible grievance mechanisms, and properly compensated at replacement cost or market for their losses, and provided with rehabilitation measures.

As a result of widening of the route for the purpose of stabilization of the cut-slopes new plots, both, privately owned and state owned, are subject of additional expropriation. The loss of land (mainly forest or agricultural and/or pastureland, and portions of meadow, orchard and built land) will be compensate at full replacement cost to the owners of land (with formal and no formal legal rights or claims over the land) by end of June 2023.

The project has installed **Grievance Redress Mechanisms (GRMs)**⁸ as an effective tool for early identification, assessment, and resolution of complaints on the project have been established at the early

⁷ The ESIA has analyzed the legislation and regulatory framework, and with regard to the Osogovo-German Biocorridor concluded the following: the Macedonian legislation does not envisage any specific limitations on conducting projects in proposed protected areas. In general, limitations are envisaged for the areas with the highest level of protection (such as the core zones of national parks/reserves). The same goes for the EU Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna, which also does not have any specific provisions on the limitations to be applied to a proposed protected area with undefined protection status. For the Osogovo-German, to serve its purpose as a biocorridor for certain species, no strict protection status is expected to be assigned.

⁸ The concerned citizens can address their concerns in person, by phone or via post or email using the contact information provided on the Public Enterprise for State Roads (PESR) website <http://www.roads.org.mk/287/kontakt> by filling out the Grievance Form or through their local community representative.

The Contractor/Engineer ensures that all received public grievances/complaints on the project are logged in writing (archived) and maintained in a database (Excel file).

The Contractor/Engineer and the PESR addressing the grievances in timely manner (acknowledge receipt of the Grievance within 5 working days, and to respond within 15 days from receiving the grievance). The PESR (Employer) has the primary role in

stage of project implementation. The PESR is committed to problem-solving and grievance redress. The established mechanism is confirmed as functional and will exist as such to assist any citizen in addressing any social issues that may occur, related among others, to the land acquisition process.

As was previously elaborated, due to the problem with slopes and necessity for route modification, a Supplements to Detailed Design was requested, which invoked additional needs for expropriation of areas located next to already expropriated route. The plots/parcels are numerous and relatively small in area and belong to the same owners from the initial expropriation phase (2018).

The same owners have already taken a part in public hearings/consultation as well as in the expropriation procedure itself, in front of the competent authority – the institution for expropriation (the Department on legal-property affaires, branch office in Kriva Palanka, within the Ministry of Finance), where the whole legal procedure on Expropriation was properly explained.

The Grievance mechanism is in detailed described in the CESMP of the project for construction of the new express road between Kriva Palanka and Rankovce.

Climate change

Environmental and Social Impact Assessment (ESIA) strictly follows national, EU and WB E&S safeguard policies and provides all required mitigation measures to avoid, minimize or compensate the adverse impacts. Environmental and social experts were engaged in the preparation of the technical documentation. Also, respective experts are engaged during the construction (and operational) phase of the project.

The removed strip of vegetation along the new alignment will be compensated according to already established practice in the country, in compliance with the Law on Forests and with adequate professional support provided by the PE “National Forests”. The envisaged replanting measures will contribute for CO2 offsetting by calculating with the following figures:

The annual CO2 offsetting rate⁹ varies from 21.77 to 31.5 kg CO2/tree. To compensate 1 ton of CO2, 31 to 46 trees are needed. Taking in consideration that in Europe, there are 300-500 trees per hectare, and the area of removed vegetation for the cut-slopes stabilization corresponds to approximately:

- 3,450 m2 (0.345 Ha) for LOT1 mostly represented with pine plantations, degraded oak forests and sporadically orchard trees.
- 7,800 m2 (0.78 Ha)¹⁰ for LOT2 mostly represented with pine plantations, degraded oak forest and natural forests of mixed Quercus Frainetto Cerris.

resolving complaints, while the feedback that requires minor corrections are generally handled directly by the Contractor/Engineer on site.

A worker`s Grievance Mechanism is also established for the employees of construction companies.

⁹ <https://www.encon.eu/en/calculation-co2-offsetting-trees> (12,000 kg of CO2 offsets, i.e. 12 tones CO2/hectare).

¹⁰ Determined by the forest specialist from the PE National Forests during the site visit

If we assume:

- An average of 400 trees per hectare
- An average of 24 kg CO₂/tree

(i.e. 1 hectare of forest: 400 trees x 24 kg CO₂/tree),

The calculations will correspond to replantation of total 1.125 x 3 Ha with 400 trees/Ha x 24 kg CO₂/tree = 32,400 kg (32.4 tonnes) of CO₂ offsets

Also, valuable mitigation measures are identified within the Biodiversity Management Plan prepared by Geonatura, Zagreb in June 2020, based on the findings of the ESIA Study and regular field observations by a biodiversity expert and by analysis of installed monitoring camera images.

Archeological sites and archaeological findings

In case of detection of significant archeological and historical sites, the measures at the location of cut-slopes where project scope widening take place should comply with the Law on Protection of Cultural Heritage, which declares that if archeological findings, sites, etc. being discovered, the construction activities will be stopped, and the competent institution will be immediately notified.