

REPUBLIC OF MACEDONIA
PUBLIC ENTERPRISE FOR STATE ROADS

Project:

Procurement of Works for

the following roads grouped in seven Lots:

**Lot 2: Rehabilitation and Reconstruction of Regional Road
R1205, section Probistip - Krupiste L=18km**

CONTRACT DOCUMENTS

Volume 5

**Environmental and Social Assessment Report and
Environmental Management Plan**

January 2019

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Introduction

On the basis of the Contract signed between the JV IRD Engineering s.r.l. Rome Italy- RUTEKS DOO Sofia Bulgaria and the Public Enterprise for State Roads for the preparation of the Design documentation at the level of general design for Repair and rehabilitation of the state road R1205, section Krupishte - Probishtip, Elaborate for environmental protection i.e. Environmental and Social Assessment Report for Repair and rehabilitation of state road R1205 section Krupishte - Probishtip; have been prepared.

This Environmental and Social Assessment Report (ESAR) prepared under the requirements of the Terms of Reference, which is in line with the World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment. This policy is considered to be the 'umbrella' policy for WB environmental 'safeguard policies'.

For the project for Repair and rehabilitation of state road R1205, section Krupishte - Probishtip, the relevant safeguard policies have been considered at all stages of preparation and planning, which are as follows:

- (i) Environmental Impact Assessment (World Bank OP 4.01, 1999, revised in April 2013);
- (ii) Natural Habitats (World Bank OP/BP 4.04: Natural Habitats 2001);
- (iii) Cultural resources (World Bank OP/BP 4.11, 2006);
- (iv) Involuntary Resettlement (World Bank OP/BP 4.12, 2001);
- (v) Forestry (World Bank OP/BP 4.36); and
- (vi) Bank Policy: Access to Information (World Bank, July 2013).

This ESAR corresponds with the content of the Elaborate for environmental protection prepared under the requirements of the same Terms of Reference, which is in line with the corresponding valid legislation in force in the Republic of Macedonia.

Subject of analysis of the Elaborate i.e. Report; is the impact of the project activities will have to the environment and the social aspects of the projected activities related to the rehabilitation of this road, for the purpose of obtaining a consent for the implementation of such project, i.e. completion of the projected project activities.

The Elaborate has been prepared pursuant to the Environmental Act¹ ("Official Gazette of the Republic of Macedonia" Nos. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 93/13, 187/13, 42/14 and 44/15) and the Opinion No. 11-2251/2 of 27.06.2017, issued by the Department of Environment at the Ministry of Environment and Physical Planning –given in Annex No.1 to this Report, i.e. Decree for amending the decree for the activities for which a study must be prepared, and for whose approval competent is the authority for conducting expert works in the field of environmental protection ("Official Gazette of RM" No. 36/12) and the requirements of the Regulations on the form and content of the Environmental Protection Study ("Official Gazette of the Republic of Macedonia" No.44/13).

¹Article 24, Elaborate for environmental protection



*Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip*

As part of the project activity, in the period during September and October 2016, the party preparing this Report paid a field visit in order to establish the current condition on site and to identify the possible impacts by the process of rehabilitation of the road subject of analysis in this Study to the media and the environmental areas.

The preparation of the Environmental and Social Assessment Report is aimed at proposing measures for reducing and/or mitigating the detected potential adverse impacts, i.e. improvement and integrated protection of the environment.

The protection and improvement of the environment is a system of measures and activities (social, economic, technical, educational etc.) which ensure creating of conditions for protection against pollution, degradation and impact to the media and certain environmental areas.

Within different Chapters of this Environmental and Social Assessment Report, the applied Operational Policies of the World Bank are as follows:

- Environmental Impact Assessment (World Bank OP 4.01, 1999, revised in April 2013);
- Natural Habitats (World Bank OP/BP 4.04: Natural Habitats 2001);
- Cultural resources (World Bank OP/BP 4.11, 2006);
- Forestry (World Bank OP/BP 4.36);
- Bank Policy: Access to Information (World Bank, July 2013).

The costs for the mitigation measures implementation shall be included within the Contractor's unit prices for the rehabilitation works. The costs for the monitoring of the mitigation measures implementation shall be those of the Supervising Engineer, both selected by the PESR.



1. General data

Name of the legal or physical party carrying out the business activity or activity	Public Enterprise for State Roads (PESR)
Legal personality	PESR was established in 2013 under the Law on Public Roads ("Official Gazette of RM" Nos. 84/08 and 168/12)
Ownership	Government of the Republic of Macedonia
Registered legal address of the legal entity (as recorded in the central register)	"Dame Gruev" str., 1000 Skopje
The address at which the business activity/activity will be conducted	State road R1205, section Krupishte - Probishtip
Legal entity's company registration number	6839673
Code of the main business activity under the National Classification of Business Activity	64.99
Category of the business activity/activity which is subject of the application under the regulations of article 24 paragraph (4) and (5) of the Environmental Act.	XI- Infrastructural projects 15. Reconstruction of motorways and regional roads. Decree on amending the decree for the business activities and the activities for which such study must be prepared, and for whose approval competent is the authority for conducting expert works in the field of the environmental protection ("Official Gazette of RM" No. 36/12)
Number of employees on the site where the business activity or the activity subject of the application will be conducted.	/
Total number of employees in the legal entity or the physical party conducting the business activity or the activity	392
Projected capacity	Repair and Rehabilitation of total length of 17.78917km (State road R1205, section Krupishte - Probishtip)
First and last name of the person competent for contact regarding the approval of the Study and its function	Sashka Bogdanova Ajceva, B.Sc. in Environmental Engineering Environmental Protection Consultant
Contact telephone contact	+ 389 2 3118-044, ext. 305

2. Type of Report

New business activity or activity	
Current business activity or activity	√
Extending the current business activity or activity	

3. Competent Authority of the Republic of Macedonia for approval of the Elaborate for the Environmental Impact Assessment

Name of the authority	Department of Environment at the Ministry of Environment and Physical Planning
Address	8 "Goce Delchev" blvd., MRTV Building, 1000 Skopje
Telephone	+ 389 2 3251400

4. Description of the project as part of which the business activity or activity is conducted

4.1 Description of the business activity or activity

The road section R1205 (section Krupishte - Probishtip) has been presented on Figure 1, (old mark P206). This section has particular traffic and commercial importance in the road network of the Republic of Macedonia connecting the cities of the North eastern plan region with the state road A3 that leads from connection with A2 at junction Trebenishte km 0+000 to the border crossing with neighbouring Bulgaria km 311+786.

The Repair and the rehabilitation starts very close to the junction between the state roads A3 and R1205, from km 0+000.00 to the end of the section on km 17+789.17 at the gas station on the south of Probishtip, with total length of 17.78917km.

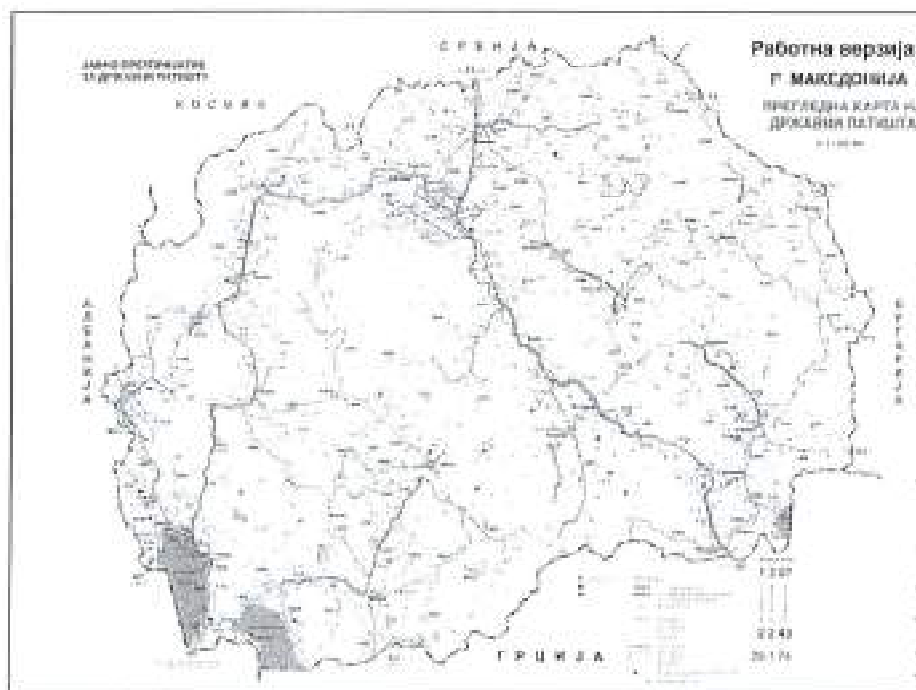


Figure 1 Road network of RM and State Road R1205 (section Krupishte - Probishtip)

On the existing national road in current conditions in certain parts there have been established intensive ravelling, longitudinal and transverse cracks and rutting.

Therefore there is a need to perform repair and rehabilitation (without extension), which would be of a great importance, since there is intensive traffic on this state road. The repair and the rehabilitation of the state road R1205, section Krupishte - Probishtip, will be performed pursuant to the purpose of the road, thereby ensuring safe and uninterrupted traffic, pursuant to the provisions of the Law on Public Roads (*Official Gazette of RM* Nos. 84/08, 114/09, 124/10, 23/11, 53/11, 44/12, 168/12, 169/15) and the regulations on the design and construction. The implementation of the rehabilitation on this road will enable in the future fast, cost effective, comfortable and safe traffic meeting the needs of the traffic fitness and capacity.

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The existing pavement width is in the range of 5.5 m to 7.0 m with shoulders width of 2*1.0 m. In the following preparation of the Basic Design for the improvement and rehabilitation by the Consultant, all elements shall be put in compliance with the technical regulations, actual ground conditions and limitations. The pavement designed width is 7.0 m with shoulders width of 2*1.0 m.

The road alignment shall be divided in equidistance length of 10 m, with profiles at critical chainages obtaining so a complete inspection of the area position of the road and its relation to the traffic and technical infrastructure of the road including definition of the road side limit.

The transversal profiles shall have all necessary dimensions, as: number of profiles, chainages, formation elements necessary dimensions, scraping, milling, upgrading, profiling and all necessary data for execution of the works, ground levels, chainage levels, road left and right side edge, cross slopes, drainage elements, longitudinal profile in a scale of 1:100/1000, and so on.

The final pavement layer, i.e. the wearing asphalt course shall be treated integrally on the whole subjected section pavement length.

The existing carriage way structure upgrading and improvement adopted sizes are:

- Asphalt concrete wearing course AB 11, d=5 cm
- Bitumenous bearing course BNS 22, d=6 cm

Basic elements of the section in subject are:

- Calculated speed V = 60 km/h
- Maximum cross curve superelevation..... 7,00%
- Maximum longitudinal gradient..... 4,00%
- Cross gradient, in direction..... 2,5%
- Shoulder width..... 1,00 m
- Channel width..... 0,75 m
- Berm width..... 1,00 m

The road, according to its function and scope, is dedicated for:

- Local, regional, national and international connection to the road network;
- Communication between the people improvement in the region and wider, as well as for goods and materials transport facilitating;
- Improved road infrastructure in the region.

As to drainage, there are no any particular changes in the existing solutions for the drainage of the section in subject.

The existing drainage consists of channels, box culverts and is surveyed by tachimetry allowing determining the situation of the drainage. It has been recognized, by a field surveying, that the drainage is functioning with decreased efficiency due to congested culverts and discharges along the slopes of high embankments, unprotected earth ditches and so on.

Considering the improvement and rehabilitation of the existing section without any active raw materials preparation, the basic raw materials to be used are: bitumen emulsion, asphalt concrete course, and other raw materials for this type of works. The Study preparation recommendation is the concrete and asphalt to be used from the existing concrete-asphalt plant in the vicinity of the



section avoiding so any additional negative impacts on the basic media and environment, from their positioning on the location.

Also, in case where the Contractor has appropriate equipment, it is recommended to recycle and reuse the removed existing asphalt layers.

5. Description of the environment around the project site

The rehabilitation activities on the state road R1205 section Krupishte – Probishtip (Figure 3) shall be realized in two municipalities: Probishtip and Krupishte as a part of the North-East plan region. An orientation – communication map is enclosed in the Annex 1.1.

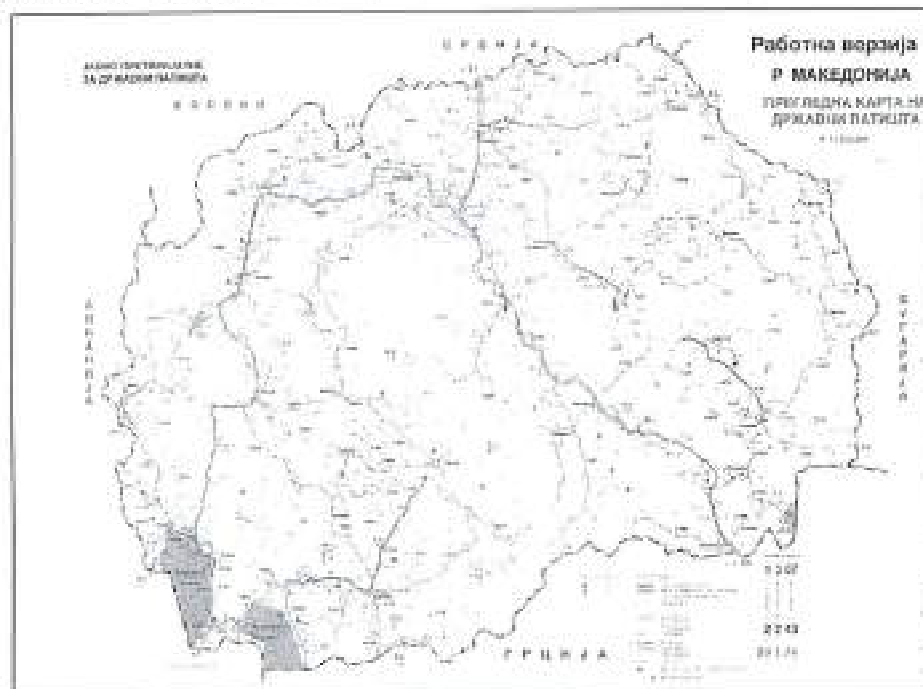


Figure 3 State road R1205 (section Krupishte - Probishtip)

Municipality of Probishtip

The town of Probishtip, as a settlement, is mentioned in the XIV century. But the execution of a new mining-industrial settlement started in the year 1937 when a power plant has been constructed, and all started with plumb-zink ore flotation and some dwellings for the miners.



Figure 4 Area of the Municipality of Probishtip



Figure 5 Town of Probishtip

The Municipality of Probishtip² is an important industrial, social (educational and cultural) and administrative center. It is in the North-East part of the Republic of Macedonia with an inhabitation of 16.193 and an area of 325,6 km², with a part in the Ovchepole Region and a part deeply entering in the Osogovo mountain massif. The Zletovska River, as biggest river, is passing through the area of the municipality forming its canyon in the mountain part and its valley in the flat part of the municipality.

The Municipality of Probishtip occupies the middle and bottom part of the Zletovska River basin. On North it borders with the Municipality of Kratovo, to West with the Municipality of Sveti

² Source web site of the Municipality of Probishtip (<http://probistip.gov.mk/>)



Nikole, to South with the Municipality of Shtip and to East with the Municipality of Kochani. The administrative center Probishtip, in relation to the neighbouring municipalities, is at a distance of: 18 km from Kratovo, 22 km from Shtip, 42 km from Kochani and about 100 km from the capital Skopje. There is two routes to Skopje: Skopje – Kumanovo – Kratovo – Probishtip by the roads M2 and R206, and second one Skopje – Veles – Shtip – Probishtip by the roads M1, M5 and R206.

Besides the fact it is a hilly – mountainous region, it could be said it has a good traffic infrastructure and favourable physical connections with the adjacent and more distant regions.

Municipality of Karbinci

Valuable archeological locations are found out in the Municipality of Karbinci² indicating the long history of this area. So, during the execution of the works related to the hydrosystem Zletovica, at location Gmcharica, near the village of Krupishte, a settlement has been discovered from the early Neolithic period with findings of objects and ceramics estimated to be old about 6000 years BC.

A little bit later, a stone has been discovered where the first organized human community in Macedonia produced its flintstone tools. It is considered to be the oldest Neolithic settlement in the Macedonia. A skeleton has been discovered too, on the same location, named *Slave the Macedonian*, who is old, according to the bone analysis performed by the Glasgow University, 7 745 years, and it is considered to be one of the oldest skeletons in South-East Europe.

Besides, a settlement has been discovered in the location Vršnik (in the region of the village Tarinci) from the Neolithic period (6200 – 3500 years BC). The archeological showpieces from the antiquity period (2 – 4 century BC) are discovered in the location Knezhevska Mogila, in the region of the village Tarinci and in the tomb near the village Crvulevo.

The Municipality of Karbinci is in the Eastern part of Macedonia, 13 km from the town of Shtip in the foothills of the Plachkovica Mountain. It is very rich in crop and vegetable cultivations. The municipality area is 259 km². The following settlements are in the Municipality of Karbinci - villages Argulica, Batanje, Vrteshka, Golem Gabed, Gorni Balvan, Gorno Trogerci, Dolni Balvan, Dolno Trogerci, Ebeplija, Junuzlija, Kalauzlija, Kepekcheliya, Kozjak, Krupishte, Kurfalija, Kuchilat, Kuchica, mal Gaber, Michak, Muratlja, Nov Karaorman, Odzallja, Pripechani, Pmalija, Ruljak, Tarinci and Crvulevo.

² Извор веб-страница на Општина Карбинци <http://opstina.karbinci.gov.mk>



Figure 6 Municipality of Karbinci region

Village Krupishte

Krupishte is a village in the Municipality of Karbinci in the surrounding of the town of Shtip. During the execution works on the hydrosystem Zletovica, with the excavations in the location Grncharica near the village Krupishte, a settlement has been discovered from the early Neolithic period with findings of objects and ceramics estimated to be dated about 6000 years BC. A little bit later, a stone has been discovered where the first organized human community in Macedonia produced its flintstone tools. It is considered to be the oldest Neolithic settlement in the Macedonia. A skeleton has been discovered, on the same location, named *Slave the Macedonian*, who is old, according to the bone analysis performed by the Glasgow University, 7 745 years, and considered to be one of the oldest skeletons in South-East Europe.

The village Krupishte is on the road Shtip – Kochani in the middle of a marshy valley at the confluence of the Zletovica River into Bregalnica River. The ground is 2-3 m above the surrounding marsh in form of a narrow peninsula. Today, the marsh is, by irrigation measures, converted in rice fields.

The village Krupishte has a good position, as it is 15 km from the town of Shtip and 13 km from the town of Kochani.

According to the last census in Macedonia in 2002, the village has 336 inhabitants, 313 Macedonians, 12 Turks, 10 Serbs and 1 from other nationality.

During the execution of the works related to the hydrosystem Zletovica, in the location Grncharica, near the village of Krupishte, a settlement has been discovered from the Early Neolithic period with findings of objects and ceramics estimated to be old about 6000 years BC. A little bit



later, a stone has been discovered where the first organized human community in Macedonia produced its flintstone tools. It is considered to be the oldest Neolithic settlement in Macedonia.

A skeleton has been discovered, on the same location, named *Slave the Macedonian*, who is old, according to the bone analysis performed by the Glasgow University, 7 745 years, and it is considered to be one of the oldest skeletons in South-East Europe.

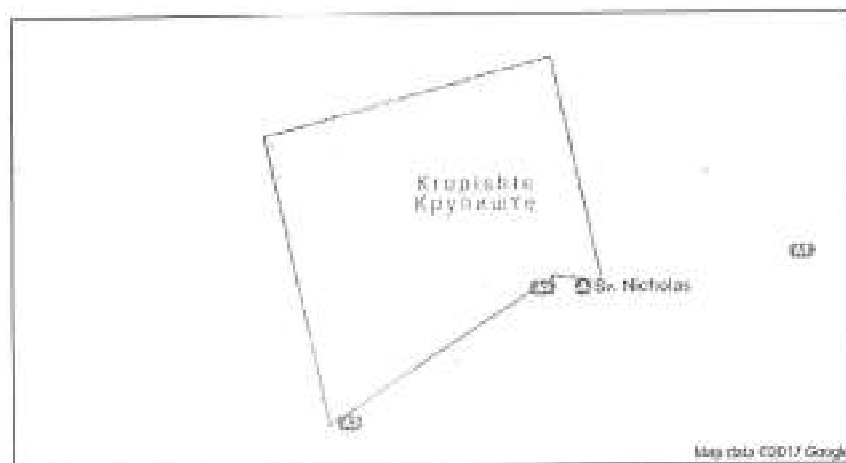


Figure 7 Village Krupishte area

5.1 Description of the existing institutions and/or facilities carrying out healthcare, social and educational activities

Municipality of Probishtip

The population in the municipalities of Probishtip and Karbindi, in the state of development, has various dynamics related to the total movements and structural changes and area settlement. Many factors had an impact on that, especially the socio-economic conditions, ethnic structure changes, natural-geographic specifics, migration movements, and so on.

According to the census in 2002, the Municipality of Probishtip has an area of 325,6 km², with a population of 16.193 inhabitants and 37 settlements (one as town and semi-town and 33 rural settlements) with characteristics described in the following text.

Buchishte

It is with an altitude of 400 m, and 68 inhabitants (35 men and 33 women) with 28 households and 34 housings. The total area of the rural area is 4,9 km², agricultural area of 465 ha with 234 arable area, 211 ha pastures and about 20 ha forest.

Bunesh

According to the census in 2002 Bunesh has 48 inhabitants (27 men and 21 women) in 27 households with 72 residents. The total area of the rural region is 11,3 km², with 1101 ha as agricultural area, 444 ha as arable area, 586 ha pastures and 71 ha forest.

Dobrevo

There are, in the most of the Dobrevo area, mine pits of the Zletovo minings, more known as a mining center than as a rural settlement with agricultural characteristics. It is with an altitude of 600

m with a total of 340 inhabitants (173 men and 167 women), 100 households and 175 residents. Region total area is 881 ha, 276 ha of which are arable land, 187 ha pastures and 418 ha forest.

Dolni Stubol

It is with an altitude of 610 m with 168 inhabitants (84 men and 84 women) with 66 households and 120 residents. Total area is 6.7 km², with 628 ha of agricultural area (448 ha arable land, 138 ha pastures and 42 ha forest).

Dolno Barbarevo

It is with an altitude of 630 m, with 11 inhabitants (6 men and 5 women) in 6 households and 22 residents. Total area is 11.2 km², with total agricultural area of 1003 ha (347 ha as arable land, 620 ha pastures and 88 ha forest).

Drenak

It is with an altitude of 650 m, with 26 inhabitants (14 men and 12 women) in 13 households and 37 residents. Total area of the village is 5.5 km², with total agricultural area of 529 ha (314 ha arable land, 212 ha pastures and 3 ha forest).

Dreveno

It is with an altitude of 640 m, with 213 inhabitants (118 men and 95 women) in 79 households and 150 residents. The total area is 6.7 km², with total agricultural area of 583 ha (329 ha as arable land, 219 ha as pastures and 35 ha forest).

Gajranci

It is with an altitude of 640 m, with 36 inhabitants (19 men and 17 women) in 19 households with 56 residents. Total area is 8.1 km², with 782 ha of agricultural land (251 ha as arable land and 5 ha forest, or in percentage 60% pastures and 38% arable land and 2% only forest and non-arable land).

Gomi Stubol

It is with an altitude of 670 m, with 99 inhabitants (54 men and 45 women) in 44 households, with 54 residents. Total area is 7.9 km², with 757 ha agricultural land (330 ha as arable land, 294 ha pastures and 133 ha forest).

Gorno barbarevo

It is with an altitude of 650 m, with 37 inhabitants (20 men and 17 women) in 21 households, with 37 residents. Total area is 15.2 km², where 1,378 ha as agricultural land (511 ha as arable land, 751 ha as pastures and 116 ha forest).

Grizilevo

It is with an altitude of 800 m, with 22 inhabitants (10 men and 12 women) in 13 households, with 35 residents, 9 flats. Total area is 3.4 km² where 280 ha are agricultural land (115 ha as arable land, 82 ha as pastures and 83 ha forest).



Gujnovci

It is with an altitude of 335 m, with 33 inhabitants (18 men and 15 wimen) in 15 households, with 27 residents. Total area is 5 km², where 459 ha are agricultural land (331 ha as arable land, 118 ha as pastures and 10 ha forest).

Jamishfo

Jamische is a small mountain village with 10 inhabitants according to 2002 census (5 men and 5 wimen) in 5 households, with 76 residents. Total area is 19.7 km², where agricultural land is 1954 ha(132 ha as arable land, 429 ha as pastures and 1393 ha forest).

Kalnishte

It is with an altitude of 600 m, with 2012 inhabitants (1063 men and 1019 wimen) in 623 households and with 1052 residents.

Kukovo

It is with an altitude of 570 m, with 18 inhabitants (8 men and 10 wimen) in 10 households and with 28 residents. Total are of Kukovo village area is 9.4 km², where 992 ha is agricultural land (449 ha as arable land, 404 ha as pastures and 24 ha forest).

Kundino

It is with an altitude of 710 m, with 81 inhabitant according to 2002 census (40 men and 41 wimen) ibn 35 households, with 66 residents. Total area is 7.4 km², with 682 ha as agricultural land (275 ha as arable land, 147 ha as pastures and 260 ha forest).

Lesnovo

It is with an altitude of 900 m, with 41 inhabitants (18 men and 23 wimen) in 25 households, and with 78 residents. Total area is 14.1 km² where 1360 ha is agricultural land (168 ha as arable land, 618 ha as pastures and 574 ha forest).

Lezovo

It is with an altitude of 400 m, with 44 inhabitants (22 men and 22 wimen) in 22 households and with 53 residents. Total area is 7.7 km², where 689 ha as agricultural land (357 ka as arable land, 330 ha as pastures and 2 ha forest).

Marchino

It is with an altitude of 700 m, with 26 inhabitants (12 men and 14 wimen) with 15 households and 37 residents. Total area is 5.99 km², where 551 ha is agricultural land (252 ha as arable land, 141 ha as pastures and 158 ha forest).

Neokazi

It is with an altitude of 450 m, with 98 inhabitants (49 men and 46 wimen) in 36 households and 60 residents. Total area is 5,8 km², where 546 is agricultural land (306 ha as arable land, 234 ha as pastures and 6 ha forest).

Pestirshino

It is with an altitude of 600 m, with 10 inhabitants (4 men and 6 women) in 5 households, with 19 residents. Total area is 7.7 km² where 728 ha is agricultural land (311 ha as arable land, 409 ha as pastures and 24 ha forest).

Petrshino

It is with an altitude of 505 m, with 60 inhabitants (32 men and 28 women) in 34 households, with 101 residents. Total area is 6.4 km² where 614 ha is agricultural land (470 ha as arable land, 136 ha as pastures and 8 ha forest).

Pishica

It is with an altitude of 450 m, with 168 inhabitants (78 men and 90 women) in 57 households, with 88 residents. Total area is 7.3 km², where 629 ha is agricultural land (347 ha as arable land, 286 ha as pastures and 16 ha forest).

Pleshenci

It is with an altitude of 590 m, with 188 inhabitants (92 men and 76 women) with 68 households and 112 residents. Total area is 9.6 km², where 914 ha is agricultural land (396 ha as arable land, 274 ha as pastures and 244 ha forest).

Puzderci

It is with an altitude of 460 m, with 34 inhabitants (20 men and 14 women) with 17 households and 31 residents. Total area is 6.1 km², where agricultural land is 586 ha (354 ha as arable land, 225 ha as pastures and 7 ha forest).

Ratavica

It is with an altitude of 460 m, with 277 inhabitants (134 men and 143 women) with 80 households and 133 residents. Total area is 3.5 km² where 232 ha is agricultural land (165 ha as arable land, 157 ha as pastures and 1 ha forest).

Probishtip village

This settlement is one of the oldest one in the Municipality of Probishtip dated in the 14 century. It is with an altitude between 550 m and 650 m, with 669 inhabitants (339 men and 330 women) in 200 households, with 280 residents in evidence. Total area is 631 ha, where 2/3 is arable land, with smaller pasture area and smallest forest area.

Shtalkovica

It is with an altitude of 650 to 1100 m, with 44 inhabitants (26 men and 18 women) in 16 households and 41 residents. Total area is 24.6 km². It is a village with largest area in the Municipality of Probishtip, with an agricultural area of 2338 ha (205 as arable land, 706 ha as pastures and 1426 ha under forest).

Strisovci

It is with an altitude of 500 m, with 54 inhabitants (31 men and 23 women), 30 households and 64 residents. Total area is 16.4 km², with 1549 ha as agricultural land (746 ha as arable land, 731 ha as pastures and 72 ha forest).

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Stimosh

It is with an altitude of 475 m, with 294 inhabitants (143 men and 151 women). Total area is 5,6 km², where 527 ha are agricultural land (387 ha as arable land, 132 ha as pastures and 8 ha forest).

Tripatainci

It is with an altitude of 390 m, with 1296 inhabitants (65 men and 61 women). Total area is 4,9 km² where agricultural land is 437 ha (251 ha as arable land, 180 ha as pastures and 6 ha forest).

Troolo

It is with an altitude of 470 m, with 45 inhabitants (26 men and 19 women) in 21 households, with 29 residents in the village. Total area is 13,9 km², where 1368 ha is agricultural land (465 ha as arable land, 889 ha as pastures and 14 ha forest).

Tursko rudari

It is with an altitude of 570 m, with total village area of 10,4 km², where 882 ha is agricultural land (263 ha as arable land, 388 ha as pastures and 231 ha forest).

Zarapinci

It is with an altitude of 425 m, with 12 inhabitants (6 men and 6 women) in 7 households and 12 residents. Total area is 4,3 km², where agricultural land is 423 ha (204 ha as arable land, 213 ha as pastures and 6 ha forest).

Zelenigrad

Most mountain village with an altitude of 1150 m, with 7 inhabitants (3 men and 4 women) with 5 households and 30 residents. Total area is 14,4 km². Agricultural area is 1424 ha (126 ha as arable land, 489 ha as pastures and 809 ha forest).

Zletovo

Oldest official data showing the existence of the Zletovo, as a settlement and Zletovo region center, is the edict dated in the year 1019. There are 2477 inhabitants, according to the 2002 census, (1262 men and 1215 women) in 733 households. Total Zletovo area is 10,4 km², where 915 ha is agricultural land (331 ha as arable land, 491 ha as pastures and 143 ha forest).

A review of the Municipality of Probishtip population is shown in the following table related to all settlements in the municipality (source <http://probishtip.gov.mk/demografija/polova-struktura/>).

Table 1 Sex structure in the Municipality of Probishtip

Settlement	Inhabitants	Men	Women
Buchishte	68	35	33
Gojanci	38	19	17
Gornj Stabal	98	54	45
Gorna Barabarevo	37	20	17
Griboveci	22	10	12
Gujnovci	33	18	15
Dobrovo	340	173	167
Dolno Stabal	188	84	84
Dolno Barabarevo	11	6	5
Drenak	26	14	12
Zarapinci	12	6	6
Town of Probishtip	8045	4073	3972



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Settlement	Inhabitants	Men	Women
Settlement Kalnishte	2102	103	1019
Kukovo	18	8	10
Kurdino	81	40	41
Lezovo	44	24	20
Marchino	26	12	14
Neokazi	95	49	46
Pestrishino	10	4	6
Petrshino	60	32	28
Pishica	168	78	90
Pleshenci	168	82	76
Puzderci	34	20	14
Sirisovci	54	31	23
Simosh	294	143	151
Troolo	45	26	19
Zlotovo	2477	1262	1215
Jamishte	10	5	5
Lesovo	41	18	23
Ralnica	277	134	143
Trilpanci	126	65	61
Tursko Rudari	185	97	88

The Municipality of Probishtip, according to the old age structure, consists of a population with an old-age over 60 years, except in the town of Probishtip and settlement Kalnishte, as shown in the following table.

Table 2⁴ Old age structure of the population in the Municipality of Probishtip

Settlement	Inhabitants	0 - 9 years	10 - 19 years	20 - 29 years	30 - 59 years	over 60 years
Buchishte	68	5	4	7	28	38
Gajranci	38	0	1	0	3	32
Gorni Stibel	99	7	7	8	29	48
Gorno Barbarevo	37	0	0	1	7	29
Griglevci	22	0	0	0	7	15
Gujnovci	33	0	5	0	8	18
Dobrevo	340	33	39	42	145	81
Dolni Stibel	168	15	9	16	72	56
Dolno Barbarevo	11	0	0	1	2	8
Drenak	26	0	2	0	6	18
Zaraphci	12	0	0	0	3	9
Town of Probishtip	8045	775	1293	1322	3755	895
Settlement Kalnishte	2102	258	430	251	907	168
Kukovo	18	2	0	1	2	13
Kurdino	81	4	5	3	26	43
Lezovo	44	1	1	2	8	32
Marchino	26	1	1	1	8	15
Neokazi	95	5	9	17	32	32
Pestrishino	10	0	0	0	4	6
Petrshino	60	2	0	2	12	44
Pishica	168	8	31	20	63	46
Pleshenci	168	8	12	19	63	70
Puzderci	34	0	0	4	11	19
Sirisovci	54	0	0	0	8	46
Simosh	294	32	43	39	128	42
Troolo	45	0	0	1	11	33
Zlotovo	2477	280	362	360	1089	385

⁴ Source internet web site of the Municipality of Probishtip (<http://probishtip.gov.mk/demografija/demografija>) (municipality profile)



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Settlement	Inhabitants	0 - 9 years	10 - 19 years	20 - 29 years	30 - 59 years	over 60 years
Janishte	10	0	0	0	5	5
Lesnovo	41	0	2	3	10	26
Ratavica	277	32	40	39	114	52
Tripatanci	126	2	18	5	43	58
Tursko Rudari	185	28	21	31	74	33

According to the nationality affiliation, in the area of the Municipality of Probishtip lives mainly Macedonian orthodox population as shown in the following table.

Table 3 Nationality structure⁵ of the population in the Municipality of Probishtip

Settlement	Inhabitants	Macedonians	Turcs	Romas	Vlachs	Serbs	Bosnians	Albanians	Other
Buchishte	66	65			3				
Gajrandi	36	36							
Gorni Stubol	99	99							
Gorno Barbarevo	37	37							
Gribilevo	22	22							
Gujnovci	33	33							
Dobrevo	340	336	2						2
Dolni Stubol	168	167							1
Dolno Barbarevo	11	11							
Dronak	26	26							
Zarapinci	12	12							
Town of Probishtip	16182	15977	6	51	37	89	1		47
Settlement Kalishte	2102	2079		1		20			2
Kukovo	18	18							
Kundino	81	79				2			
Lozovo	44	44							
Marchino	26	26							
Neokazi	95	95							
Pestishino	19	19							
Petreshino	60	60							
Pishica	168	159			9				
Pleshental	168	168							
Puzdenci	34	34	32	1					
Strisovci	54	54							
Stenash	294	294							
Trocla	45	45							
Zletovo	2477	2471			1	2			3
Janishte	10	10							
Lesnovo	41	41							
Ratavica	277	267			9		1		
Tripatanci	126	125				1			
Tursko Rudari	185	185							
Shtalkovica	44	44							

Elementary schools

The elementary education in the town of Probishtip started organization and realization in the year 1947. The Secondary education started in the year 1948 by establishing of the Industrial – mining School.

⁵ Макед. истражен центар за општество Пробиштип, <http://probishtip.gov.mk/dokumentacija/natsionala-zemljopisni-problemi> (prezeto na 08.09.2016)



The Municipality of Probishtip has the jurisdiction over the elementary schools "Miladinovci Brothers" and "Nikola Karev", including the regional schools functioning under their content and jurisdiction on the Secondary education School "Naum Naumovski Borche".

The teaching in the schools is organized and realized in accordance with the scheduled calendar for the organization and work of the elementary and secondary schools in the teaching year 2013/2014. The educational work is organized and realized in Macedonian language in one shift in the period of 730 – 1430 hours. A tour of duty is organized by the students and teachers with purpose to establish a better order and discipline in the schools.

The schools total area is 20 813 m² which, in winter season, is heated by hot water heating system, except in the regional schools in the villages Ratavica, Dobrevo and Strimosh where the heating is by stove on wood (175 m²). There are 58 classrooms (2 980 m²), 48 teaching rooms (2 870 m²), 5 libraries (196 m²), 5 sport halls (4 918 m²) and winter pool (258 m²), with a total yard area of 48 820 m².

In the school year 2013/2014 the schools enrolled 1541 pupils, in 81 classrooms, where 432 students in the secondary education in 21 classrooms with 15 in the high school and 6 in the professional classrooms. In the elementary education were 1119 pupils with 646 pupils enrolled in section teaching in 35 classrooms and 473 students in subject teaching in 24 classrooms. There is, in the municipality, a combined classroom for special needs with 9 pupils.

There is a Low Music School with 51 students and a teaching for the students with prolonged sojourn standing with 163 students in the section teaching. The educational work is organized and realized by 221 employed teachers, 6 as managerial staff (director and assistant director), 11 professional collaborators, 7 administrative staff, 173 teachers (38 are professors for general subjects, 9 for professional subjects, 2 for instruction teaching, 38 are teachers for classroom teaching and 56 teachers for subject teaching) including 54 technical staff.

Secondary schools

The secondary education is organized and realized in the Municipality of Probishtip in the year 1948 by establishment of the Industrial-mining School. In the year 1961 the High School "Naum Naumovski Borche" is opened, and in the year 1963 the Mining-geological technical School is opened. In the year 1978, the independent schools established a unique school as a school center for secondary education under the name "Naum Naumovski Borche". In the year 2000/2001 the UCISO "Naum Naumovski Borche" is transformed into State Secondary School. In the year 2005/2006 it has been transformed into the Secondary municipal school "Naum Naumovski Borche".

The Secondary municipal school "Naum Naumovski Borche" has a total covered and usable area of 423 m² which, in winter period, is heated by a hot water heating system. There are, in the schools, 13 classrooms (702 m²), 15 instruction rooms (837 m²), 1 library (102 m²) and two sport halls (1 302 m²), with a yard of 15 144 m².

In the teaching year 2013/14, 423 student were enrolled in the school in 15 classes (253 students in the high school in 11 classes and 84 students in sport high school in 4 classes). 95 students were enrolled in the professional education in 6 classes. The educational work is organized and realized by 67 employees, where 2 of them are managerial personnel (director and assistant director), 3 of them are professional collaborators, 2 are administration personnel, 49 are professors

(38 for general subjects, 9 for professional subjects and 2 for instruction teaching) and 11 are technical staff.

In the SOU "Naum Naumovski Borche", a teaching is organized and realized for the students enrolled in the high school and professional education. All fields are verified, under the combination A and B (natural-matemathics, social-humanitarian and language-artictic), in the highs school education as well as the sport high school. The mechanical specialization is verified in the professional education for the educational profile as mechanical and mechanical-energetic technician of IV degree, locksmith ant car mechanist of III degree, as well as the geological-mining and metallurgy specialization with the educational profile for geological-mining technician of IV degree.

The teaching is organized and realized during the teaching year for the students enrolled in the high school education (in the natural-mathematics field) under the combination A, as well as in the sport high school, and in the professional education for the mechanical profession for the educational profile mechanical/mechanical-energetic technician and in the geological-mining and metallurgy profession for the educational profile of the geological-mining technician.

There is a possibility, for the persons which have not completed their education, to do that by part-time manner.

High school education

The Technological-technical Faculty is established in Probishtip by the decision of the Government of the Republic of Macedonia in the year 2008 as one of the three new technical faculties at the University "Goce Delchev" in the town of Shtip. The faculty objective is to contribute in the development of the personel with capability to accept and realize the achievements in the high technology, as well as to be innovative for new technologies developed in the domestic and international areas.

Studies are organized as:

- First cycle of studies
- Second cycle of studies

Studies carrier is the Technological-technical Faculty. The proceeding of the studies is performed by the chairs as integral part of the Technological-technical Faculty, as:

- Chair for textile and organic engineering
- Chair for ready-made processing and ready-made processes managing
- Chair for chemical engineering and managing and regulation of technological processes
- Chair for material engineering

Health protection

The health protection is realized in the town of Probishtip in the private health organizations, as follows:

- PZU SOLIN-DENT, Jakim Stojkovski 44, 2210 Probishtip – for stomatological-protetic needs

- PZU PROBI-DENT, Jakim Stojkovski 40, 2210 Probishtip, Stomatology ordination PROBI-DENT
- PZU Donevska D-r Paca, Jakim Stojkovski 20, 2210 Probishtip established before 20 years in the beginning as an independent specialized ordination with one doctor.
- PZU D-r Mijalche Andonovski, Nikola Karev 23 Probishtip.

Municipality of Karbinci

With the territory partition of the Republic of Macedonia in the year 2004 the Municipality of Karbinci is separated from the Municipality of Shtip and started to function as independent municipality. Besides the separation Karbinci is very closely connected to Shtip. The Municipality of Karbinci has an area of 259 km² and it is considered as a medium municipality in the Republic of Macedonia. The Municipality of Karbinci is 13 km far from Shtip. It is located in the foothill of the Plachkovica Mountain.

The Municipality of Karbinci has 29 settlements, all of them as rural ones. Argulica, Dalarje, Vrteshka, Golem Gaber, Gorni Balvan, Gorno Trogerci, Dolni balvan, Dolno Trogerci, Ebeplija, Junuzlija, Kalauzlija, karbinci, Kepekchelija, Kozjak, Krupishte, Kurfalija, Kuchilat, Kuchica, Mal Gaber, Michak, Muratlija, Nov Karaorman, Odzalija, Pripechani, Prnalija, Radanje, Ruljak, Tarinci and Crvuljevo.

Table 4⁶ Basic demographic indicators for the municipalities

Municipality	Area km ²	Population	Number of settlements
Karbinci	259	4012	29

The following table shows the data related to the municipalities after the number of the households, residents and sex structure. The table shows the difference, which is characteristic for the whole Republic of Macedonia, between the number of settlements and the number of households where the number of settlements is higher (Source: State Statistics Office – 2002 census).

Table 5 Basic indicators for the number of households, residents and sex structure in the Municipality of Karbinci

Municipality	Households	Residents	Sex structure	
			Men	Women
Karbinci	1212	1466	2034	1078

As to the nationality affiliation it is characteristic that the Macedonians dominate in the three reviewed municipalities in an amount of 88.2% with very small amounts of other ethnic groups (Source: Stat Statistics Office – 2002 census).

Table 6 Population in the Municipality of Karbinci Chestinova-Oblesinova after the nationality affiliation expression

Municipality	Total	Nationality							
		Macedonians	Albanians	Turcs	Romas	Vlachs	Serbs	Bosnians	Other
Karbinci	4012	3200	0	728	2	54	12	0	16

The population age structure in the municipalities is shown in the following table (Source: State Statistics Office – 2002 census).

⁶ Source: State Statistics Office (census 2002)



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Table 7 Population structure after the age

Municipality	Total	Age 0-19 year	Age 20-64 year	Age 65 and over	Unknowning age
Karbinci	4012	1175	2175	661	1

The agriculture, forestry and fishing are the main activities in the rural Municipality of Karbinci right before the wholesale and retail trade; motor vehicles and motorcycles repairs and transport and warehousing. The wholesale and retail trade are main activities in other rural Municipality of Cheshinovo – Obleshevo: as well as motor vehicles and motorcycles repairs right before the agriculture, forestry and fishing (Source: State Statistics Office).

Table 8 Active business entities by sectors of activities according to MKD Rev. 2 in the Municipality of Karbinci per years, standing at 31.12.2012

Municipality of Karbinci	Total 65
Agriculture, forestry and fishing	29
Processing industry	7
Water supply; waste waters discharge, waste management, environment improvement	1
Civil Engineering	2
Wholesale and retail trade; motor vehicles and motorcycles repair	16
Transport and warehousing	8
Professional, scientific and technical activities	2
Public administration and defence; compulsory social insurance	1
Education	1
Health and social protection activities	1
Art, entertainment and recreation	1

The following table shows that the average number of household members, in the Municipality of Karbinci, is higher and the number of residents is higher than the number of households, concluding that some households own their resident.

Table 9 Total population, households and residents in the Municipality of Karbinci

Municipality	Population	Households	Residents (all types of residents)	Average members in household
Karbinci	4012	1212	1468	3.31

Table 10 Age structure of the population in the Municipality of Karbinci

Municipality	Total	Age class (years) men			Age class (years) women		
		0 - 14	15 - 64	over 65	0 - 14	15 - 64	over 65
Karbinci	4012	424	1300	300	463	1154	361

As shown in the table above it could be found out that, in the Municipality of Karbinci, the most present age group is from 15 to 64 year. It shall be noted that the population over 65 year is not dominating, meaning that prevails the young population. It indicates a positive trend of the age structure of the population in the region.

The education structure of the population is not favourable. It could be seen in the following two tables.

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Table 11 Education structure of the population in the Municipality of Karbinci

Municipality	Total 5 year old and over population	Enrolled in					Not enrolled in school
		Primary education	Secondary education	High school	Faculty, academy	Post-diplome studies	
Karbinci	3745	438	132	3	27	-	3145

Table 12 Current education structure of the population in the Municipality of Karbinci

Municipality	Population	In the education process	Without school	Incomplete primary education	Primary school	Secondary school	High school	High school, faculty, academy	Master study	Graduate
Karbinci	3125	8	481	875	1078	638	29	17	-	-
	100%	0,256%	15,392%	28%	34,432%	20,448%	0,928%	0,544%	-	-

According to the shown in the table, 34% of the population has a primary education, 20% has secondary education and approximately 1.5% has high education.

By the amendments in the Law on mandatory secondary education as well as with the campaigns for high education of all persons and the possibility to enroll a faculty for the persons over 45 years of age, it is expected these percentages to change drastically to a better outcome. In such case the social disparity shall be diminished and the social image of the state shall be significantly improved allowing, in future, socio-economical, cultural and functional prosperity of the population and the municipalities along the section in subject.

Table 13 Active and non-active population number in the Municipality of Karbinci

Municipality	Total	Economically active			Economically non-active
		Economically active	Employed	Non-employed	
Karbinci	3122	1331	706	625	1791

Karbinci is a municipality where prevails an agricultural economy, an economy activity which is characteristic for the whole Eastern region of Macedonia with all three main undersections: farming, stockbreeding and vineyard-orcharding. The existing industry is directly or indirectly in the value line coming out from the agricultural resources in Karbinci: pig farm, cow farm, compost plant with basic activity of vegetables cultivation, flowers, decorative plants and seed production as well as mushroom production – oyster mushroom, greenhouses; production of early garden cultures (tomatoes, cucumbers, cornishons, peppers, carrots), production, pasteurization and preserving of fruits and vegetable; flour and livestock food mills. Small private companies were established upon the privatization of the previous metal processing industry which kept only a percentage in the whole industry participation. There is a successful foundry in the Municipality of Karbinci.

Village Krupishte, Municipality of Karbinci

The village Krupishte is on the road Shtip – Kochani in the middle of a marshy valley at the confluence of the Zletovica River into Bregalnica River. The ground is 2-3 m above the surrounding marsh in form of a narrow peninsula. Today, the marsh is, by irrigation measures, converted in rice fields.



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The village Krupishte has a good location for it is 15 km from the town of Shtip and 13 km from the town of Kochani.

Table 14 The number of inhabitants, households and residents in the subjected settlements

Settlement (village)	Inhabitants	Households	Residents
Krupishte	336	123	148

Table 15 Number of inhabitants in the subjected settlements after nationality

Settlement (village)	Nationality						Total
	Macedonians	Turcs	Romas	Vlachs	Serbs	Other	
Krupishte	313	12	10	-	-	-	336

Table 16 Number of inhabitants in the subjected settlements after religion affiliation

Settlement (village)	Верска припадност			Total
	Orthodox	Muslims	other	
Krupishte	319	12	5	336

5.2 Geological, Geological-Hydrogeological, Geomorphological and Pedological Features of the Location

5.2.1 Geological features of the wider region

Given that the geological processes of the wider area affected the geological characteristics of the investigated area along the planned section, the geological structure of the wider region has the following geological features.

On the territory of Macedonia there are four distinguishable regional units, namely the Serbo-Macedonian massif, the Vardar zone, the Pelagonian horst anticlinorium, and the Western Macedonian zone.

These differentiated tectonic units underwent a long evolution in their geological past, and the modelling processes are active and manifested in the present conditions through the effects of the geo-exogenic factors.

The Detailed Design for Repair and rehabilitation of state road R1205, section Krupishte – Probishtip, involves the area of the Kochani Depression. It is formed North-East from the city of Shtip and is bordered on the north side by the Osogovo mountain range and its highest peaks Sinkovica, Sudugrob, and Golem Ruen. On the south and southeast side it is bordered by Plackovica Mountain and its highest peaks Turler and Lisec. Kochani Depression is located at an altitude of about 290 m. The presence of upper Eocene sediments indicates that the initial formation of this depression is tied to pre-paleogenic movements, assuming its final form later, in the Quaternary Period.

Within the area of Kochani Depression there are interesting morphological forms: river valleys, river terraces of various age, as well as a number of smaller and larger hills.

The terrain is comprised of a complex of Paleozoic metamorphic and metamorphosed igneous rocks, volcanic rocks, Mesozoic sediments and magmatites, Neogene sediments as well as contemporary Quaternary sediments most widely represented on the surface of the investigated area. The geological division of the lithological members present on the location is based on the Basic Geological Map - Shtip 1:100 000 shown in Figure 11 below.

Within the overall analysis of the route, and with the aim of obtaining more detailed data, due attention was devoted to defining the geological features of both the wider area and the area along

the route, i.e. in accordance with the fact that the geological development of the wider area has an impact on the geological features of the investigated route, and on the geotechnical conditions for construction of the planned structure.

From a geological perspective, the area traversed by the route and the wider surrounding area is generally comprised of Neogene sediments and decomposed material on the surface. The geological structure is shown in Appendix 1.2 (Geological map of the wider area, scale 1 : 100 000).

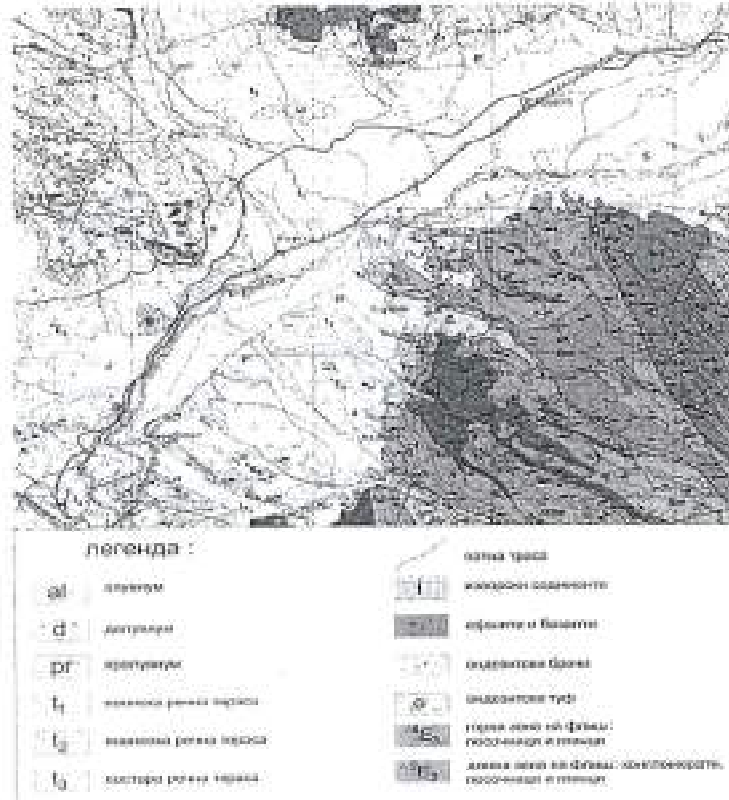


Figure 8 Geological map of the wider area M 1:100 000

The area of Kochansko Pole traversed by state road R1205, section Krupishte – Probishtip, mostly consists of Tertiary and Quaternary sediments. The largest part of the Tertiary sediments is comprised of upper Eocene Priabonian sediments where four superposition series have been identified as a result of numerous investigations:

- Basal series (sandstones, marls, conglomerates);
- Lower Flysch Zone;
- Lower yellow sandstones;
- Upper Flysch Zone.

The following lithological units are present within the investigated area:

Lower Flysch Zone (²E₃)

This zone consists of almost consistently alternating conglomerates, sandstones and clays.

Conglomerates occur multiple times in the series, forming conglomeratic zones with a thickness of 2-20 m. They usually appear as 2-5m thick beds, starting from the largest and ending

with the finest fractions. Pebbles are 2-5 cm in size, mostly granite and more rarely gneiss, quartzite, and other types. The cement is clayey-sandy and contains significant percentage of iron.

Sandstones are most dominant and occur as 20-200 cm thick beds. In terms of their mineralogical composition, they are arcose sandstones due to the large quantities of feldspar. They are usually medium to coarse-grained, comprised of quartz, feldspar and mica.

Clays are comprised of clay matter and very low quantities of fine-grained sand mixed with carbonate and limonite. They occur as beds with a varying thickness of 20-150 cm.

Upper Flysch Zone (⁴E₃)

Flysch is quite prevalent in this area and is characterized by a thickness of several hundred meters.

Upper Flysch Zone sediments are characterized by extremely gray to grayish yellow color, higher percentage of clay compared to sandstones, mostly horizontal spread, graded bedding and flow traces, and ripple marks in the upper parts which indicates that these sediments correspond to turbidites - flysch sediments containing large amounts of fossil remains.

Clays occur in 3-4m thick beds, gray to gray-yellowish in color, and are comprised of illite type clay matter and detritus comprised of quartz, feldspar, muscovite, and heavy minerals.

Sandstones are also gray to gray-yellowish in color and correspond, in terms of their mineralogical composition, to greywacke. They consist of quartz and mica, and small quantities of quartzites, cherts, etc.

Andesitic tuff (θ)

Andesitic tuffs have a varying thickness in different locations, and are pale yellow to yellow in color. The entire mass has a crystal-like structure with pronounced silicification.

Andesitic breccias (ω')

Breccias lie directly over the tuffs, covering a significant part thereof. The breccias are comprised of rough pieces of andesite randomly scattered within the base mass, which is comprised of volcanic ash and broken mineral grains. It can be observed that the andesite pieces have been significantly altered.

Kyanites and basalts ()

These rocks are associated with the youngest volcanism in the Vardar zone. They appear as effusions and drifts breaking through the Paleogene sediments. They are reddish, red-brown, grey-black to dark grey in color, and composed of sanidine, plagioclase, magnetite, biotite, olivine, and carbonate matter. They are fine-grained rocks with massive texture and porphyric structure.

Stream sediments (I)

Stream sediments are represented by breccias wherein the cement is grey-yellowish in color and has a scaly texture. Minor stratification can be observed where the slope elements are determined by the terrain configuration. These sediments originate from thermal springs that still exist today with very low yield.

Older river terrace (T_3)

The oldest Holocene deposits are represented by old river terraces, and are developed along the Bregalnica River. These terraces are, for the most part, erosional fill terraces situated over the Paleogene and Miocene sediments. They are composed primarily of andesite pebbles, and more rarely of quartz and gneisses. Their thickness ranges from 10-15 m.

Higher river terrace (T_2)

The higher river terrace is situated along the valley of River Bregalnica, at an altitude of 20-50 m above the river bed, comprised almost exclusively of loose gravel and sand.

Lower river terrace (T_1)

These terraces are situated along River Bregalnica and are mainly comprised of clays, clay soil, sandy loam, and gravels.

Proluvial deposits (pr)

Proluvial deposits are very widely distributed over the northern and northwestern slopes of Mount Plachkovica within Kochansko Pole. They are comprised of poorly rounded and angular fragments from Precambrian, Cambrian, and Paleozoic rocks bound with clay soil and sandy loam. In some places these deposits are tens of meters thick, indicating intensive sediment deposition on such areas.

Diluvial deposits (d)

These deposits are found in areas where there are upper Eocene sediments. For the most part, it is a decomposed - loose cover with a thickness ranging from a few centimeters to a few meters.

5.2.2 Hydrogeology

According to the geological structure of the terrain, there are unconfined aquifers formed in areas of intragranular porosity, i.e. in Quaternary and Pliocene sediments. In the Eocene sediments, the materials are hydrogeological complexes wherein there are individual layers acting as aquifers and aquicludes. Discontinuous aquifers are formed in granites and gneisses. They have poor permeability and the formed aquifers have low yield, usually ranging from 0.1 to 1.0 l/s. At a lower depth these rock masses are more compact, and in some places on the surface there are cracks which, in this aspect, act as aquicludes. Conditionally arid areas within the investigated region include consolidated semipetrified rock masses represented by Eocene sediments. Taking into account the identified aquifer types, in terms of the groundwater regime (groundwater intake, movement, discharge and water table), we can conclude that, according to the geological structure of the terrain, the main factor in the formation of aquifers are the continuous and occasional river courses and streams, as well as precipitation (rain, snow) which are the main sources of recharge to the aquifers.

The rock masses situated along the route are characterized, in terms of their hydrogeological function in the terrain, as typical aquifers, relative aquiclides, and aquicludes.

The group of aquifers consists of proluvial-alluvial creations. They are characterized by super-capillary (intragranular) porosity. Depending on the percentage of clay present in the proluvial sediments, they also can function as relative aquifers.

Diluvial deposits situated above the gneisses, mica schists and the flysch (dl), function as aquicludes, where the circulation and ability to store ground water is quite difficult due to the presence of clay and silty fragments.

The group of aquicludes includes gneisses (Gn) and mica schists (Smg), which are characterized by tight cracks and are regularly filled with silty sandy clay.

Eocene sediments and flysch series function as so-called hydrogeological complexes. Along the vertical axis, there are alternating aquicludes consisting of marls and clays, and relative aquifers consisting of sandstones. They are generally arid areas.

The main hydrological structure within the investigated area, running through the entire area of Kochansko Pole, is the River Bregalnica with its left-bank tributaries: River Orizarska, River Kochanska and River Zletovska. During the dry season, their water level may decrease, and occasionally dry up. The other basins, during the mapping process, were waterless.

This suggests that along the course of River Bregalnica and its tributaries, there are characteristic geological prerequisites on the terrain for the formation of an aquifer zone. Namely, the aquifer zone is expected to have formed in a fairly wide area (practically extending along the width of Kochansko Pole) along the course of River Bregalnica, and in a narrow area near the tributaries, mainly in the proluvial-alluvial sediment zones. Within this area, the aquifers are continuous and unconfined, with a water table hydraulically connected to the river water level.

With regard to the gneiss zone, there may be discontinuous aquifers in the deeper areas, but the ongoing investigations are unable to confirm this, due to the fact that almost the entire area is covered with humus (diluvium) and due to the impossibility of identifying any fault zones and open unfilled cracks which, in such cases, could function as hydrogeological conductors. Storm water could infiltrate through them and fill up the aquifer. The discontinuous (fractured) aquifer formed as described above would have a low storage capacity and yield of less than 1.0 l/s.

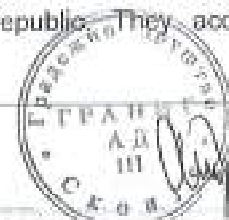
No aquifer zones are expected to have formed in the mica schists.

The consolidated semipetrified rock masses represented by Eocene sediments are included as conditionally arid parts of the investigated area. Where there are appropriate hydrological conditions, the formation of relative continuous low yield aquifers is possible in intensively fractured and weathered sandstones as parts of the flysch complex.

In terms of their hydrogeological function, the rock masses (soil materials) present in the area for the most part function as typical hydrogeological complexes and aquicludes, and as aquifers to a lesser extent. Aquifers include sandy-gravelly sediments in the form of interbeds and wedges, connected to the narrow zones of the permanent and occasional surface watercourses with significantly small amount of surface water flow.

Due to the prevalence of hydrological complexes and aquicludes along the route, precipitation is hardly infiltrated into the underground; instead, a part of it evaporates, another part is infiltrated into the river courses, and a certain quantity of surface water interacting with groundwater forms wet zones, i.e. occasionally flooded areas as contemporary geological phenomena and processes requiring appropriate measures for groundwater drainage.

Groundwater on the territory of Macedonia is an essential resource for water supply. Groundwater aquifers are formed in the main valleys in the Republic. They account for



approximately 70% of the organized water supply, and with regard to individual water supply, this percentage is even higher. Despite the high groundwater utilization percentage, the potential of ground water is neither sufficiently explored, exploited, nor protected. There are many reasons for that, foremost among them being the commitment to build multipurpose surface reservoirs, neglecting thereby the hydrogeological surveys of existing and potential groundwater sources; the inconsistency in the current legislation with not very clearly defined obligations and rights with regard to groundwater exploration, utilization, and protection, misalignment of competences in the area of water supply, incomplete hydrometeorological (hydrological) observation network, lack of hydrogeological base maps for detailed research and design, etc.

Some of the rainfall infiltrating beneath the soil surface turns into groundwater. Its movement in the soil and through the rock masses is slow and with greater or lesser delay. It comes to the surface in suitable places and replenishes the surface waters. Part of the groundwater replenishes the underground reservoirs – aquifers, raising the water table of such reservoirs.

The most prevalent type of aquifer in the water management area of Upper Bregalnica is a continuous unconfined aquifer developed in the alluvium of River Bregalnica (with good filtration properties and a thickness of 5-15 m), River Gabrovska, Grashnica, and others, and in the water-bearing parts of the Quaternary-Pliocene sediments within the Delchevo-Pehchevo-Berovo basin. The yield of the water reservoirs in these aquifers ranges from 10 l/s up to 30-40 l/s in the Shamakot locality, which the city of Delchevo uses for additional water supply. A pressure level aquifer is developed in the vicinity of v. Zvegore – Pancharevo. A small sized karst aquifer is developed in the Triassic limestones around the villages of Zvegor, Grad, and Planica, drained by several smaller springs.

The most prevalent type of aquifer in the water management area of Middle and Lower Bregalnica is a continuous unconfined aquifer developed in the alluviums of the rivers Bregalnica, Lakavica, Otinja, Svetinikolska, Orizarska, Osotnichka, Gradechka, Zletovska, and others. These aquifers are drained via several water collection structures (wells, river wells, galleries), which are mostly used for water supply of nearby places: Vinica, Kochani, Shtip, Probishtip, Kratovo, and others, and whose individual yields go up to 10-60 l/s. The individual exploitation of groundwater via wells is also quite intensive particularly during the vegetation period, for the purpose of irrigation. The forthcoming commissioning of HS Zletovica will solve the problem of water supply for the cities of Shtip, Probishtip, Kratovo, Sveti Nikole and a number of smaller populated areas in the region. Pressure level continuous aquifers can be found locally, in the Pliocene sediments of the Ovche Pole valley, with a Q of up to 10 l/s around the villages of Krupishte, Durfulija, Lozovo, Erdzelija, and others. Karst-fracture aquifers are present locally, in the carbonate rocks of the mountain ranges of Plachkovica and Osogovski Mountains, with numerous lower capacity springs.

Cold shallow groundwater is found in the alluvial deposits of River Bregalnica and its tributaries. The second type, artesian groundwater in the Kochani Depression, found in volcanogenic sediment deposits, is also economically very significant. It occurs at different depths ranging from 30 to 1000 meters, in all three types of aquifers – fracture, continuous, and karst, with various filtration coefficients.



Figure 9 River Bregalnica

The Zletovska River springs up in the North side of the Lopensko Crest of the Osogovo Mountain at an altitude of 1620 m. It empties in the Bregalnica River after the village Ularci at an altitude of 293 m. It is 50 km long. It has many tributaries where the longest one is the Belashica River. Its basin area is 460 km² with a relative gradient of 26,5%.

The Zletovska River has 35 larger and smaller tributaries where the biggest one is the Venechka River. The average measured flow of the Zletovska River is 2,64 m³/s. Upper part of the Zletovska River is between the emptying of its left tributaries Emirichka River and Eshterec. This location is important by its deep river valley with ravine like, in some places canyon like, appearance.



Figure 10 River Zletovska

The Kiselica River is redirected a little bit to West from the downstream side when the new one is executed in the late 1970. It is accepting the discharges South of the barrier, and emptying eventually in the Zlelovica River about 7 km downstream. The acidic waste water empties by an discharge/pipe directly in the Kiselica River waters.

The Kiselica River is not, for the time being, classified, but it is polluted by the discharges from the batteries factory by passing through the factory barren soil. The town of Probishtip is missing a waste waters treatment plant, so the communal waste waters empty directly in the river waters without any treatment.



Figure 11 River Kiselica

5.2.3 Hydrological and hydrographic features

The hydrographic network of the analyzed area is fairly developed with numerous rivers with constant water flow, as well as rivers and streams with temporary water flow, particularly in the spring months, all of which belong to the basin of River Bregalnica. The river basins in Macedonia are shown in the Figure below.

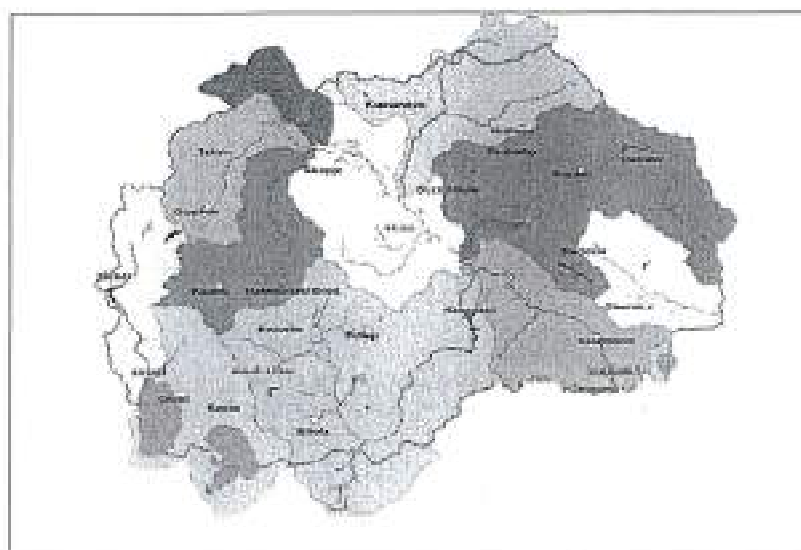


Figure 12 Basins in Macedonia

Surface water (rivers and lakes) in the Republic is divided into 4 classes and water usage is defined depending on the class, as shown in Table 6. Also defined are the characteristic parameters and their limits, according to which the appropriate surface water class is determined (Table 6). Table 6 shows the required surface water quality (as prescribed in the Law of the Republic of Macedonia) and the water quality achieved during the period (1989 - 1994).

Table 17 Water use according to its classification

Water class	Water usage
I	Clean water that can be used, in its natural state or upon disinfection, for water supply to populated areas, in the food industry, or for the purpose of breeding assorted varieties of fish.
II	Water used for bathing, recreation, and water sports, as well as for breeding other varieties of fish. Using normal treatment methods (coagulation, filtration, disinfection), such water may also be used for water supply to populated areas and in industries where there is demand for clean water.
III	Water that can be used, in its natural state or upon appropriate conditioning, in agriculture or industry water supply, where there is no demand for clean water.
IV	Any other water that may be used upon its specialized treatment.

Source: Spatial Plan of the Republic of Macedonia, 2007

The surface water quality is measured as part of the networks maintained by the State Hydrometeorological Service and the Ministry of Environment. Certain measurements, particularly of the quality of groundwater used for water supply, are conducted by the National Institute of Public Health.

Results from the conducted measurements are published in reports and, partly, on the website of the Ministry of Environment and Physical Planning of Macedonia (<http://www.moepp.gov.mk/>).

During the analyzed period 2003-2011, a significant reduction of BOD5 and ammonium concentrations was observed in the rivers in Macedonia in 2003, 2009, and 2010, while in 2011 there was a slight increase in the BOD5 and ammonium concentrations. BOD5 data for River Bregalnica is shown in the table below.

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Table 18 Biochemical oxygen demand for River Bregalnica (2003-2011)

River/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bregalnica	2.36	4.50	0.55	7.44	5.79	8.00	5.41	2.60	4.79

Source: Ministry of Environment and Physical Planning

Table 19 Total ammonium in River Bregalnica (mg/ltr) (2003-2011)

River	Year								
	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bregalnica	0.20	0.17	0.14	0.20	0.13	0.14	0.12	0.05	0.07

Average annual nitrate and orthophosphate concentrations have been relatively stable since the early nineties. It has been established that the concentration of these parameters is higher at some measuring points along River Vardar.

Table 20 Nitrate concentration (mg/ltr) in River Bregalnica (2003-2011)

River/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bregalnica	3.14	0.76	1.58	1.80	1.99	1.87	1.69	1.17	0.98

Table 21 Orthophosphate concentration (mg/ltr) in River Bregalnica (2003-2011)

River/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bregalnica	0.62	0.80	0.39	0.30	0.43	0.48	0.29	0.29	0.05

Source: Ministry of Environment and Physical Planning

5.2.4 Basic tectonic and seismotectonic features of the area

Tectonic and seismotectonic features of the area are found in correlation with the geological development of the terrain and the geological processes. Given that the terrain is, for the most part, covered in Neogene sediments and decomposed material on the surface, it is difficult to observe any remarkable tectonic structures (faults, nappes, etc.)

According to the geotectonic regionalization of the Republic of Macedonia, the investigated area is part of the Vardar zone as a larger geotectonic unit (Figure 5). In terms of its tectonic evolution the Vardar zone is fairly instable due to the presence of complexes from the old Paleozoic and Albian structural stratum, with an already inherited original structural form. Miocene sediments lie discordantly on top of the older formations, with a slight monoclonal dip towards west and southwest. Pliocene sediments lie discordantly on top of them, on a nearly horizontal axis. They are largely influenced by disjunctive tectonics, with the youngest effusive rocks spilling out along the fault lines.

According to the current Seismologic Map of the Republic of Macedonia, for a return period of 500 years (recommended according to Eurocode 8 until the adoption of a national document for utilization in the field of seismics), it can be concluded that the area along the road is located in areas of intensity може да се констатира дека подрачјето по должина на патот е лоцирано во подрачја со интензитет I=VIII⁰ MCS (according to the Mercalli-Cancani-Sieberg scale). A seismologic map of the wider area is shown in Appendix 1.5.



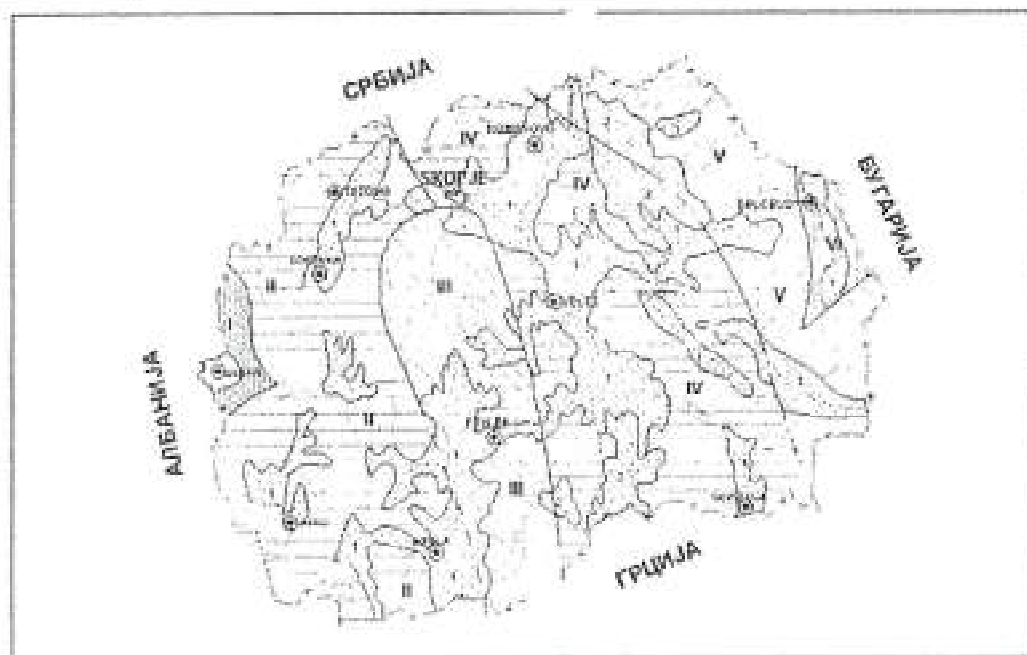


Figure 13 Tectonic regionalization map of the Republic of Macedonia I - Kukull-Krasita; II - Western-Macedonian zone; III - Pelagonian massif; IV - Vardar zone; V - Serbo-Macedonian massif; VI - Kraistide zone

Neotectonic features and zoning of the territory of Macedonia

The period of geological history that encompasses the Neogene and Quaternary periods is characterized, on the entire territory of Macedonia, by continental development when sinking depressions were formed against the general elevation backdrop. This period is characterized by high degree of volcanic activity, resulting in the intrusion of large volcanic masses composed of andecite-dacite and their tuffs, only in the area of Zletovo, along a reactivated deep fault, where there was an outpour of about 1000 km³ of volcanic material. For instance, similar volcanic mass also appeared within the area of Kozhuf - Vitachevo. According to the existing data, volcanic activity has been occurring periodically, and while it started earlier in the Zletovo area, in Kozhuf it continued until the beginning of the Quaternary period.

The fairly active neotectonic processes created the current relief, and in the lake basins and current depressions there has been deposition of mollase-type terrigenous sediments, with coal interbedding. In the Pliocene period, the terrigenous material became rougher as a result of the activation of tectonic movements. These processes continue to this day and manifest as earthquakes (the 1963 Skopje earthquake, the 1931 Valandovo earthquake, etc.) By the end of the Pliocene and the beginning of the Quaternary period, the volcanic activity on the territory of Macedonia stopped with effusion of basalt near Nagorichani and other localities. Today, there are only traces of such activity in the area of Ohrid (v. Kosel) in the form of solfatar-fumaroles.

All of the above identified geotectonic units on the territory of Macedonia have been developed, starting from the Neogene period, as land, thereby initiating the continental stadium. In the first phase, the existing forms created by the orogenous processes underwent peneplanation towards the end of the Paleogene - Oligocene period, and in the second phase, starting from the Miocene period; there was a neotectonic stage which formed the main creations seen in the current relief. The mountain ranges were created as elevation elements, whereas the depressions are areas of relative sinkage.

These neotectonic processes are superimposed on the old tectonic processes, thereby activating them. A number of the subjacent faults have been reactivated (the Drim fault zone, in the Vardar zone, and in other places).

The presented neotectonic features of the identified zones on the territory of Macedonia clearly indicate that they underwent significant transformation in the neotectonic stage.

According to (M. Arsovski, R. Petkovski, 1975) neotectonic zoning of Macedonia has been conducted (Fig. 2). The territory of Western Macedonia is dominated by elevation morphostructures whose height exceeds 2000 m. Elevation morphostructures are blocks stretching in the meridional direction. Graben structures also stretch in this direction. All of the above indicated that during the neotectonic stage of the general elevation backdrop there was an expansion oriented east-west (J. Janchevski, 1987). A particular characteristic of the morphostructures in the Vardar zone is that the mountain ranges, as elevation morphostructures, have an average height of 1000 - 1500 m (on average 500 m shorter compared to Western Macedonia).

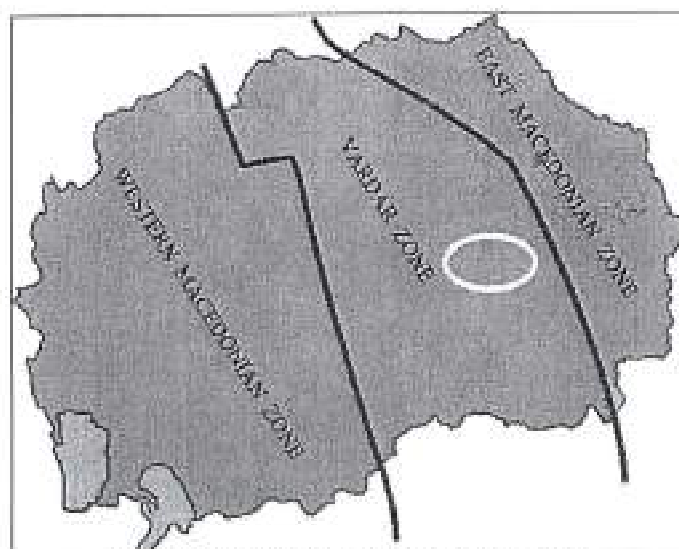


Figure 14 Neotectonic map of the Republic of Macedonia

Depressions (Skopje Depression (I), Ovche Pole Depression (II), Tikvesh Depression (III) and others) have a dominant role in the Vardar zone. They are superimposed on the older structures and have complex shapes, with an average height of 100 - 400 m. Given the intensity of vertical movements, the effect of which can be observed in the current relief, and according to the morphostructures of higher order, it can be concluded that the horizontal component of extension is oriented differently in different zones.

Unlike the Vardar zone, the elevation morphostructures in East Macedonia are represented by 1600-1800 m tall mountain ranges, while depressions are represented by intensively submerged grabens oriented east-west. As above, the main stress component is oriented vertically, while the extension axis is in the meridional direction.

The identified neotectonic zones (Western Macedonian, Vardar, and East Macedonian) are vastly different.

5.2.5 Site characteristics

Relief and Morphology

Preserving the natural values of an area is only possible by integrating human needs within protection activities. Basically, the landscape approach should allow maximum preservation of nature in terms of the full implementation of human intentions and projects. In the particular case of the rehabilitation of the national road A3 (Bypass Kocani), the landscape will suffer no consequences for the environment, taking into account that it is a rehabilitation of the existing road.

However there is a need to specify and describe the cultural and natural characteristics of landscape types along the route.

Within the area affected by the rehabilitation of the subject section of state road A3, human activities have taken and are being taken with varying intensity in different ecosystems, mainly depending on the altitude. As a result of that along the corridor of interest they have been formed several different areas (landscapes).



Cruxa 15 Current condition of the state road R1205 (section Krupishte – Probishtip)



Слика 16 Current condition of the state road R1205 (section Krupishte – Probishtip)

5.2.6 Characteristics of the landscape

Landscape is topographically defined territory consisting of characteristic mosaic of interdependent types of ecosystems that may be or have been subject to specific human activities. The landscape is mainly defined as a piece of land that can be covered by a glance. But the landscape exists independently of perception (as opposed to scenery). It is heterogeneous and dynamic level of organization of ecological systems. The level of development of the landscape is under the influence of natural and / or human factors or a combination of both. A landscape type can own completely natural features or be completely changed by man and does not cover any natural ecosystems. Therefore the landscape is exactly a level of environmental organization that includes people and their activities in environmental systems. Through the landscape we are studying the relations man-nature and we are defining the causes of the current look and layout of ecosystems in space.

Taking into account the anthropogenic, biogeographical and physical-geographical features as criteria, two to three landscape types can be divided along the route grading from purely cultural, through dominantly cultural to the ones with until more or less natural features. The characteristic natural vegetation that gives the appearance of the natural or slightly modified landscapes is given in the description of habitats (5.8). The more clear distribution of biomes or zones largely overlaps with the distribution of landscapes. Geographical characteristics of the respective spatial sections are detailed in the respective chapters.

Along the road we can set aside a clearly differentiated spatial whole with a typical lowland landscape type.

Lowland landscape

The main activity and land use along the road corridor of interest is agriculture. In most of the corridor agriculture dominates, in Kocani field where rice is mainly represented. The lowland area stretches along the entire section. Compared to farming and viticulture, fruit growing is less common.



At some places there are trees between fields, mostly fruit, oak or poplar trees or thickets. These spaces are important corridors, especially in places where real thickets have developed and can serve as habitats or migration routes of large animals. It can be accepted that this region has enough importance to support biodiversity. Areas with forest vegetation are to be connected or even in some cases connected. It is especially important as connectivity goes wide in space and through there corridors fairly remote forest ecosystems from neighboring areas are connected. An important feature of this region are linear corridors in river valleys represented by willow belts or small patches of poplar groves. They provide easy movement and survival of important species (such as otters), so that they represent a particularly important structural element of the functionality of this region in terms of biodiversity preservation.

In the periphery of the corridor of interest the landscape is getting more and more the looks of a semi-natural landscape of broadleaf oak forests.

The settlements are scattered-type villages that are not continuously distributed and usually not interconnected with asphalt roads. Some of the settlements were almost evicted so that traditional agricultural practices are completely abandoned. In recent times there prevail the processes of healing of abandoned fields with the neighboring shrubby or forest vegetation.

Hilly rural area in the oak forest zone

This zone is a smaller part of the area along the designed road corridor. It is presented by hill pastures stretching sporadically almost along the whole length of the corridor. They are between the villages Kumarino and Mamutchevo, Teranci and Kuchichino and in the surroundings of the villages Chardaklija, Karbinci. There is a presence also in small areas of downy oak-hornbeam forests, as well as degraded oak forests (downy oak-hornbeam and flat turkey oak) in the vicinity of the settlements.

The hilly rural zone could be considered mainly as a cultivation area. The relief is hilly with mild falls, crossed by river valleys and dry water beds. Some parts of larger rivers and streams are characterized by alluvium deposits. There is an erosion in some places. This region type is mostly present in the hilly areas in the whole of Macedonia.

Mountain deciduous forests

There is in the region corridor a presence of oak forests presented by conifer oak and turkey oak forming the mountain region of deciduous forests with, in some places, of pine plantation, as well as forest clear fields with various sizes. This region is extraordinary important for the large games for it provides an appropriate habitat for the migrating animals.

The larger region, as the actual region, belongs to two large geotectonic units, Serbian-Macedonian massif and Vardar zone. The section is mainly passing through a hilly mountainous ground, with mild and plain ground, mild hilly and hilly ground.

5.3 Permanent water resources

Bregalnica is the biggest river and it represents the main drainage network of Zletovska river, Kochanska river, Onzarska river, Zrnovska river, Plackovicka river and other smaller dry ravines and streams. The following figure 15 shows the area around Bregalnica River.



Figure 17 Bregalnica river

Bregalnica by its length is the largest tributary of Vardar. It springs below the peak Cengino Kale at the Maleshevo Mountains at an altitude of 1,720 m, and it flows into Vardar between the villages Nogaevci and Uljanci, at an altitude of 137m. The mean flow at the mouth is 28 m³/s (maximum flows 640 m³/s, and at the minimum the bed is dry). It has a total length of 225 km, it drains an area of 4307 km² and relative average drop of 7 ‰.

After descending from Maleshevski Mountains where Bregalnica has pretty developed source crest, it first flows through the Berovo Valley where it has wide flow, it is pretty calm but also accumulates significant riverine material. At the village of Budinarci the valley width reaches 500-600m, and from the village of Razlovci it enters the gorge part of the Razlovska Gorge which is 19.1km long. In this gorge there appear certain erosive expansions as the one at the village of Mitrashinci.

After Razlovska Gorge Bregalnica runs through Delchevsko Field where it deposits a significant amount of gravel and sand and in certain sections the flow branches into several sleeves. The upper reaches of Bregalnica are in Pijanec and Malesh. Here it flows from south to north and has meridian direction of propagation. From the mouth of Ochipalska river and then to the village of Istibanja i.e. to the entry in the Kochani Valley and after that to the mouth into Vardar, Bregalnica runs from east to west and has a parallel direction.

Through the Istibanjska Gorge, Bregalnica runs in a total length of 39 km. In this gorge, the lake Kallimanci is formed which is used for irrigating approximately 28.000 ha of agricultural land in Kochansko and Ovche Fields. In the Kochani Valley Bregalnica enters at the village of Istibanja and it runs through the valley along the middle part and it leaves it at the village of Krupishte. Through the valley bottom Bregalnica has flat character with average drop of only 1.8‰.

Covered by the sediment of tributaries and torrents the bed is shallow and inconsistent due to which the water frequently overflows. From Sateska in Shtip until the mouth into Vardar, Bregalnica runs through young Paleogene and Neogene sediments and the bed has meander shape. It is the region Stan Dol.

In its course Bregalnica receives 23 tributaries longer than 10 km. On the right side, there are 10 tributaries that flow into it with a total length of 241 km and on the left side it has 13 tributaries with a total length of 260 km. The valleys of all tributaries, unlike the valley of Bregalnica which is

polygenetic, are monogenetic. They developed as separate tributaries of lake basins, and with the leakage of the lake their waters continue their flows and become tributaries of Bregalnica. In the highlands valleys are deep and have the shape of the letter V. By entering into former lake basins, their valleys expanded and their valley sides decreased. Today, they have symmetrical valley sides.

Right tributaries of Bregalnica

Orizarska River or Masalnica- it rises under Carev Vrv on Osogovo at an altitude of 1.510 m, and flows into Bregalnica above the village of Mojanci at an altitude of 320m. It is 30 km long and it is created from two rivers Bela and Crna Rivers which joint at the village of Rechani. It comprises a territory of 133 km² and a relative drop of 39.5‰;

Kochanska River rises on the southern part of Lopensko Bilo on Osogovi at an altitude of 1.630m, and flows into Bregalnica above the village of Chiflik at an altitude of 295 m.

It has well developed spring crest and its main tributary is Mala Reka at the mouth of which artificial reservoir "Gratche" has been built. It is 34 km long, and it comprises a territory of 198 m² and a relative drop of 39.3‰;

Zletovska River rises on the north side of Lopensko Bilo on Osogovo at an altitude of 1,620 meters and flows into Bregalnica under the village of Ularci 293 meters above sea level. It is 50 km long and its course receives several tributaries the longest of which is Belashica River. It comprises an area of 460 km² and has a relative drop of 26.5 ‰. Zletovska River has 35 larger and smaller tributaries, the largest of which is Venechka River. The average measured flow of Zletovska River is 2.64 m³/sec. The upper reaches of Zletovska River are located between the mouth of its left tributaries: Emirichka River and Eshterec. This site is important because of deeply carved river valley with gorge, and at some points canyon looks.

Left tributaries of Bregalnica

Osojnica rises on Strumichi Rid on Plachkovica at an altitude of 1.260 m, and flows into Bregalnica under the village of Jakimovo at an altitude of 345. It is 32 km long, and its drainage basin covers an area of 327km² and it has a relative drip of 28.6‰.

It has well developed spring crest composed of several rives such as Kalugjerica, the rivers Laki and Barboshnica, and then it receives several tributaries among which more important are Sushica, Dragobrashka river and Blateshnica. The water of the river Osojnica and its tributaries are used for irrigation of the fields under tobacco and rice in the Vinica region. The running waters of Osojnica, Gradechka and Vinichka River are used for irrigation of 210 ha of fertile land. A total area of 1.140 ha is irrigated.

Gradechka River rises under the peak Kozbran on Plachkovica at an altitude of 1.600 m, and it flows into Bregalnica at the village of Pribachevo at an altitude of 331m. It is 18 km long, its drainage basin covers an area of 32 km² and it has a relative drop of 70.5‰;

Zrnovska river rises from the western slopes of the peak Kozbran in Bachalija on Plackovica at an altitude of 1,420 meters and from the beginning it flows towards west under the name Ulomija and then turns to the north under the name Zrnovska River and it flows into Bregalnica right next to the road Kocani-Zrnovci at 325 meters above sea level. It is 23 km long, and its drainage basin covers an area of 70 km² and has a relative drop of 47.6 ‰. By the village of Zrnovci the river is mountainous with gorge Valley, then across the field, to the mouth, it flows like a lowland river. It

flows in right next to the road Kocani - Zrnovci, at an altitude of 325 m. The river is used for irrigation of 250 ha of land under corn, rice and other crops.

The following figure shows the drainage basin area of Bregalnica and the location of existing metering stations for monitoring the surface and underground waters.



Figure 18 Bregalnica's drainage basin and the location of hydrology stations for surface and underground waters

It should be noted that in this area of Kocani Field there are hydrothermal springs near the village of Banja and v. Podlog and some other places with much smaller amounts of thermal water. The points of thermal water are out of the area through which the route to be subject of rehabilitation passes, i.e. the state road R1205 (Krupishite - Probishtip).

The Zletovica River springs up in the South part of the Osogovo Mountains. It is formed by The Modra and Gorna River. Up to the Knezhevo Dam Site the Plochka River empties into the Zletovica River, as well as few smaller tributaries. Downstream, up to the basin with the Gorna River, the valley and the river bed mouth widen and there is another larger widening after the Plochka River mouth. The accumulation receives the waters from the Kucheshka River which springs up in the North part of the basin, under the Kostadinica peak, at an altitude of 1,480 m. The most important tributaries of the Zletovica River, after the accumulation, are the rivers Emirichka and Mushkovska.

The Zletovica River basin belongs to the municipalities of Kratovo, Zletovo and Probishtip, as well as an insignificant part to the municipalities of Kriva Palanka, Kochani, Obleshevo, Cheshinovo and Karbinci. The Zletovica River empties into the Bregalnica River near the village Ularci at a location with an altitude of 316 m.

During the spring period from April, the rivers waters level is higher due to the increased precipitations and intensive snow melting. Small water levels are in the months of August, September and October. The mean annual flow in the period 1961 – 1995, according to the measurements performed by the hydrology station Zletovo located upstream from the village Zletovo, is estimated to be 1.98 m³/s.

The Koritnica River is tributary of The Zletovica River. It empties into the Zletovica River about 3 km southeast from the town of Probishtip. There is a small village Dobrevno in the upper part of the river, about 3 km from the town of Probishtip and 7 km Northwest from the village Zletovo where is the Zletovo mine. The Koritnica River flows in South direction passing by the mine buildings. The water quality is estimated to be very bad (Class II-III) downstream from the control. The condition is good (Class I) over the mines and structures.

The Kiselica River is redirected a little bit to West from the downstream side when the new one is executed in the late 1970. It is accepting the discharges South of the barrier, and empties eventually in the Zletovica River about 7 km downstream. The acidic waste water empties by an discharge/pipe directly in the Kiselica River waters.

The Kiselica River is not, for the time being, classified, but it is polluted by the discharges from the batteries factory by passing through the factory barren soil. The town of Probishtip is missing a waste waters treatment plant, so the communal waste waters empty directly in the river waters without any treatment.

The Kiselica River is redirected to West from the downstream side when the new one has been executed in the late 1970. Now, it receives the discharges south of the barrier, emptying eventually by discharge/pipe directly into the Kiselica River waters. The Kiselica River, for the time being, is not classified, but it is polluted due to the discharges from the factory for batteries, and is passing through the factory barren soil. The town of Probishtip is missing a waste waters treatment plant, so the communal waste waters empty directly in the river waters without any treatment.

5.4 Site climatic characteristics

Municipality of Probishtip

Concerning the climate, the area is located at the southern part of the northern temperature zone, between the areas whereon mediteranian climate exists (Kochani valley and Ovche Pole) and the Osogovo massive where exists expressed mountain climate. This geographic location conditioned its climate to be characterised with elements of continental temperature, modified-mediterranian and mountain climate.

Concerning the relief of this area there are two climate regions:

- Region with moderate climate, with elements of modified mediteranian climate, and
- Region with mountain climate.

The first region covers the area of Zletovo area southern from Zletovo i.e. Zletovo field. Along the Zletovo river valley this field is open to mediteranina influences.

The second climate region covers the area that spreads toward north from Zletovo to the highest crests of the area. As mountain area it is characterized with fresh summer, cold spring and autumn, and cold and snowy winter.

The average annual air temperature is approximately 13 degrees is between, whilst the average temperature during the winter months 1°C до 30°C, and during the summer mounts from 21°C to 25°C.

The quantity of annual precipitations is approximately 600-650 mm.

As it may be concluded from the previous text, the basic characteristic of the climate at this region, i.e. Zletovosko field are as follows winter is not so cold, and it does not last long; really it is snowing, and when it falls it melts period very fast because during this there is green grass.

The spring is moderate warm and less rainy than the winter.

The summer is very hot and dry and because of the mountain climate, the mornings are fresh.

The autumn is long, moderate warm and very rainy, Vegetative period is very long and lasts almost 10 months, which such climate characteristics is presents area suitable for growing agricultural culture not only because of the altitude but also because of the subtropical climate zone.



Figure 19 City Probishtip

Municipality of Karbinci

The Municipality of Karbinci is part of a larger regional whole which from the point of view of a physical, economical, social and infrastructure sense is identified, almost some decades, as a region of Eastern Macedonia. The municipality covers a large area in the Bregalnica River basin from the Northwest falls of the Plachkovica Mountain and going through the wide Bregalnica River valley up to the Northwest hilly morphological ground of the Ovchepole.

The climate is moderate continental with some impact of changed mediteranean one through the Bregalnica River valley. The municipality border is with the municipalities Radovish, Shtip, Sveti Nikole, Probishtip, Chishinovo, Obleshevo and Zmovci. The municipality territory area is 259 km² so it includes as a medium municipality in the Republic of Macedonia. The months with most precipitations are May with 56,1 mm and October with 56,3 mm. The month with minimum precipitation is August. Months with relatively dry period are January, February, March, April, June, August, September and December.

Snow months are from November to March with an average of 18 days of snowfall. The maximum is in January – 6.3 days. The region is dry with yearly average water deposit of 506,1 mm. The precipitations are irregularly distributed by month and during the year.

The Municipality of Karbinci is 13 km from the town of Shtip, at the foothill of the Plachkovica Mountain. It is pretty rich in grain and garden cultures.

Legend

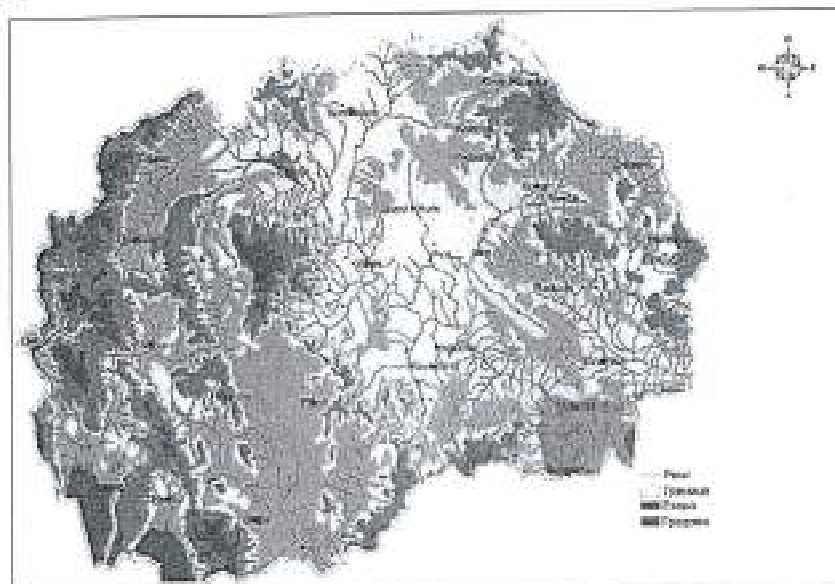


Figure 20 Map of the climate types in Macedonia

5.5 Current road and communal infrastructure

The Municipality of Probishtip borders to North with the Municipality of Kratovo, to West with the Municipality of Sveti Nikole, to South with the Municipality of Shtip and to East with the Municipality of Kochani. The administrative center Probishtip is far from the neighbouring municipalities as follows: 18 km from Kratovo, 22 km from Shtip, 42 km from Kochani. It is about 100 km far from the capital Skopje. Two routes could be used from Skopje: Skopje – Kumanovo – Kratovo – Probishtip by the roads M2 and R206, and next route is Skopje – Veles – Shtip – Probishtip by the roads M1, M5 and R206.

Besides the fact it is a hilly mountainous region, the traffic infrastructure is good with favourable physical connections with the neighbouring and far regions.

Many caravan roads were passing through the territory in the past connecting the Bregalnica River valley by the surmounts Dzguri, Dolni and Gorni Pechenici with Kratovo and Kjustendil in Bulgaria.

The so-called Veleshki Road has been passing through the village G. Barbarevo. So-called Skopski Road has been passing through the territory going from Skopje to Ovche Pole and village Kukovo up to Kochani.

It could be concluded from the analysis of the traffic connections, the municipality has a favourable position in relation to the physical communications for it is between two important traffic arteries: Bregalnica connecting Kochani, Shtip, Veles and Skopje, and Kriva Palanka with a segment going to Kratovo, Kumanovo and Skopje and with another one going to Kratovo, Kriva Palanka and the Republic of Bulgaria.

Today, the town of Probishtip has a flexible economy with various structure of economical entities by activities, where a large number (500) MSP are carrier of the economy activities with the role of diversification of the Probishtip economy making it to be flexible and resistant to impacts. It is not concentrated only to mining. This structure provides preconditions for a development of the local economy in a system of suppliers – producers – purchasers. But, as any economy, it cannot be closed. It is important to be competitive, i.e. MSP to be in permanent development with purpose to be competitive on the local, regional, national and international level. With purpose to obtain higher efficiency, profitability by cost decrease as well as production time decrease and to have more quality products with a higher economical value, it is necessary to use contemporary work tools and methods in MSP. The introduction of new technologies, modern design, use of internet communication in the supply of raw materials and promotion. All these require new knowledge, new skills of MSP managers to keep presence on the market and to respond to the challenges.

The quality electrical energy is provided to the town and municipality by the distribution branch of EVN-Macedonia, by two power transformers with capacity of 20 MVA, where one is in function and the second one is in standby. The town and population, in summer period, use an energy of 9-10 MW, and during the winter period an amount of 13-14 MW, which is less than the half of the installed capacity of the transformer station.

New transformers are necessary to satisfy the needs by activities and the way of land use (light industry, small economy, social standard, public functions and other) which shall be supplied by the main supply point 110/35/10 KV, by the transformer station from the distributor and from the existing 10 transformer stations. Zletovo town is supplied with power from 110/35/10 KV transformer station from Probishtip by a 10 KV transmission line. There are 5 transformer stations in the settlement. Power supply is satisfactory. The street lighting is not satisfactory.

As to the water supply of the citizens of the Municipality of Probishtip with potable water, it is provided by the PCE "Komunalec", established by the Council of the Municipality of Probishtip in the year 2002 by the transformation of the previous PCE "Ilinden".

The town of Probishtip, with its suburban settlements and few villages from the municipality, is using the Zletovska River for water supply.

- Household connections 3.306
- Reservoir space 2.100 m³
- Pump Stations 1
- Water supply zones 3

Over 90% of the urban area is covered by sewerage network. There are 6 primary sewerage networks.

The total sewerage network length is about 26.097 m.

Installed profiles: Ø 150-1000; number of discharge points: 4; end recipient: Kiselica River and Kalnisha River (80% is emptying into Zletovica River).



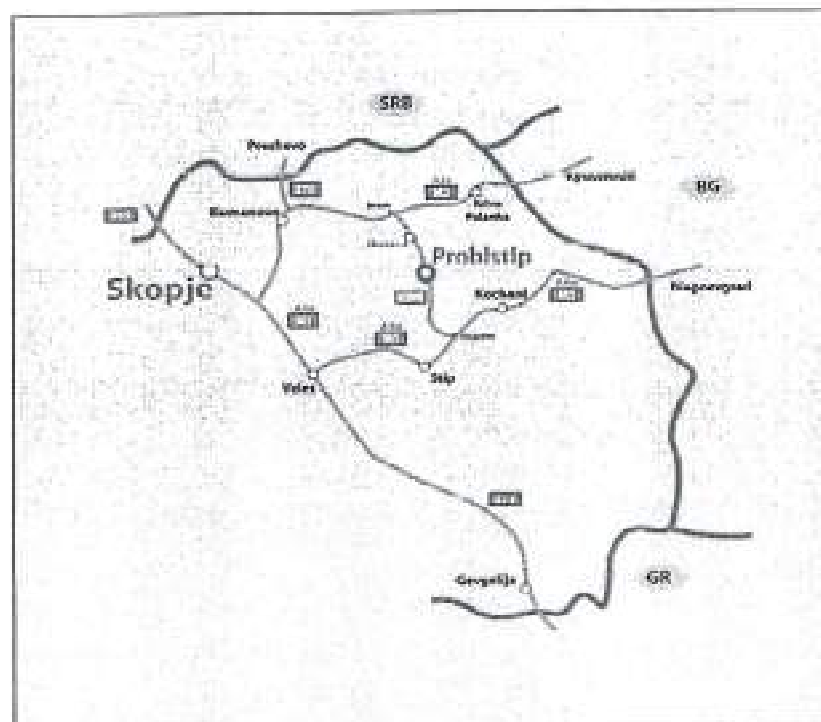


Figure 21 Road infrastructure map in the Municipality of Prohlistip

5.6 Soils and land use

The land and soil are important physical and economical resources, particularly for the agricultural sectors and forestry, industry and infrastructure development. The land use in the region of the section in subject is shown in the following tables. They are undertaken from the agricultural census realized in the year 2007.

Table 22 Agricultural economies, land ownership and separated parts of used land

Municipality	Individual agricultural economies	Land available area	Used land	Owned land	Used by renting from others	Given to be used by others	Separated parts of used land
Karinci	1384	3408.00	3191.02	2323.07	920.00	52.13	4633

Table 23 Used agricultural land area per categories, in ha

Municipality	Farmland, garden and house gardens	Meadows	Pastures	Orchards	Vineyards	Tree nursery	Forests
Karinci	2877.61	89.03	108.99	37.48	76.18	0.53	69.45

Table 24 Agricultural economies with livestock, poultry, rabbits and bee families

Municipality	Catties	Horses	Sheeps	Goats	Pigs	Poultry	Rabbits	Bee families
Karinci	287	110	67	352	528	629	53	18

The tables above show that the region of the section in subject is noticeably rural area with various cultivations, mainly vineyards, orchards, rice fields, gardens and grains. Stock breeding is developed in the Kochani region. This activity is not so present in the town of Shtip and its surroundings.

Regosols

Regosols are defined as undeveloped and weakly developed soils found on loose substrates and easily physically deteriorated substrates in an unconsolidated mass (with the exception of alluvial and diluvial deposits, Aeolian sand, and skeletal detritus). They are an indicator of the highly



developed erosive processes in Macedonia. Regosols are found in valleys dominated by rugged hilly terrains such as the Ovche Pole and Kochani basin. They serve a significant purpose for sheep breeding, crop production, and particularly for viticulture and fruit production. A small part of regosols can be found in our mountains, some under forests, and some in areas that need to be afforested. The rugged hilly terrain in the basins, where the regosols are most prevalent, is comprised less of Mesozoic and more of Eocene, Miocene, and Pliocene sediments. According to the mechanical composition, regosols are the most heterogeneous soil type.

Vertisols

Vertisols are one of the most widespread soil types in the country. Vertisols are identified as intrazonal, lithogenetic, topogenetic soils. They can be found together with other soil types, depending on the parent material, such as regosols, rendzinas, chernozems, and cinnamomic-forest soils, and in some places with lithosols and vertic rankers. Vertisols are highly significant for agricultural productions. They are found in the Ovche Pole, Shtip, and Kochani basins.

Rankers

Rankers cover vast areas of the country's mountain terrains, and can be found at any altitude between 300 m and 2764 m. They are covered by high mountain pastures and a few hill pastures. The genesis, properties, and evolution of rankers largely depends on the substrate, since they are the first stadium following the lithosols and regosols. Rankers are characterized by their very heterogeneous mechanical composition. They have good aeration and thermal properties. They are highly permeable and do not hold water very well.

Brown forest soils

These soils are sandy-clayey soils mostly distributed in the mountain regions, above 600 m. Brown forest soils are rich in humus - up to 12 %; however the humus matter is not of great quality. Reaction is slightly acidic - pH ranges between 5.5 - 6. They are usually covered by mountain vegetation and are rarely used for agricultural purposes. They are prevalent in the lower part of the middle forest plant belt. The vegetation is formed entirely under the influence of woody plants. Most common woody plants are the sessile oak, beech, black and white pine, and fir. Brown forest soils are characteristic for the northern expositions and the adjacent expositions. They are characterized by very thick cross-sections, well defined humus-accumulative horizon, and poorly skeletal features. They contain large reserves of nutrients and have high capacity of active moisture. This makes them, in most cases, soils with high forest growing properties, promoting successful growth of beech, fir, white pine, and other trees. Light brown soils are characteristic for the southern expositions and the adjacent expositions. They have a thin cross-section, a reduced humus horizon and many skeletal elements. They are largely covered by variously productive white pine trees. Beech and fir trees have poor growth and low productivity.

Alluvial soils can be found in the middle part of the valley expending to an altitude of up to 100 m, situated in the downstream section of River Bregalnica. They were formed by deposition of fine material transported by the rivers from the higher plane areas. They are water permeable, allowing water to pass through.

Diluvial (colluvial) soils are formed by erosion and transportation of parent rocks and soils from higher (mountainous and hilly) land as a result of torrential water flow and surface water and recent deposition of the eroded material in the base of such land. Diluvial soil can become a different type

of soil as a result of the influence of shallow groundwater or the influence of pedogenetic processes during a longer period of time. They exhibit greater heterogeneity in horizontal and vertical direction. Compared to their neighbouring alluvial soils, diluvial soils are characterized by significantly lower productivity. They are more poorly sorted, have no flat surface, have less quantity of water available, have worse chemical properties, and contain fewer nutrients.

On a very small area in Ovcha Pole there are whitish saline soils which, due to their salt content, have a detrimental effect on vegetation growth.



Figure 22 Saline soil

Agrogenous soils are distributed throughout the agricultural area around the highway. These types of soil are formed as a result of human influence and are used for farming.

Rigosols are soils formed as a result of human intervention in vineyards (vinesols) and fruit orchards.

Hortisols are an anthropogenic soil type used in floriculture and horticulture formed from different soils.

Rizosols are anthropogenic hydromorphic soils. Rizosols are distributed throughout the Kochanic basin (formed from colluvial soils, alluvial soils on the flat bed around Kochani, Grdovci, Obleshevo, and Morodvis). Most of the observed rizosols are distributed in alluvial soils. They are prevalent in river valleys, or at the flat basin beds. After construction of the Bregalnica irrigation system, the paddy fields were expanded to other soil types.

Soil and land are important natural and economic resources, particularly for the agriculture and forestry, industry, and infrastructural development sectors. Land use planning within the scope of the Infrastructure Project is shown in the tables below. The tables are taken from the agricultural census of 2007.

5.7 Natural and cultural heritage

The law on Protection of Cultural Heritage (*"Official Gazette of the RM"* no. 20/04, 71/04, 115/07, 18/11, 148/11, 23/13, 137/13, 164/13, 38/14, 44/14, 199/14, 104/15, 154/15, 192/15 and 39/16) regulates the types, categories, identification, manners of placing under protection and other instruments on the protection of cultural heritage, the regime for protection and use of cultural



heritage, rights and duties of holders of the restrictions on the right of ownership of cultural heritage of public interest, organization, coordination and supervision, professional titles and other issues of importance to the unity and functioning of the protection of cultural heritage in the country.

Considering the fact that cultural heritage is a fundamental value of the Republic of Macedonia, it is protected in all circumstances. Protection of cultural heritage is of public interest and must be exercised throughout the territory of the Republic of Macedonia. The Law states that the protection of the cultural heritage depends on its value and the level of threat, no matter the time, place and manner of creation or who created it and the ownership or possession, and whether the secular or religious character and to which religion it belongs or whether it is registered. Cultural heritage is protected together with the immediate environment, by establishing contact zones in accordance with the law. Cultural heritage shall be considered a factor of sustainable development.

In addition to the developer's obligation to protect the existing cultural heritage during the execution of the construction works on the projected route, the Law on Cultural Heritage indicates that it can come to the accidental discovery of an until then unknown archaeological site, or items of archaeological significance. In that case, he must:

- Report the discovery to the Cultural Heritage Protection Office;
- Discontinue the works and secure the site against any possible damage and destruction, as well as against unauthorized access;
- Preserve the discovered items on the site and in the condition they were found; and
- Provide all relevant information with regard to the location and the position of the items at the time of discovery and the circumstances in which it was made.

Furthermore, the Office is the one that it takes additional actions pertaining to the process of identification of accidental discoveries, then archaeological supervision and temporary suspension of work. The legislator has also anticipated that the costs related to the archaeological supervision, protective excavations and research, conservation and other measures for protection shall be borne by the Office, as well as the prize for accidental discovery.

The planned project activities for the rehabilitation of the existing road are not expected to come to new archeological sites or significant items of cultural and archeological value.

Cultural heritage

Cultural heritage is a general term used as a name for all types of material objects, structures, architecture, architectural units and historical sites created during the human multiple cultural traditions.

Immovable monuments of culture according to the Office for protection of cultural-historical heritage of the Republic of Macedonia are the following:

- Registered monuments of culture;
- Recorded monuments of culture;

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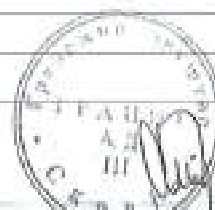
- Archeological sites-all locations, or any other traces of human existence, which witness of the epochs and civilizations, for which the excavations or the discoveries are the main source of scientific information;
- monumental construction wholes-neighborhoods or architectural complexes or areas which have special cultural significance, and which are protected and included in the contemporary development, to the extent allowed by the nature of the protection;
- individual (architectural monuments) -architectural works of special cultural significance, with their protected direct environment or location to which they belong, which are protected to preserve their origin and ensure appropriate conservation, restoration and revitalization;

According to Book 3 – Environmental and Social Impacts Study of the project documentation for the Construction of an express road A3, section Stip - Kocani, technical project number 600-07 - 15 of July 2015, prepared by the Civil Engineering Institute "Makedonija" JSc; the designer "DIK - Chakar & Partners" asked the Ministry of Culture - Cultural Heritage Protection Office, records for the existence of archaeological sites in the section Stip - Kocani. The Office then forwarded the designer's request to the National Institution -Institute for Protection of Monuments of Culture and Museum Stip. Based on the prepared report, several sites have been set aside, part of which would be endangered by the projected construction works for the rehabilitation and reconstruction of the section Shtip-Kochani.

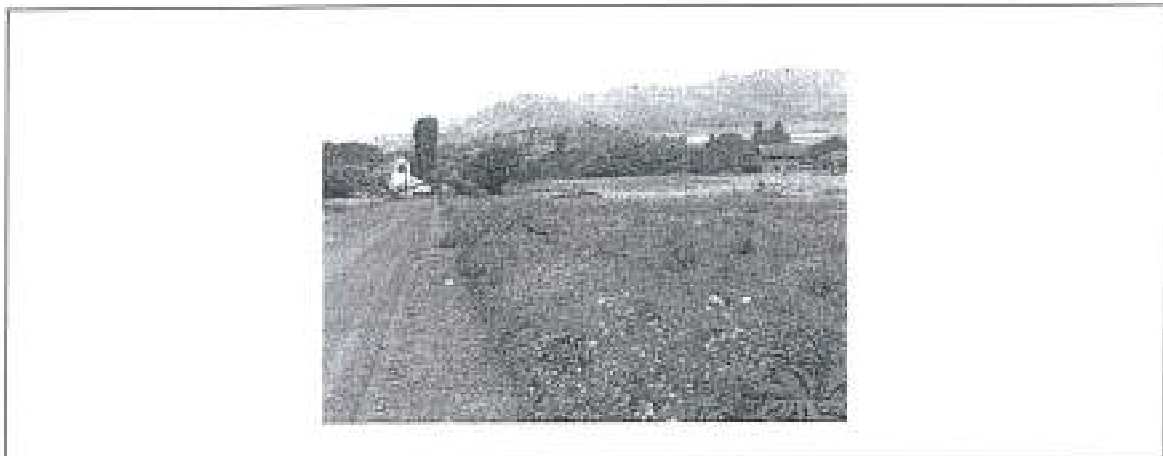
The inventory of cultural heritage is based on the findings of the inspection report (of 04.06.2014) of the route Stip - Kocani, by a designated committee of the Institute for Protection of Monuments of Culture and Museum Stip. It listed the following archaeological sites and they are presented according to several parameters (cadastral municipality, cadastral lots, ownership of cadastral lots, a description of the site, geographical coordinates), with the data presented in the following table that are relevant to the section in subject.

Table 25 Archeological locations data

Location Bash Tepo – Anche - Bargala			
Cadaster municipality	Cadaster lot	Ownership	Geography coordinates
Location description	/	/	/
Location description			
Urban settlement from Roman and late Antiquity period about 600-71001 m Southeast from the village, on the left side of the road to the village Radanje.			
Figure 23 Bash Tepo – Anche - Bargala			
/			
Location over the church			
Cadaster municipality	Cadaster lot	Ownership	Geography coordinates
Krupishte	1084, 1085, 1086, 2236/1, 2211	Private ownership	Y 7604594.98 X 4633819.04
Location description			
Settlement from Neolithic period at the East edge of the village Krupishte in the vicinity of the church St.Nikola. It is a small terrace crossed by the existing road Shtip – Kochani alignment. There are many fragments of ceramic pots and stone weapons. There is many fragments from ceramics pots and stone tools and stone where its type is connected to the phases 3-4 of the Neolithic culture group Anzabegovo – Vratnik.			
Figure 24 Over the church			



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Location Church St Nikola

Cadaster municipality	Cadaster lot	Ownership	Geography coordinates
Krupishte	281, 1282, 1283, 1284	Private and state ownership	Y 7004007.68 X 4633808.53

Location description

Old Christian basilica and middle century church in the Northeast end of the village Krupishte under the road Shtip – Kochani at the right bank of Bregalnica River. Known in the professional literature as a structure from 17 century. After the newest findings of B. Aleksova the church construction is located in the 9-10 century. There are, on the outdoor side of the walls, executed elements from the early Christian period and architectural and sculptural plastics with signs and letters. It has been noted, with the excavations in the year 1975, that the church is constructed on the foundations of a three-aisles basilica with a length of 16 m and a width of 14,9 m, with a central apse which on the outdoor side is organized in a polygonal form and a narthex on the West side. An existence of old Christian and middle century graves were found out around the church. Art of the sarcophagus is used as a through for the fountain at the south of the church.

Figure 25 Church St Nikola



Natural heritage

There is no, along the section in subject, i.e. the state road R1205 (section Krupishte – Probishtip) any area under protection including also the framework under the Emerald network.



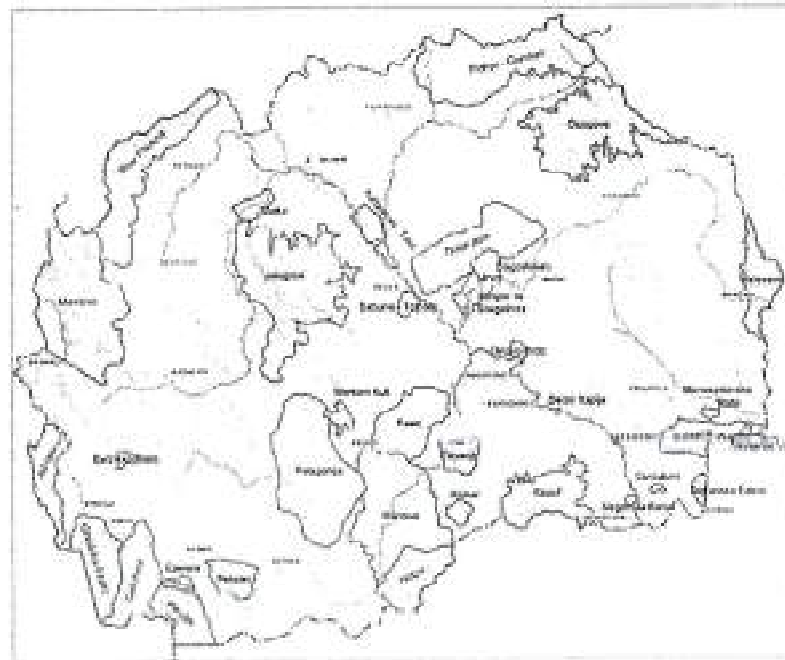


Figure 26 Map of the Emerald network

Emerald Network is a network of areas of special conservation interest designated to preserve the network of natural habitats and extends to the territory of the Member States of the Berne Convention. Actions for developing the national Emerald network in the country started in 2002, and the full identification was completed in 2008. A total of 35 sites (20 in Alpine biogeographical region - Western Macedonia and 15 in the continental region - Eastern Macedonia) are included in the national Emerald network which cover a total area of 752,223 ha, which represents about 29% of the territory of the Republic of Macedonia (MEPP 2008). Twelve Emerald areas are completely and two others partially protected at national level in various categories of protection i.e. only 27% of the Emerald areas are protected at national level, while others are outside the network of protected areas.

In conclusion, in the vicinity of the analyzed corridor, there are no protected sites or proposed for protection by law, or are part of the Emerald Network.

5.8 Biodiversity (flora and fauna) within the area planned for rehabilitation activities

In order to adequately identify and examine the Protected and designated areas that may be located in the impact radius of the project, a distance of about 10 km around both sides of the road section was taken into account. This distance will cover all protected and ecologically important places along the route.

With regard to the habitats, flora and fauna, a 500 m wide piece of land along the route (250 m on both sides of the state road A3 Kochani bypass) is considered sufficient for studying the potential impact that the project may have on them upon completion of construction work and commencement of operation.



Description of habitats

Habitats located along state road A3 can be divided into two main categories according to their origin: natural and anthropogenic.

Natural habitats include:

- *Woods and shrublands;*
- *Grasslands;*
- *Wetlands.*

Anthropogenic habitats include:

- *Tree plantations;*
- *Anthropogenic grasslands;*
- *Agricultural land;*
- *Urban and urbanized areas.*

The main criterion for the division into the two categories was the division proposed by EUNIS Habitat Classification (European University Information System) but there were also other criteria, such as the presence of different plant communities, the distribution, the level of degradation, and the geomorphological features.

A description is given of:

- General characteristics of the habitat,
- Distribution within the region affected by the project
- Description of the plant community
- Description of the species of fungi;
- Description of habitat fauna, represented by vertebrates (amphibians, reptiles, birds, mammals) and selected groups of invertebrates (dragonflies, beetles, crickets, and diurnal butterflies).
- For wetlands, an analysis is made of fish species and some invertebrate groups.

Natural habitats

Riparian forests, woodland and shrubland areas

These woodland and shrubland areas develop along riverbanks and streams, in the vicinity of the area planned for construction work. Well preserved woods of this type are very rare at this moment, since humans have converted the land into agricultural land.

Within this area, forest associations belong to the *Salicion albae* Soó (30) association 1940, whereas shrubs belong to the *Tamaricion Parviflorae* Kárp. 1961 association.



Riparian woodland with dominant willow and poplar

Reference to EUNIS habitats: G1.11 Riverine [Salix] woodland- G1.112 Mediterranean tall [Salix] galleries (G1.1121 Mediterranean white willow galleries)

Reference to EU Habitats Directive Annex I: 92A0

Salix alba and Populus alba galleries

Reference to CoE BC Res. No. 4 (1996): 44.1 Riparian willow formations

Reference to EUNIS habitats: G1.31 Mediterranean riparian

[Populus] forests - G1.315 East Mediterranean poplar galleries

Reference to EU Habitats Directive Annex I: 92A0

Salix alba and Populus alba galleries

Reference to CoE BC Res. No. 4 (1996): none

General characteristics: Willow dominated woodland within the investigated area develops on alluvial sandy soil on river bank terraces. The first level is regularly submerged under water during wet season. The biotope is characterized by a light soil structure and texture. In the wider areas along the rivers, there is often open land and small meadows.

Distribution in the project area: Communities, crisscrossed in places, can be found on numerous locations near rivers Bregalnica and Kochanska.

Within the area of the planned road corridor there are riparian forests dominated by poplar in locations where the planned corridor approaches River Bregalnica, in the vicinity of the village of Chardaklija, beside the village of Dolni Balvan, and near the village of Karbindi where the corridor gets critically close to the river bank, and where there is the largest community of riparian woods dominated by willow and poplar along the corridor. Willow and poplar trees can also be found beside the numerous irrigation canals along the corridor.



Figure 27 River Bregalnica



Figure 28 River Kochanska

Flora: This type of woodland belongs to the *Salicetum albae-fragilis* community (Isler 1926). Most typical tree species are *Salix alba*, or mixed *Salix alba* and *Salix fragilis*. The species *Populus nigra*, *Salix triandra*, *Sambucus nigra*, *Viburnum opulus*, *Cornus sanguinea*, *Rhamnus frangula*, *Amorpha fruticosa* and others are found in small groups or individually. In some places, poplars (*Populus nigra*, *Populus tremula* and *Populus alba*) dominate and the belt resembles a typical poplar community.



Figure 29 *Typha angustifolia*

In the grass layer, most typical species are: *Poa trivialis*, *Poa palustris*, *Carex vulpina*, *Polygonum lapatifolium*, *Polygonum hidropiper*, *Rumex sanguineum*, *Veronica anagalis-aquatica*, *Scirpus lacustris*, *Typha angustifolia*, etc.

Fungi: The majority of the known specie of fungi within this habitat type are lignicolous, living as parasites and saprophytes on *Salix alba*, *Populus tremula* and *Ainus glutinosa*, e.g *Laetiporus sulphureus*, *Pheleinus igniarius* and *Panus tigrinus* are species typical for *Catix*.



It is of particular importance to mention the parasitic species in this community, such as: *Phellinus igniarius*, *P.tremulae*, *Ganoderma applanatum*, *Polyporus squamosus*, *Pleurotus cornucopiae* and *Laetiporus sulphureus*. The species *Phellinus igniarius* and *Laetiporus sulphureus* are only identified as parasites on *Salix alba*, while *Phellinus tremulae* is a dangerous parasite on Aspen trees.

Mammals: Some species typical for this habitat are the lesser white-toothed shrew (*Crocidura suaveolans*) and the wood mouse (*Apodemus sylvaticus*), the red fox (*Vulpes vulpes*), the wild boar (*Sus scrofa*), the red squirrel (*Sciurus vulgaris*), the European mole (*Talpa europaea*) and the least weasel (*Mustela nivalis*). The presence of other species such as *Lutra lutra* is likely for this habitat within the investigated area, although it has not been confirmed.

Birds: The fauna of permanent species is not very different from other habitats on road A3, with the exception of *Falco tinnunculus* and *Cettia cetti*. The following species are specific for this habitat: *Coracias gamulus*, *Acrocephalus schoenobaenus*, *Acrocephalus palustris*, and *Eas Hippolais pallida*.

Reptiles and amphibians: This habitat is preferred by both amphibians and reptiles. Overall, there are about 8 species of amphibians, and 10 species of reptiles. Amphibian species typical for this region are the fire salamander (*Salamandra salamandra*), the smooth newt (*Lissotriton vulgaris*), the yellow-bellied toad (*Bombina variegata*), the common toad (*Bufo bufo*), the green toad (*Pseudepidalea viridis*), the European tree frog (*Hyla arborea*), the Greek stream frog (*Rana graeca*) and the marsh frog (*Pelophylax ridibundus*).

The following reptile species have been found in this area: the Hermann's tortoise (*Eurotestudo hermanni*), the Greek tortoise (*Testudo graeca*), the wall lizard (*Lacerta erhardii*), the green lizard (*Lacerta viridis*), the Balkan green lizard (*Lacerta trilineata*), the slow worm (*Anguis fragilis*), the Aesculapian snake (*Zamenis longissimus*), the grass snake (*Natrix natrix*), the dice snake (*Natrix tessellata*) and the horned viper (*Vipera ammodytes*).

Butterflies: The riparian habitats form good biotopes for survival of butterflies. The rare woodlands along the rivers host dozens of species such as: *Thymelicus lineola*, *Apatura ilia*, *Polygonia*, *Maniola jurtina*, *Celastrina argiolus*, *Pieris mannii*, *Pararge aegeria*, *Leptidea sinapis*, *Limenitis reducta*, *Erebia ligea*, *Vanessa cardui*, *V.atalanta*, *Aglais urticae*, *Aglais io*, *Apanthopus hyperantus*, *Anthocharis cardamines*, *Lycaena tityrus*, *Coliascrocea*, *C. affacariensis*, *Pontia edusa*, *Gonepteryx rhamni*, *Argynnis adippe*, *A. paphia*, *Melanargia larissa*, *Pyronia tithonus*, *Nymphalis antiopa*, *N. polychloros*, *Polyommatus icarus*, *P. belargus*, and *Satyrium spini*.

Beetles: The beetle fauna in the willow woodlands is considerably rich in hygrophilic species, and has only a few eurytopic species. Dominant species are *Carabus granulatus*, *Chlaenius nitidulus*, *Stenolophus mixtus*, *Agonum sexpunctatum*, *Bembidion*, and others.

Dragonflies: The dragonfly fauna in the willow woodlands is one of the more important aspects of preservation. There are about 15 dragonfly species. Most typical are: *Calopteryx virgo*, *Calopteryx splendens*, *Libellula depressa*, *Sympetrum sanguineum*.

Crickets: This fauna is very similar to the sandy and gravelly river banks, but the abundance of species in the willow woodlands is much smaller.

Riparian shrub communities – Tamarix and Salix amplexicaulis

Reference to EUNIS habitats: F9.12 Lowland and collinar riverine (Salix) scrub

F9.123 Balkan riverine willow scrub

Reference to EU Habitats Directive Annex I none

Reference to CoE BC Res. No. 4, 1996: 44.1 Riparian willow formations Reference to EUNIS habitats: F9.31 (Merium ulmiferi, Vitex agnus-castus) and (Tamarix) galleries - F9.3133 East Mediterranean tamarisk thickets

Reference to EU Habitats Directive Annex I none

Reference to CoE BC Res. No. 4, 1996: 44.8 Southern riparian galleries and thickets.

General characteristics: This biotope is mostly comprised of heliophilous shrubland, dominated by *Tamarix spp.* and *Salix amplexicaulis*.

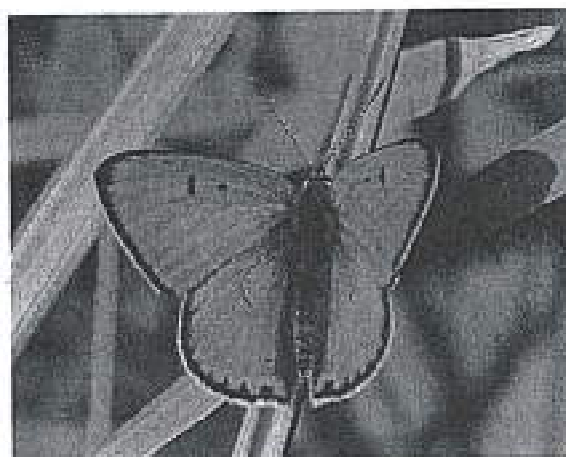
These shrub species form a specific plant community called *Tamarisci-Salicetum amplexicaulis* (Kárpóti 1962) Em 1967. It develops on sandy and gravelly river drifts in the range of the willow community. Earth is comprised of sand or gravelly soil, or soil in the process of formation. These stands are occasionally flooded, preventing growth of swamp shrubs or forest vegetation. Common species are: *Lycopus europaeus*, *Equisetum arvense*, *Juncus articulatus*, *Mentha longifolia*, *Agrostis alba* and others.

Distribution within the project area: This biotope also develops on the banks of rivers Bregalnica and Kochanska, or on smaller, perennial river islands.

Fungi: Fungi are represented by very specific species growing on *Tamarix spp.*, such as the supro-parasitic species *Inonotus tamaricis*, *Periophora tamaricicola*, etc.

Fauna: The animal composition within the shrublands dominated by *Tamarix* and *Salix amplexicaulis* is a mixture of different fauna species from neighbouring communities and is very similar to the animal composition in the willow forests, but much scarcer, due to the small surface area of distribution of the community in very small patches.

Butterflies: River banks are one of the most suitable habitats of various butterfly species. Members of the Lycaenidae family are most common in this habitat. Typical species found along River Bregalnica are: the large copper, *Lycaena dispar*, the lesser purple emperor, *Apatura ilia* and the common glider, *Neptis sappho*. A whole host of other species can also be found here: *Lycaena atciphron*, *L. virgaureae*, *Pyrgus malvae*, *P. sidae*, *Glaucopsyche alexis*, *Maniola jurtina*, *Papilionomachaon*, *Iphiclides podalirius*, *Aglais io*, *Coenonympha pamphilus*, *Zerynthia cerisy*, *Pyronia tithonus*, *Erebia medusa*, *E. ligea*, *Limenitis reducta*, *Phengaris aion*, *Plebejus argus*, *Polyommatus amanda*, *Cupido osiris*, *Ochlodes sylvanus*, *Erebia euryale*, *Vanessa atalanta*, *Boloria euphrosyne*, etc. Pieridae such as *Aporia crataegi*, *Pieris manni*, *Colias crocea*, *C. alfa cariensis* and *Pontia edusa* are also common in this habitat.



Слика 30 и 31 Apatura ita и Lycaena dispar

Beetles: The beetle fauna is similar that found in the willow forests.

Dragonflies: The dragonfly fauna consists of 16 species, the same that can be found in the willow forests. Most typical species are: *Sympetrum sanguineum*, *Libellula depressa*, and *Onychogomphus forcipatus*.

Crickets: The cricket fauna is very similar to the fauna found on the sandy and gravelly river banks.

Open areas – grasslands

Hill pastures with sparse shrubs

Reference to EUNIS habitats: E1.33 East Mediterranean xeric grassland (E1.332 Helleno-Balkan short grass and therophyte communities)

Reference to EU Habitats Directive Annex I: 6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea

Reference to CoE BC Res. No. 4, 1996: 34.5

Mediterranean xeric grasslands

General characteristics: Hill pastures in Macedonia are secondary formations. They develop in areas of the sub-Mediterranean zone and the hot continental oak forest division. Due to excessive exploitation or systematic logging in order to get pasture and arable land, the primary forest vegetation has been either heavily degraded or has disappeared completely in the last few years.

With regard to plants, these areas are dominated by grass species: *Andropogon ischaemum* L., *Bromus squarrosus* L., *Stipa aristella* L., *Chrysopogon grillus* Trin.; thorns and spines: *Eryngium campestre* L., *Echinops sphaerocephalus* L., *Echinops ritro* L., *Xerathemum annuum* L., *Carlina graeca* Heldr. et Sart., *Cirsium* spp, and others: *Plumbago europaea* L., *Marrubium peregrinum* L., etc.

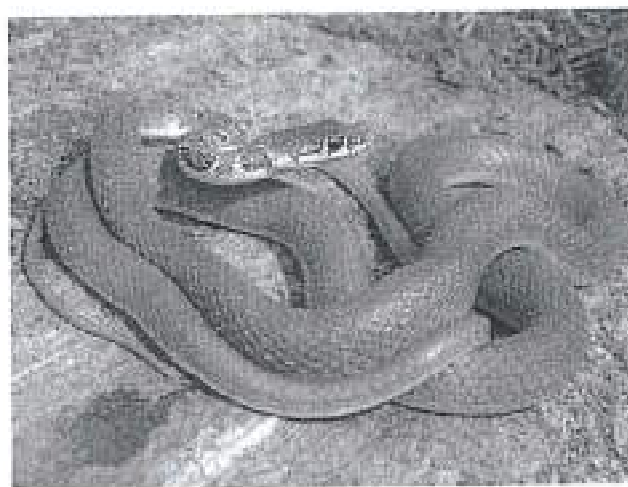
Distribution within the project area: The hill pasture community spreads almost throughout the entire investigated region, but it is patchy and often mixed with other cultivated or natural grass biocommunities. Near populated areas, the composition of species is slightly different due to the invasion of plants growing among waste, and weeds from the neighbouring fields.

Fungi: As for fungi, the area is dominated by grass fungus species, in particular non-mycorrhizal saprotrophic species, such as *Pleurotus eringii*, *Bolbitius vitellinus*, *Bovista plumbea*, *Calvatia utriformis*, *Entoloma sericeum*, *Hygrocybe conica*, *Omphalina pyxidata*, *Stropharia coronilla*, *Vascellum pratense*. Several edible species are also common in this habitat, such as: *Calocybe gambosa*, *Marasmius oreades*, and *Macrolepiota procera*.

Mammals: Commonly observed species in this habitat: the European mole (*Talpa europaea*), the southern vole (*Microtus rossiaemendionalis*), the Günther's vole (*Microtus guentheri*), the wood mouse (*Apodemus sylvaticus*), the striped field mouse (*A. agrarius*), the brown hare (*Lepus europeus*), the grey wolf (*Canis lupus*), the red fox (*Vulpes vulpes*), the least weasel (*Mustela nivalis*), the marbled polecat (*Vormela peregusna*), the European badger (*Meles meles*) and the roe deer (*Capreolus capreolus*).

Birds: There are about 30 bird species living in this habitat. The number of birds living here permanently is very small (grey partridge and crested lark). There are 10 species hatching eggs in this habitat: the Montagu's harrier *Circus pygargus*, the common quail *Coturnix coturnix*, the Eurasian thick-knee *Burhinus oedipodius*, the calandra lark *Melanocorypha calandra*, the greater short-toed lark *Calandrella brachydactyla*, the Eurasian skylark *Alauda arvensis*, the tawny pipit *Anthus campestris*, the common stonechat *Saxicola torquata*, etc. However, this habitat is very important for the remaining 15 bird species from other habitats who feed here.

Reptiles and amphibians: Hill pastures are much more suitable for reptiles than for amphibians due to the lack of humidity and water. There are only two amphibian species living in this habitat: the common toad (*Bufo bufo*) and the green toad (*Pseudepidalea viridis*). This habitat is more suitable for reptiles and is the most abundant of all habitats along the railroad. A total of 11 species of this class can be observed here, represented by: Hermann's tortoise (*Testudo hermanni*), Erhard's wall lizard (*Lacerta erhardii*), the wall lizard (*Podarcis muralis*), the Balkan wall lizard (*Podarcis taurica*), the green lizard (*Lacerta viridis*), the Balkan green lizard (*Lacerta trilineata*), the Dahl's whip snake (*Coluber najadum*), the Caspian whipsnake (*Coluber caspius*), the Dahl's whip snake (*Platyceps najadum*), the four-lined snake (*Elaphe quatuorlineata*) and the nose-horned viper (*Vipera ammodytes*).



Figures 32 and 33 *Podarcis taurica* and *Coluber najadum*

Butterflies: Hill pastures are a great habitat for a variety of butterflies. The following species can be observed in the investigated area: *Hesperia comma*, *Euchloe ausonia*, *Pontia edusa*, *Pieris*

mannii, *P. napi*, *P. rapae*, *Aglais urticae*, *Pseudophilotes vicrama*, *Papilio machaon*, *Iphiclides podalirius*, *Zerynthia cerisy*, *Collas crocea*, *Gonepteryx rhamni*, *Lasiommata megera*, *Arethusana arethusa*, *Pyrgus malvae*, *P. serratae*, *Polyommatus icarus*, *Lycaenaphleas*, *L. tityrus*, *L. vigeureae*, *L. thersamon*, *Plebeius sephirus*, *Aporia crataegi*, *Callophrys rubi*, *Argynnisniobe*, *Melitaea athalia*, *M. phoebe*, *Boloria euphrosyne*, *Cyaniris semiargus*, *Limonitis reducta*, *Melanargialarissa*, *Coenonympha pamphilus*, *Pierisius agestis*, *Vanessa cardui*, *Euphydryas aurinia*, *Hesperia comma*, etc.

Dragonflies: There are several dragonfly species found on the hill pastures. Most common species are *Onychogomphus forcipatus*.

Longhorn beetles: Even though larvae of longhorn beetles spawn in forests, the majority of adult insects feed on flowers in open low vegetation areas. Therefore, species that are characteristic of degrading oak and hornbeam forests can often be observed in this habitat: *Purpuricenus huldensis*, *Pachytodes erraticus*, all four species of *Stenurella*, *Pseudovadonia livida*, etc.

However, due to the presence of other vegetation (such as orange mullein, musk thistle, bay laurel and other grass plants), this habitat is characterized by many other species (mainly species that eat one type of food) such as: *Agapanthia cynarae*, *A.* (type of dragonfly), *A. maculicomis*, *A. violacea*, *A. vilosovirdiscens*, *Phytoecia virgula*, *Oberea erythrocephala*, *Vadonia moea*, etc.

A few representatives of the genus *Dorcadion* are also present here (*D. aethiops* and Balkan endemic species *D. lineatocolle*).

Orthoptera (straight-winged insects): This habitat has the second richest diversity of winged insects, and even though they seem similar, at first glance, to the species living in degrading oak forests and hornbeam forests, and the habitat generally includes the same species, some common species can be observed such as *Tylopsis lilifolia*, *Ancistrura nigrovittata*, *Polysarcus denticauda*, *Tettigonia viridissima*, *Decticus albifrons*, *Decticus verrucivorus*, *Platycleis affinis*, *Bucephaloptera bucephala*, *Oecanthus pallucens*, *Gryllus campestris*, *Dociostaurus brevicollis*, *Omocestus rufipes*, *Chorthippus bomhalmi*, *Acrida ungarica*, and also the Balkan endemic species *Saga hellenica*, and east Mediterranean species such as *Asiotmethis limbatus* and *Gampsocleis abbreviata* and *Paracaloptenus caloptenoides*, all of which are in accordance with the Bern Convention.

Epipotamal streams - Rivers (approximately wider than 5 m)

Reference to EUNIS Habitats: C2.31 Epipotamal streams

Reference to EU Habitats Directive Annex I: 3260 Water courses of plain to montane levels with the *Ranunculus fluitans* and *Callitriche-Batrachion*

Reference to CoE BC Res. No. 4, 1996: none

Reference to the Water Framework Directive (2000/60/EC): Lowland medium/small river type

General characteristics: River Bregalnica is the only water course meeting the above criterion for "river" within the area of road A3. The vascular vegetation forming the physiognomy of the river banks and the water near the banks is not well-developed. However, there are some plants related to the water ecosystem, such as: *Ranunculus trichophyllus*, *Myosotis scorpioides*, etc. The



rocky banks allow for development of *Cladophora* during the summer season, and rich epilithic diatom communities and cyanophytes during the winter and spring seasons.

Mammals: The typical mammal species inhabiting the larger rivers is the otter (*Lutra lutra*).

Birds: The only characteristic feeding bird is the common kingfisher (*Alcedo atthis*).

Amphibians: This habitat is suitable for amphibians and much less for reptiles. Three amphibian species, namely the yellow-bellied toad (*Bombina variegata*), the Greek stream frog (*Rana graeca*) and the marsh frog (*Pelophylax ridibundus*), and two reptile species, namely the grass snake (*Natrix natrix*) and the dice snake (*Natrix tessellata*) are present in this habitat.



Figure 34 *Rana graeca*

Fish: There is an abundant fish population in the rivers, particularly in Bregalnica. According to the available information, the following species are present: *Squalus cephalus* L., *Chondrostoma nasus* L. (common nase), *Gobio gobio* L. (gudgeon), *Barbus macedonicus* Karam. (white barbel), *Barbus balcanicus* Kotlik et al. (Danube barbel), *Vimba melanops* Heck. (Macedonian vimba), *Alburnus alburnus* L. (common bleak), *Cobitis taenia* L. (spined loach), *Salmo macedonicus* (Macedonian trout) and others.

Rivers and streams (narrower than 5 m)

Reference to EUNIS Habitats: G2.22 Hyporhithral streams

Reference to EU HD Annex I: 3260 Water courses of plain to montane

levels with the *Ranuncullon fluitantis* and *Callitriche-Batrachion* vegetation

Reference to CoE BC Res. No. 4 1996: none

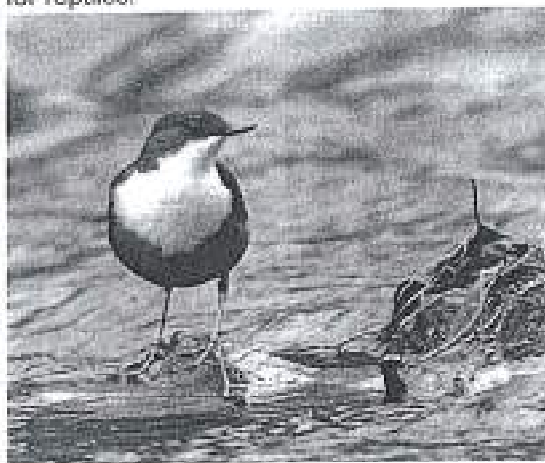
Main characteristics and distribution within the area of the corridor: The area of the road corridor is not characterized by a well-developed hydrographic network. The majority of river courses are dry during much of the year. Along its course, River Bregalnica takes in 23 tributaries longer than 10 km. There are 10 tributaries flowing in from the right side with a total length of 241 km, and 13 tributaries coming in from the left side with a total length of 260 km. Within the area of the planned corridor, the following right-bank tributaries to River Bregalnica are of special importance:

River Zletovska - emanates from the north side of Lopensko Bilo at Osogovo, at an altitude of 1620 m, and flows into Bregalnica under the village of Ularci, at an altitude of 293 m.

Fauna – vertebrates are largely represented by species similar to those of River Bregalnica.

Birds – bird fauna is similar to the bird fauna of Bregalniva and its larger tributaries. One species that is more typical for these habitats is the white-throated dipper (*Cinclus cinclus*).

Amphibians and reptiles – there is a very small number of amphibians and reptiles in this type of rivers. Typical frog species include *Rana graeca* and *Pelophylax ridibundus*, and *Natrix natrix* for reptiles.



Figures 35 and 36 *Cinclus cinclus* and River Kochanska

Intermittent streams

Main characteristics and distribution within the area of the corridor. Intermittent streams only have flow during the wet season. In early spring, the melting of snow increases the water level, whereas the beds are dry during the rest of the year. Therefore, these water streams are of no major importance as aquatic ecosystems. However, there are forests and willow zones usually developing around the river beds (dry river beds). River Kochanska emanates from the south side of Lopensko Bulo at Osogovo at an altitude of 1630 m, and flows into Bregalnica above the village of Chiflik, at an altitude of 295 m.

Amphibians – the following species are present: *Bombina variegata*, the common toad (*Bufo bufo*) and the green toad (*Pseudepidalea viridis*).

Butterflies – typical species: *Pygus alveus*, *P. sidae*, *Parnassius mnemosyne*, *Zerynthia cerisy*, *Apanthopus hyperantus*, *Arethusana arethusana*, *Lasiommata petropolitana*, *Pyronia tithonus*, *Vanessa atalanta* etc.

Gravel and sand deposits

Reference to EUNIS Habitats: C3.62 Unvegetated river gravel banks

Reference to EU HD Annex I: none

Reference to CoE BC Res. No. 4, 1996: 24.2 River gravel banks

Main characteristics: This biotope is represented by a very specific vegetation and exists along rivers or on small river islands. Earth base is characterized by gravel or soil under formation. In some places there are soft ridges that are not very tall. Such biotopes are occasionally flooded, and therefore exhibit scarce vegetation, mainly represented by *Gramineae*, as well as many pioneer plant species developing on sandy soil, such as representative species from *Polygonaceae*, *Chenopodiaceae* and other families. The physiognomy of this biotope is also influenced by young *Tamarix* shrubs.

Distribution within the project area: this biotope can be found near the point of entry of River Zletovska in Bregalnica, at the place called Ularci.

Flora – the plants that shape the physiognomy of this biotope are listed in the main characteristics section.

Mammals – the following mammal species can be found: the otter (*Lutra lutra*), Günther's vole (*Microtus guentheri*), the wood mouse (*Apodemus sylvaticus*), the striped field mouse (*A. agrarius*), the red fox (*Vulpes vulpes*), and others.

Birds – this habitat is not very suitable for birds; however some species use it for nesting (*Charadrius dubius*, *Actitis hypoleucos*, *Motacilla cinerea*, *M. alba*), or they visit it in search of food, such as some heron and stork species.

Amphibians – this habitat is inhabited by several frog species, such as: the marsh frog (*Pelophylax ridibundus*), the Greek stream frog (*Rana graeca*) and the European tree frog (*Hyla arborea*).

Reptiles – snake species include the grass snake (*Natrix natrix*) and the dice snake (*Natrix tessellata*).

Invertebrates – the following **butterfly** species can be found: *Lasiommata petropolitana*, *Scolitantides orion*, *Aporia crataegi*, *Pseudophilotes vicrama*, *Zerynthia cerisy*, *Erebia medusa*, *Pyronia tithonus*, *Polyommatus icarus*, *Cupido osiris*, *Plebeius sephirus*, *Colias alfacariensis*, *Pyrgus sidae*, *Argynnis aglaja*, *Brintesia circe*, *Hipparchia syriaca*, *H. Stalinius*, and *Maniola jurtina*.

This habitat is suitable for some species of **ground beetles**, particularly from the *Bembidion* genus, which are widely distributed throughout Europe and the Balkans. The dominant species in habitats containing gravel and sand deposits near lowland rivers include *Bembidion decorum*, *Bembidion lampros* and *Nebria brevicollis*. Along small river and stream banks, there are species such as *Platynus scrobiculatus* and *Limodromus assimilis*. The **dragonfly** fauna is similar to the riparian willow and poplar forest fauna. A small number of species use this habitat for hunting and mating. Some straight-winged insect species are highly specialized in this type of habitat, such as species from the *Tetrix* genus, the marsh cricket (*Pteronemobius heydenii*), the grasshopper (*Aiolopus strepens*), and others. Due to the presence of sandy soil, the following species can also be found: *Acrotylus insubricus*, *Oedipoda germanica*, and *Oedipoda caerulea*.

Reedbeds (*Phragmites australis*)

Reference to EUNIS Habitats: D5.1 Reedbeds normally without free-standing water, including: D5.11 [*Phragmites australis*] beds normally without free-standing water, and D5.13 [*Typha*] beds normally without free-standing water

Reference to EU HD Annex I: none

Reference to CoE BC Res. No. 4, 1996: none

General characteristics: In the road plan, reeds do not represent a typical reed biotope in several cases. They develop narrow beds in some areas along slow flowing rivers. Such reed species are usually fragments of *Sclipo-Phragmitetum* W, Koch 1926, association of marsh plants. Most typical plant species are *Typha latifolia* and *Phragmites australis*. Other vascular plant species associated with water include *Veronica anagalis-aquatica*, *Veronica beccabunga*, *Stelaria aquatica*,



Lycopus europaeus, Myosotisscorpioides, Alisma plantago-aquatica, Rumex cristatus, Polygonum hydropiper, and Ranunculus repens.

Distribution within the project area: Reedbeds can be seen in several areas along rivers Kuchanska and Zletovska, and near irrigation canals.

Flora and fauna

Mammals: A typical species in this habitat is the striped field mouse (*Apodemus agrarius*). The presence of *Crocidura suaveolans*, *Microtus rossiaemeridionalis* can also be expected.

Birds: The only species of breeder birds found here is the great reed warbler *Acrocephalus arundinaces*, and probably *Ixobrychus minutus*. The other species (same as in the river habitats) use the smaller marshes for feeding and during migration. In general, the number of bird species and varieties is significantly low.

Amphibians: This habitat is largely inhabited by amphibians. There are six varieties of the Greek stream frog (*Rana graeca*) and the marsh frog (*Pelophylax ridibundus*), the European tree frog (*Hyla arborea*), the Greek stream frog (*Rana graeca*) and the marsh frog (*Pelophylax ridibundus*).

Reptiles: There are only two reptile species present in this habitat: the grass snake (*Natrix natrix*) and the dice snake (*Natrix tessellata*).

Butterflies: Marsh habitats are also very suitable for butterflies due to their diverse flora. The following species are present in the investigated area: *Lycaena dispar*, *L. tityrus*, *L. candens*, *Apatura ilia*, *Thymelicus lineola*, *Argynnis pandora*, *A. paphia*, *Papilionomachaon*, *Celastrina argiolus*, *Polyommatus icarus*, *Argynnis aglaja*, *Colias crocea*, *Pontia edusa*, *Aglais io*, *Carcharodus alceae*, etc.

Beetles: Dominant species: *Carabus granulatus*, *Chlaenius u Agonum*, *Stenolophus mixtus*, *Poecilus cupreus*, etc.

Dragonflies: The dragonfly fauna consists of 16 species. Most typical species: *Libellula depressa*, *Lestes virens*, *Pyrhasoma nymphula*, *Sympetrum sanguineum*, and *Orthetrum cancellatum*.

Anthropogenic habitats

This part of the chapter describes anthropogenic habitats such as urban and rural settlements, deciduous tree plantations, and agricultural land (paddy fields, fruit orchards, corn fields, fallow fields, etc.

Tree plantations

Forests planted by man in the investigated corridor mainly consist of black locust (*Robinia pseudoacacia*) which is usually planted for its ability to grow in dry and very unfavourable conditions. Silver birch (*Betula pendula*) plantations were also observed along the road.

Amphibian species present here include the common toad (*Bufo bufo*), the green toad (*Pseudepidalea viridis*), the European tree frog (*Hyla arborea*), and the marsh frog (*Pelophylax ridibundus*).



Reptiles also prefer these habitats because they are rich in prey (grasshoppers, beetles, worms, rodents). Reptile species present here include the European green lizard (*Lacerta viridis*), the Balkan green lizard (*Lacerta trilineata*), the Caspian whipsnake (*Dolichophis caspius*), the Aesculapian snake, and the horned viper (*Vipera ammodytes*).

Agricultural land

Agricultural land is mainly characterized by smaller or larger plots with monoculture plantations. Agricultural ecosystems along the corridor are mainly represented by field, cropland, garden plots and plantations, consisting mainly of monocultures (rice, sunflower, wheat, tobacco, vine, fruit, etc.).

Fields and cropland

Reference to the Habitats Directive: No particular reference

Reference to the Classification of Palearctic Habitats: 82. Crops

Main characteristics: Fields and cropland within the area of the planned road corridor are mainly represented by cereal grains and crops. Industrial plants grow on larger land areas, in particular sunflower and, to a lesser extent, tobacco. Maize and paddy fields can be seen often. Monoculture plantations have a lower biodiversity value than individual fields. The monotypical structure of the community and the environmental conditions controlled by humans with the use of large quantities of pesticides and fertilizer dictate the development of the Biocenosis with low diversity of species. Unlike the economic importance of the cropland, its importance for the biodiversity is very low. Some of the fields are divided by hedges comprised of various species of shrubs and fruit trees, among which most common are: *Morus* spp., *Pyrus* spp., *Populus* spp., *Robinia pseudoacacia*, and *Juglans regia*.

Distribution within the project area: Fields and cropland can be found almost throughout the entire area of the road corridor. Rice is mostly found in Kochansko Pole, including some corn and sunflower fields.

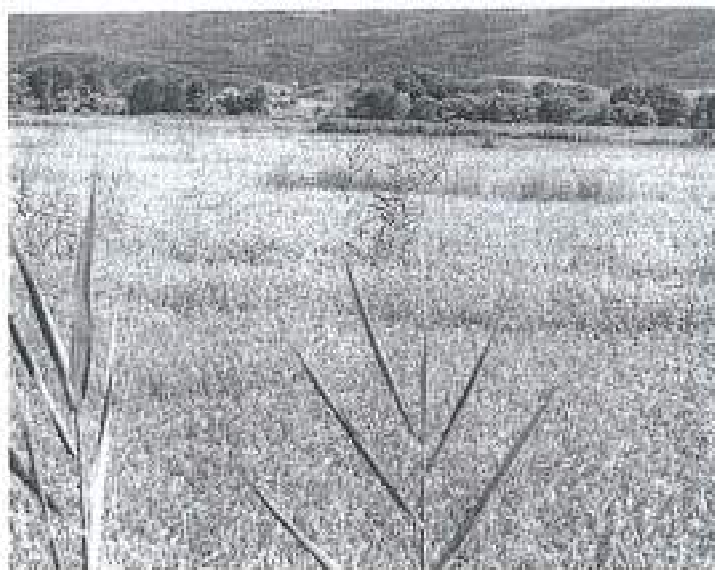


Figure 37 Paddy fields in the village of Obeshovo

Fungi – some species of fungi are typical for different types of agricultural land, such as: *Agaricus hortensis*, *Coprinus* spp., *Anelaria semiovata*, *Volvariella speciosa* etc;

Mammals – the range of mammal species is identical to the abandoned fields.

Birds – several bird species can be found in these habitats, such as: *Melanocorypha calandra*, *Galerida cristata*, *Oenanthe oenanthe*, and several other species use them for laying eggs.

Reptiles – this habitat is rich in species similar to those in the abandoned fields.

Amphibians – toads (*Bufo bufo*, *Bufo viridis*) are the most common amphibian species in this habitat.

Invertebrates –butterfly species found in the area: *Gonepteryx rhamn*, *Nymphalis antiopa*, *Vanessa atalanta*, *Colias crocea*, and ground beetles: *Amara aenea*, *Brachinus eximius*, *Harpalus affinis*, *H. rufipes*, *Chlaenius vestitus*, *Pterostichus niger*, *P. nigrita*, *Carabus coriaceus*, *Bembidion lampros*, *Cicindela campestris*.

Abandoned fields with ruderal vegetation

Reference to EUNIS Habitats: E5.1 Anthropogenic herb stands,

including: E5.11 Lowland habitats colonised by tall nitrophilous herbs; E5.12 Weed communities of recently abandoned urban and suburban constructions; E5. Weed communities of recently abandoned rural constructions; E5.14 Weed communities of recently abandoned extractive industrial sites

Reference to EU HD Annex I: none

Reference to CoE BC Res. No. 4, 1996: none

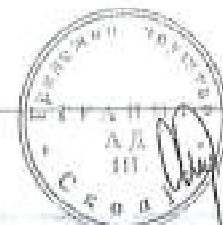
General characteristics: With regard to the flora composition, the most significant characteristic of this biotope is the domination of ruderal plants species over plant species which are typical of grasslands. The vegetation cover is mostly closed, indicating that the fields have been abandoned for many years.

Distribution within the project area: This habitat is only slightly distributed along the road corridor, but it is not negligible. Abandoned fields can be seen from the start of the route at station km 0+000 at the exit from the industrial zone in Shtip to station 2 +000 at the village of Chardaklija.

Fungi: The presence of grass fungi is the main feature of this habitat from a mycological perspective. The most common species belong to the non-mycorrhizal group, such as *Agaricus*, *Coprinus*, *Entoloma*, *Psathyrella*, *Stropharia*, etc.

Mammals: Most common mammal species in this habitat are: the southern white-breasted hedgehog (*Erinaceus concolor*), the European mole (*Talpa europea*), the southern vole (*Microtus rossiaemeridionalis*), Günther's vole (*Microtus guentheri*), the striped field mouse (*Apodemus agrarius*), the lesser white-toothed shrew (*Crocidura svaevicolans*), the wood mouse (*Apodemus sylvaticus*), the house mouse (*Mus domesticus*), the beech marten (*Martes faina*), the Macedonian mouse (*Mus macedonicus*), the European brown hare (*Lepus europaeus*), the grey wolf (*Canis lupus*), the red fox (*Vulpes vulpes*), the least weasel (*Mustela erminea*), the European badger (*Meles meles*), the wild boar (*Sus scrofa*), and the roe deer (*Capreolus capreolus*).

Birds: The avifauna of abandoned fields is very similar to the avifauna of hill pastures. Dominant species are: the grey partridge, the calandra lark, the common quail, the Eurasian swallow, etc.



Reptiles and amphibians: Amphibian and reptiles species in this habitat are identical to those in hill pastures and the neighbouring habitats.

Butterflies: Abandoned cropland and fields are one of the most visited habitats by butterflies. Typical species found in this habitat: *Maniola jurtina*, *Pieris rapae*, *P. brassicae*, *P. manni*, *Pontia edusa*, *Zerynthia polyxena*, *Iphiclides podalirius*, *Aglais io*, *Erebia medusa*, *Polygonia c-album*, *Argynnis pandora*, *A. niobe*, *Vanessa cardui*, *V. atalanta*, *Polyommatus icarus*, *Loxia crocea*, *Plebeius argus*, *Melanargia galathea*, *Arethusana arethusa*, *Coenonympha pamphilus*, *Pyrgus malvae*, *P. serrataluae*, *Lycaena tityrus*, *Aporia crategi*, *Euphydryas aurinia*, *Parnassius mnemosyne* etc.

Ground beetles: About 15 species are known to roam around abandoned fields. Dominant species are: *Amara aenea*, *Calathus fuscipes*, *Calathus melanocephalus*, *Cicindela campestris*, *Harpalus affinis*, *Harpalus attenuatus*, *Harpalus rufipes*, *Harpalus serripes serripes*, *Harpalus tardus*, *Microlestes fissuralis*, and *Poecilus cupreus*.

Longhorn beetles: Due to the presence of grass vegetation such as mullein, milkweed, and Scotch thistle, this habitat is also characterized by several species found on pastures: *Agapanthia cynarae*, *A. maculicomis*, *A. violacea*, *A. vilosoviridiscens*, *Phytoecia virgula*, *Oberea erythrocephala*, *Vadonia moca*.

Crickets: Since these habitats are often adjacent or relatively close to open fields of natural origin, several species present in hill pastures are expected to be found here, such as *Leptophyes albivittata*, *Ancistrura nigrovittata*, *Poecilimon thoracicus*, *Poecilimon brunneri*, *Melanogryllus desertus*.

Abandoned arable land

Reference to EUNIS Habitats: E5.1 Anthropogenic herb stands,

including: E5.11 Lowland habitats colonised by tall nitrophilous herbs

Reference to EU HD Annex I: none

Reference to CoE BC Res. No. 4, 1996: none, and

Reference to EUNIS Habitats: 11.53 Fallow un-inundated fields with annual and perennial weed communities

Reference to EU HD Annex I: none

Reference to CoE BC Res. No. 4, 1996: none

General characteristics: Abandonment of arable land in has been a common process in Macedonia over the past decades. This variation originates from the abandoned fields, with development of several tree and shrub species as a consequence of natural succession. Although it is very similar to the previous habitat, it is treated as different since the shrubs present provide shelters for many animal species, especially for food and cover. In addition to the the characteristic herb plants defining this habitat mentioned in relation to the previous biotope type, the shrub species growing here (*Paliurus spina christi*, *Rosa spp.*, *Prunus spinosa* etc.) also define its physiognomy. As for the fungus species, this habitat is identical to the previous one. The fauna is almost identical to the fauna in the previous habitat, with much more suitable conditions for crickets and some bird species. For more details regarding the species, see Appendices I, II, and III.



Distribution within the project area: Vineyards are most prevalent in the Cheshinovo-Obleshevo region. Vineyard plots can be found along certain sections of the planned corridor near the village of Chiflik, from station KM 18+000 to KM 18+495, at the village of Obleshevo, and at station KM 20+000dp KM 21+429.

Mammals – there are several species that can be observed in this habitat: the beech marten (*Martes foina*), the red fox (*Vulpes vulpes*) and the southern white-breasted hedgehog (*Erinaceus concolor*).

Birds – there are only a few bird species living in this habitat, such as the common blackbird (*Turdus merula*), house and tree sparrows (*Passer domesticus*, *Passer montanus*), but this habitat provides food for many other bird species, most numerous being the common starling (*Sturnus vulgaris*).

Reptiles – there are no characteristic reptile species, and the composition of species is similar to that found in fruit orchards.

Amphibians – there are no characteristic amphibian species in this habitat.

Invertebrates – the invertebrate fauna is similar to that found in fruit orchards.

Urban and urbanized areas serving as habitats

Rural settlements (villages)

Reference to the Habitats Directive: no particular reference

Reference to the Classification of Palearctic Habitats: 84.4 Rural mosaics

Main characteristics: Villages situated along the road corridor are characterized by rural features. Generally, the houses in these villages are surrounded by small gardens and fruit orchards. These conditions allow for development of diverse natural vegetation and presence of many wild animal species. In addition to the cultural and ornamental species, the vegetation is mainly comprised of plants present in neighbouring biotopes, such as ruderal plants and weeds.

Distribution within the project area: The road corridor will run through the rural settlements Chardaklija, Dolni Balvan, and Obleshevo.

Mammals – the abundance of vegetables, livestock, and poultry in villages makes them suitable habitats for mammals, both herbivores and carnivores. Most common species are: the red squirrel (*Sciurus vulgaris*), the yellow-necked mouse (*Apodemus flavicollis*), the wood mouse (*Apodemus sylvaticus*), the striped field mouse (*Apodemus agrarius*), the edible dormouse (*Glis glis*), the black rat (*Rattus rattus*), the house mouse (*Mus domesticus*), the red fox (*Vulpes vulpes*), the least weasel and the European polecat (*Mustela nivalis*, *Mustela putorius*), the beech marten (*Martes foina*), the European badger (*Meles meles*), and the wildcat (*Felis silvestris*).

Birds – there are species associated with anthropogenic: *Pica pica*, *Corvus monedula*, *Corvus cornix*, *Corvus corax*, *Passer domesticus*, *Passer montanus*, *Ciconia ciconia*, *Falco tinnunculus*, *Columba livia*, *Streptopelia decaocto*, *Tyto alba*, *Otus scops*, *Athene noctua*, *Asio otus*, *Hirundo rustica*, *Hirundo daurica*, *Delichon urbica*, *Sylvia atricapilla*, *Parus caeruleus*, *Parus major*, *Oriolus oriolus*, and *Passer hispaniolensis*.

Reptiles and amphibians – rural settlements are suitable habitats for amphibians and reptiles. Commonly found amphibians include: the smooth newt (*Lissotriton vulgaris*), frog species

Rana dalmatina, *Bombina variegata*, *Bufo bufo*, *Hyla arborea*, and *Pelophylax ridibundus*, while reptile species include: Hermann's tortoise (*Eurotestudo hermanni*), lizards (*Lacerta erhardii*, *Podarcis muralis*, *Lacerta trilineata*, *Lacerta viridis*) and the horned viper (*Vipera ammodytes*).

Invertebrates – this habitat is very suitable for butterflies. Typical and common species include: *Lycaena virgaureae*, *L. tityrus*, *Polyommatus belargus*, *P. icarus*, *Leptidea sinapis*, *Plebeius argus*, *Pieris brassicae*, *P. napi*, *Coenonympha pamphilus*, *C. arcania*, *Maniola jurtina*, *Argynnis paphia*, *Satyrion aesciae*, *Colias crocea*, *Arethusana arethusa*, *Nymphalis polychloros*, *Erebia medusa*, *Vanessa cardui*, *V. atalanta*, *Cupido osiris*, *Erynnis tages*, *Polygonia c-album*, *Pseudophilotes vicrama*, *Hamearis lucina*, *Pyrgus alveus*, *Aglais urticae*, *Aponia crategi*. The beetle fauna is similar to that found in agricultural land (crop fields, fruit orchards, vineyards). Common species include: *Amara aenea*, *Calathus melanocephalus*, *Calathus fuscipes*, *Microlestes fissuralis*, *Harpalus serripes*, *Harpalus rufipes*, and *Poecilus cupreus*.

6. Project's environmental impact

The preparation of the Report is aimed at locating and determining the existence of any harmful effects on the environment as a result of project activities that will take place at the rehabilitation of the subject section. Environmental impact of this type of project activities occurs in three stages:

- Preparatory stage –preparatory works (preparation of the subject section for the rehabilitation);
- Construction stage (rehabilitation);
- Operations stage (traffic along the subject section and maintaining it in functional condition, removal of all detected irregularities i.e. defects).

From the above described activities, which will take place during the execution of activities or rehabilitation of national road A3 bypass Kocani, there have been examined the sources of emissions in the basic media and environmental areas in terms of their environmental impacts.

6.1 Emissions

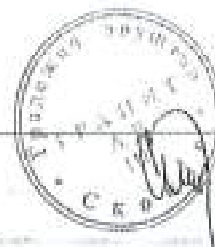
During the execution of the projected construction activities for rehabilitation of the road in subject, the following emissions are expected:

Preparatory stage (preparation of the road in subject for rehabilitation)

- exhaust fumes from construction machinery;
- occurrence of fugitive dust emissions from clearing the respective section;
- municipal and construction waste;
- wastewater from the construction workers and waste water drainage;
- noise and vibration from the work of construction machinery.

Construction stage (rehabilitation)

- fugitive dust emissions from construction activities;



- emissions from construction machinery;
- municipal and construction waste;
- wastewater from construction workers and waste water drainage;
- noise and vibration from the work of construction machinery;
- impact on biodiversity (disturbance).

Operational stage

- exhaust fumes from mobile sources of pollution (vehicles);
- waste rain water;
- noise.

6.1.1 Air emissions

Under the Law on Ambient Air Quality ("Official Gazette" No.67 / 04, 92/07, 47 / 11,59 / 12, 100/12, 163/13 and 4/13 new amendments, additions?) and the by-laws arising from it, air emissions are categorized into: emissions from boilers, particles emissions from stationary and mobile sources, potential and fugitive emissions. Emissions of harmful pollutants in the air will occur in two stages: construction and operation (traffic flow along this road).

Construction stage

In the process of rehabilitation of the subject section, the following air emissions will occur: fugitive dust emissions during cleanup and removal of ground vegetation, fugitive dust emissions during scratching the existing asphalt; its removal and replacement, dust emission during loading and transport of excavated material, emissions from mobile sources of pollution or the construction machinery and fugitive emission of volatile organic components during the application of bitumen emulsion and the application of asphalt mixture.

From all the above impacts, fugitive dust has utmost importance according to the environmental impacts. Dust will be generated by mechanical operations of construction machinery, as well as from mechanization fuel combustion, during the preparation of the terrain it affects the nearby and distant surroundings depending on the size (aerodynamic diameter) of the particles and the meteorological conditions during the activities, primarily wind flow velocity (affects their dissemination i.e. transmission). The impact of the fugitive dust emissions generated from the activities of the construction machinery (asphalt scratching) will be further enhanced as it will be accompanied by emissions from construction machinery.

The fine particles or particles which can be inhaled with diameter $D \leq 2.5 \mu\text{m}$ that are created during the combustion of fuel in the motor vehicles is transmitted over a long distance and they contain organic components and heavy metals that have negative influence on human health and the environment.

The following table presents the limit values and margin of tolerance for suspended dust with a diameter of 10 micrometers PM10 according to the Ordinance on limit values of levels and types of pollutants in ambient air and alert thresholds, deadlines for achieving limit values, margins of tolerance for the limit values, target values and long-term goals ("Official Gazette"-no. 50/05 and 4/13).

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Table 26 Limit values and margin of tolerance for suspended dust PM10

Pollutant	Average period	Limit value which has to be reached in 2012	Permitted number of exceeding during the year
PM10	24 hours	50 µg/m ³	35
	1 year	40 µg/m ³	0

The impacts of fugitive emissions of volatile organic components from the application of bitumen emulsion and asphalt mixture will be less severe because these compounds are volatile and briefly detained in the air and are not transmitted or emitted.

Gases and pollutants present in them are emitted into the ambient air through the system for disposing the exhaust fumes from the means of transport and construction machinery on the site. The quantity and composition of the exhaust fumes depends on several parameters such as the type and age of the vehicle, the technical characteristics of the vehicle, the type of fuel used, the characteristics of the fuel distribution network, the presence of additives, the degree of combustion of fuel and so on.

During full combustion of fuel there are produced SO₂, CO₂, H₂O, aromatic hydrocarbons, and catalysts are used Pb₂O₃ and the like is produced. In case of incomplete combustion of fuel CO is produced as well as hydrocarbons, suspended dust etc. During long-term exposure to the above mentioned toxic substances, they have harmful effects on human health. Therefore, smoke affects the respiratory organs and the skin, lead affects the respiratory and central nervous system and blood system and bones. The particles that appear in the process of combustion of fuels also have cancerous effect.

Herein below is a table showing the limit values for the pollutants from the construction machines, pursuant to the directive 97/68/EC:

Table 27 Limit values for the pollutants emitted from construction machines (Directive 97/68/EC)

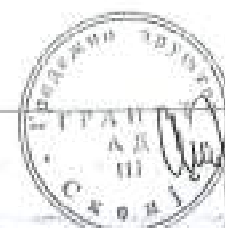
Motor power	CO (g/kWh)	HC(g/kWh)	NOx(g/kWh)	PT(PM) (g/kWh)
130 ≤ P ≤ 560	5.0	1.3	9.2	0.54
75 ≤ P ≤ 130	5.0	1.3	9.2	0.7
37 ≤ P ≤ 75	6.5	1.3	9.2	0.85

The concentrations of emitted air pollutants in the region, i.e. the ambient air pollution is affected by the meteorological and the geo morphological condition on the site.

The impact to the air during the rehabilitation of the section in subject will be assessed in the rank from insignificant to significant on sites where section in subject passes near inhabited places.

Operations stage

In the operations stage there will be air impacts during the traffic flow on the respective section, expressed through the emission of exhaust fumes from the combustion of fuels in the internal combustion engines. It is known that 1 liter of gas produces approximately 10 m² harmful gasses which have adverse impact to the human organism. The following graph shows a presentation of the internal combustion engines' impact to the environment.



6.1.2 Emissions to Water and Sewer

Construction phase

Water pollution during the rehabilitation of the road section can be physical, chemical, or biological. Physical pollution is manifested by the presence of solid particles from earth and sand debris, solid particles from tire friction, debris from car accidents, disasters and the like. Physical pollution of liquids means the presence of fats and oils. During the washing of the road surface, solid particles are deposited in the gutters and drains and can cause clogging, while the fats and oils rise to the surface and reach the recipient. Here they create a film, and the inlet of oxygen in the water flow is blocked which constrains the natural creation of the aquatic flora and fauna in the recipient.

Chemical pollution occurs as a result of the dissolution of pollutants in air. These pollutants are the result of vehicle exhaust gasses, emissions from polluting components of nearby industrial and manufacturing capacities, dilution of individual components from the surrounding land, application of agro-chemical materials and pesticides, as well as animal and plant waste. Chemical pollution can be manifested as a highly acidic, or a low acidic neutral medium and all the variations ranging from a highly basic to a highly acidic medium.

Biological pollution is caused by the decomposition of organic mater that serves as food for various organisms. They can be the result of food discarded by reckless road users, leaves blown by the wind, or other biodegradable waste, feathers and other substances that are present in the nearby environment.

Mechanical impurities from soil weathering due to heavy rainfall and surface water flow will cause filling of the beds and water turbidity, which will reduce the penetration of light to greater depths and will change the living conditions in streams.

The most dangerous pollutants to surface and groundwater are non-degradable components of organic matter and heavy metals.

The locations planned for accommodation for the workers and for maintenance and cleaning of the machinery can be potential sources of pollution caused by sewage water, solid waste, and improper maintenance and cleaning of the machinery.

Given their intensity and duration, the planned activities for rehabilitation will not have a negative impact on the quality of River Bregalnica as a water resource running in the vicinity of the route.

Groundwater and soil pollution can also occur in case of car accidents and disasters.

Operational phase

During the operational phase, the sources of emission to water will generally be same as during normal use of the road.

6.1 Waste Generation

Waste management is one of the most serious environmental problems in Macedonia. The regular waste collection service is restricted to urban areas, and very little attention is paid to rural settlements. 70% of the total urban population benefits from the regular waste collection service, whereas only 20% of the population in rural areas is covered by the service.

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Municipal waste management is entirely controlled by the local government. It is directly connected to the urban plans for use of local land and should be in accordance with the national strategic documents – the National Plan for Waste Management and the National Strategy for Waste Management, as well as other relevant documents.

Proper waste management in accordance with the widely accepted international norms will reduce the impact of waste on soil (caused by uncontrolled waste disposal), groundwater (directly contaminated over time as a result of uncontrolled waste disposal) and air (caused by burning waste in the open).

The current method of municipal waste management on the territory of the Municipality of Kochani is far from the required level. Only procedures for collecting, transporting and removal of municipal waste are carried out, and there are no procedures for reducing waste from the source of generation. The total quantities of produced municipal, industrial and other non-hazardous and inert waste are collected, transported by PUC Vodovod – Kochani, and disposed of.

The Work Unit Komunalna Higijena operating as part of PUC Vodovod – Kochani ensures timely, proper, and continuous collection (sweeping and washing), transportation, and disposal of garbage generated by households, businesses, and other legal entities.

In addition to regular waste collection in Kochani, the suburban areas, and the city market, WU Komunalna Higijena also conducts periodic clearing of the area around the city stadium, the city pool, and the ASNOM complex. It also periodically clears the area around the St. Basil monastery at Ponikva. This work unit also maintains the children's playgrounds in the city park, Sivi Dom, Kalimanova Glava, and other locations throughout the city.

The cleanup of illegal dumps appearing around the city of Kichevo and the nearby villages is also one of the tasks of this work unit.

About 38000 m³ (20000 tons) of waste is disposed of annually.

In the first zone (daily), the Public Land maintenance covers:

- Streets 18.640 m²
- Sidewalks 8.460 m²
- Square, and shopping center 3.200 m²

The second zone (once per week) covers:

- Streets 32.850 m²
- Sidewalks 5.440 m²

It can be concluded from the above that on the territory of the Municipality of Kochani there is no organized waste management system, and waste management only involves collection, transport, and disposal of waste to a local landfill, without any pretreatment or implementation of sanitary measures during removal.

The general situation with regard to waste management is evaluated as partially satisfactory due to incompliance with the criteria set out in the European waste directives, primarily with regard to the waste collection service coverage, the lack of an integrated waste management system, the situation with the municipal landfills, and the emergence of a large number of illegal dumps.



Construction phase

The process of rehabilitation of the road section analyzed in this Report will result in the generation of mixed municipal waste by the workers and construction waste.

Waste generators shall, as far as possible, avoid waste generation and reduce any adverse impacts of waste on the environment, human life and health⁸.

Municipal waste generators shall enter into a separate waste collection and transport agreement with the service provider PUC Vodovod - Kochani on the territory of the Municipality of Kochani.

The types of waste that will be generated during construction and rehabilitation of the road section, and the method of treatment of different types of waste are shown in the table below:

Table 29 Types and quantities of waste

Phase	No.	Waste type	Number in the List of Wastes (Official Gazette No. 100/2005)	Amount of waste per year (in tons or liters)	Waste treatment method (Processing, storage, transfer, removal, etc.)	Name of the entity handling the waste and waste disposal location (landfill)
Конструктивна фаза	1	Mixed municipal waste	20 03 01	Cannot be determined ⁹	Waste is stored temporarily in bags until its disposal in containers located nearby	PUC Vodovod - Kochani
	2	Contaminated soil as a result of possible release of oil from construction machinery	17 05 05*	Cannot be determined (only in incidental situations)	Contaminated soil is covered with inert material and removed (similar to hazardous waste treatment)	Legal/natural person who holds a license for such type of waste
	3	Removed asphalt	17 03 02	Cannot be determined during this phase	Waste is stored to an adequate location until its disposal to a construction waste landfill and/or used for local access roads (best practice)	PUC Vodovod - Kochani

* Hazardous waste in accordance with the List of Wastes (Official Gazette of RM No. 100/05)

Operational phase

The operational phase of the road may lead to generation of waste as a result of the cleaning of culverts (earth, rocks, organic waste, etc.) and as a result of maintaining the road in proper condition, such as backfilling holes and the like.

⁸ According to the Law on Waste Management (Official Gazette of RM No. 66/04, 71/04, 107/07, 102/08, 134/08, 06/11, 47/11, 123/12)

⁹ The amount of municipal waste generated will depend on the number of performers of construction works during the rehabilitation, the time schedule for construction, and the time required for implementation of the planned activities.



6.2 Emissions to soil

Impacts on soil during the process of rehabilitation of state road A3 (bypass Kochani) are expected to be negligible since it does not involve extension of the road section, and because it is an existing road that has served vast amounts of traffic in the past.

Impacts caused by road traffic along the road section resulted in its degradation, salinization, reduction in the organic material content, loss of soil biodiversity, etc.

Construction phase

Impacts to the quality of soil during the rehabilitation of the road section are a result of construction activities set out as part of this phase, and may be caused by:

- Fugitive dust emissions during scraping and removal of asphalt,
- Emission of exhaust gasses from the construction machinery engaged in the implementation of activities;
- Leakage of fuel and lubricants from the construction machinery which, apart from their impact on soil, will result in groundwater contamination after their seepage and filtration through the soil;
- Contamination of groundwater and soil may also occur in case of accidents and major failures.

Operational phase

Emission of exhaust gasses is expected during the operational phase, caused by traffic moving along the road section.

6.3 Noise, Vibration, and Non-Ionizing Radiation

Construction phase

During the process of rehabilitation of the road section, the maximum allowable noise levels will be exceeded significantly.

Noise will be produced as a result of the construction machinery which will be employed during this phase, and the vehicles for delivery and transport of construction material and generated waste. The specificity of the impact will mostly depend on the type of equipment, and the type and operating condition of the construction machinery.

The distance from populated areas, the geological conditions, and the terrain configuration are crucial with regard to the environmental impact of noise.

Weather conditions have a major effect on the noise and airblast intensity. Airblasts are influenced by wind direction and speed, whereas sound propagation is influenced by wind speed and temperature, in relation to terrain elevation and configuration.

Table 24 gives a list of noise, vibration, and non-ionizing radiation sources.

Table 24 List of noise, vibration, and non-ionizing radiation sources

Source of emission	Emission type (noise, vibration, or non-ionizing radiation)	Equipment – device with maximum output description	Intensity of noise emitted (dB) indicated by the value designated on the equipment	Intensity of vibration and non-ionizing radiation emitted	Periods of emission (number of hours per day)
Heavy vehicles	Noise (04 dB)	Bulldozer, excavator, trucks	/	/	/



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The environmental noise basic indicator levels are set out in the Regulation on noise level limits (Official Gazette of RM No.147/08). According to the noise protection degree, the environmental noise basic indicator limits should not exceed:

Table 31 Legend

Legend			
Basic noise indicators			Additional noise indicator
Ld day (from 07:00 to 19:00)	Lv evening (from 19:00 to 23:00)	Ln night (from 23:00 to 07:00)	L _{Amax}

Table 32 Noise levels per area

Area differentiated according to the noise protection level	Noise level in dBA		
	Ld	Lv	Ln
First degree area	50	50	40
Second degree area	55	55	45
Third degree area	60	60	55
Fourth degree area	70	70	60

Table 33 Room noise levels

Room types	Noise level in dBA		
	Ld	Lv	Ln
Hospital room, intensive care units, operating rooms	30	30	30
Rooms in residential buildings, recreational rooms for children, bedrooms in old age and retirement homes, hotel rooms	35	35	30
Medical offices in health facilities, conference halls, movie theaters, theater and concert halls	40	40	35
Schoolrooms, reading rooms, lecture theaters, classrooms, rooms for scientific research work	40	40	40
Work premises in administrative buildings, offices	50	50	50
Theater and cinema lobbies, hairdressing and beauty salons, restaurants, pastry shops	55	55	55

Table 34 Room noise levels

Room types	Noise level in dBA	
	L _{Amax} day	L _{Amax} night
Residential zone (outdoors)	/	60
Rooms in residential buildings, recreational rooms for children, bedrooms in old age and retirement homes, hotel rooms (indoors)	/	45
Hospitals and other stationary treatment facilities	/	45
Industrial, commercial, shopping, and traffic areas	110	110
Public gatherings, festivals, concerts, discos	110	110

Table 35 Noise level per area

Area types	Noise level in dBA		
	Ld	Lv	Ln
Areas exposed to intensive road traffic	60	55	50



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Area types	Noise level in dBA		
	Ld	Lv	Ln
Areas exposed to intensive rail traffic	65	60	55
Areas exposed to intensive air transport	65	65	55
Areas with intensive industrial activity	70	70	70
Quiet areas outside agglomerations	40	35	35

Areas identified according to the noise protection degree are defined in the Regulation on locations of measuring stations and measuring points (Official Gazette of RM No, 120/08).

- Areas with I degree of noise protection are areas intended for tourism and recreation, areas in the vicinity of hospitals, and national park and nature reserve areas;
- Areas with II degree of noise protection are areas primarily intended for residence, i.e. residential areas, areas nearby buildings designed for educational activity, social protection facilities intended for accommodation of children and the elderly, facilities for primary health protection, playgrounds and public park areas, public greenery spaces and recreational areas, and local park areas.
- Areas with III degree of noise protection are areas where construction activities in the surrounding area are allowed and noise generation causes minor interference: commercial/business/residential areas, which are also designed for accommodation, i.e. areas with buildings that have protected spaces, crafts and related production activities (mixed areas), areas designed for agriculture activities and public centers for administrative, commercial, service and catering activities.
- Areas with IV degree of noise protection are areas where construction in the surrounding area that can cause noise interference are allowed, areas without apartments, designed for industrial, crafts or other similar production activities, transport activities, storage activities, service and communal activities causing significant noise.

According to the classification of areas according to the noise protection degree, the project activity belongs to areas with III degree of noise protection, which are areas where construction activities in the surrounding area are allowed and noise generation causes minor interference: commercial/business/residential areas, which are also designed for accommodation, i.e. areas with buildings that have protected spaces, crafts and related production activities (mixed areas), areas designed for agriculture activities and public centers for administrative, commercial, service and catering activities.

The Decision on determining in which cases and under which conditions it will be deemed that noise pollution has caused disturbance of peace (Official Gazette of RM No. 01/09) identifies actions which, in case they emit noise exceeding the noise level limits, are deemed to cause disturbance of peace.

In the absence of a developed state monitoring network, there are no data on environmental noise measurements in the wider area of the project location. Consequently, there are no planning documents for noise management, such as a strategic map and an action plan.

Given that the road is an existing road, any noise emitted will not have a significant impact on the population living nearby. During construction activities there will be vibration caused primarily by the movement of construction and transport machinery.

Operational phase

The rehabilitation of the road section is expected to reduce the level of existing noise caused by the current condition on the road, the heavy axle loads on the road and its deteriorated state, as a result of the improved technical characteristics of the road section, and the use of modern construction materials for the rehabilitation.

6.4 Biodiversity (flora and fauna)

The implementation of the planned project activities on the road section will also result in impacts on the surrounding flora and fauna. These impacts are expected during the preparatory, construction, and operational phases. Impacts on wildlife during the preparatory and rehabilitation stages will be manifested as increased noise levels and vibration caused by the construction machinery and the presence of construction workers, and will result in temporary displacement of animals. Impacts caused by the rehabilitation of the road section will be minor and short-term, since the road section is an existing structure located in an area where there are no endangered or protected animal and plant species.

Construction phase

During this phase, an increased noise and vibration intensity and an increased amount of emitted exhaust gasses and dust are expected as a result of the use of construction machinery, causing impact on the surrounding flora and fauna.

Impacts caused by noise, vibration, and exhaust gasses from propulsion fuels will certainly also appear during the operational phase, during use of the road section covered by the project activities. However, it is important to note that the impacts expected during the operational phase are already present and appear during use of the road section.

Operational phase

There are no rare or endangered plant and animal species living within the road section area, and given that the area along the road route is dominated by ruderal species and agricultural arable land, impacts on biodiversity can be deemed as negligible.

7. Environmental Protection Program

The implementation of an efficient environmental management system allows for gradual improvement and enhancement of the environmental and social aspects. Most project activities have the potential to create environmental and social impacts. Such impacts can be beneficial or adverse, range from insignificant to highly significant, or range from short to long-term.

Environmental and social impacts are expected during the Construction Phase - reconstruction and rehabilitation, and during the Operational Phase - movement of traffic along the route and maintaining the route in operating condition.



Almost all impacts can be reduced by implementing mitigation measures, given that such impacts are expected to be temporary and without any lasting adverse impacts on environmental media and social aspects.

The effective impact mitigation measures have been designed for the purpose of reducing or eliminating the expected impacts caused by individual activities by the Contractor for rehabilitation of the road. Impact mitigation measures will be effective only if applied properly, in order to ensure that each impact mitigation measure will have the planned effect.

7.1 Air Pollution Prevention Measures

Construction phase

Fugitive dust emissions and emissions from mobile sources in the air (during combustion of oil derivatives from internal combustion engines) will arise during performance of construction activities for rehabilitation of state road A3 bypass Kochani.

During the installation of asphalt and the bitumen emulsion there will also be fugitive emission of organic volatile components depending on the composition of the bitumen emulsion. This emission will be minor and short-term given that the bitumen emulsion is a regenerative agent applied on the old asphalt layer on top of which the new asphalt layer is installed; thus the emission of such components will be minimal.

Expected impacts from air emissions in this phase will be local and are expected to be minimized by implementing the following protection measures:

- Use of standardized fuels for the machinery and turning off the engines when not in use, for the purpose of reducing exhaust gas emissions;
- Route planning and the loading and unloading factor are of great importance for reducing fuel consumption, as well as exhaust gas emissions and fugitive dust emissions;
- Avoiding operation of the machinery when "idling";
- Determining the operating hours for the machines;
- Residents/sensitive receptors will be informed of Contractor's construction activities and work hours;
- Implementing a Traffic Management Plan.

7.2 Water Pollution Prevention Measures

Construction phase

The road rehabilitation process will result in generation of wastewater from personal hygiene practices by employees at the site, as well as storm wastewater. The amount of wastewater generated is expected to be minimal; thus it will not cause environmental contamination requiring further analysis.

Drainage is a fundamental protection measure for collection and draining of stormwater from the road surface. Drainage on the road section will be performed using the existing flat and arched culverts along the section.



During exploitation, culverts must be cleaned regularly. Culverts must not be clogged with mud or branches, and water must be able to flow freely. In case of clogging for any reason whatsoever, the culvert must be cleaned (flushed). This ensures free flow of water and collection from the stream, which also leads, to a large extent, to self-cleaning.

Operational phase

No adverse environmental impacts are expected during the operational phase; thus, the Environment Program does not define any measures.

7.3 Waste Management Improvement Measures

Waste management activities must prevent environmental emissions and harmful and other adverse effects on the health and well-being of people, animals, vegetation, habitats, and nature, by means of technical measures with a special goal of ensuring protection of agricultural land and water resources which are designated as goods of special national interest.¹⁰

Construction phase

Management of waste generated during construction activities must be in accordance with the Law on Waste Management, Chapter II - Waste management, where the obligations for waste management of the waste generator have been defined in accordance with **Article 26**:

1. With regard to the waste, its generator or owner shall:
 - a) select it;
 - b) classify it according to the List of Wastes;
 - c) determine the waste characteristics;
 - d) control the impacts of waste on the environment and human life and health;
 - e) store it in locations designated for that purpose
 - f) process the waste, and if waste processing is not technically feasible or cost-effective, hand over the waste to a legal or natural person authorized to collect, transport, process, dispose of, and/or export the waste.

2. If the waste has one or more hazardous properties, its generator and/or owner shall classify it as hazardous waste and treat it as such.

In order to improve waste management during the construction process, in accordance with the laws dealing with waste management, the following measures are recommended:

- Selection and classification of all types of waste in accordance with the Law on Waste Management (Official Gazette of RM no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12);
- Entering into an Agreement for municipal waste management and handing over the waste to a legal or natural person who has a Permit for collection and transport of municipal or any other non-hazardous waste in accordance with **Article 45** of the Law on Waste Management (Official Gazette of RM no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12);

¹⁰ National Waste Management Strategy of the Republic of Macedonia (2008 – 2020), page 49



- For further treatment of selected waste generated from construction activities (construction waste), the Contractor must proceed in accordance with **Article 54** of the Law on Waste Management (Official Gazette of RM no. 68/04; 71/04; 107/07; 102/08; 143/08; 124/09; 09/11, and 51/11);
- For further treatment of selected packaging waste (temporary storage of various packagings in a particular designated location), the Contractor must proceed in accordance with **Article 30(2)** of the Law on Packaging and Packaging Waste Management (Official Gazette of RM no. 161/09);
- Regular servicing of vehicles and machinery during the construction activities in order to avoid any leakage of motor oil and/or fuel. Vehicle service must be performed in places authorized for that purpose;
- Soil contaminated with waste oil and/or fuel (hazardous waste) must be removed in case of accidental spillage from the machinery, and treated as hazardous waste.

Operational phase

No adverse environmental impacts are expected during the operational phase; thus, there are no measures specified in the Environment Program.

7.4 Soil Protection Measures

Construction phase

The most serious pollution of the soil and, indirectly, of groundwater may occur in case of spillage of fuel, oil, and lubricants from the machinery, or chemicals used in construction.

In addition, spilled fuel, oil, lubricants, and some chemicals used in construction are highly volatile and flammable in high outdoor temperature, and can cause fire.

Because of the above impacts, the following measures are recommended:

- Inspecting the operability of the construction machinery and transport vehicles;
- Stopping all work in case of uncontrolled spillage of fuel, oil, lubricants, and chemicals;
- Installation of an adequate number of portable toilets along the route. The toilets will be emptied by an authorized company that will be required to transport the fecal matter to a treatment plant, which will provide sustainable wastewater management ensuring that wastewater is kept to a minimum and avoiding possible soil contamination.

For the purpose of preservation of the surrounding land areas affected by the spread of emulsions during the paving process, it is advisable to carefully store and handle the bitumen emulsion and the asphalt mass, and apply them only on specified surfaces.

Operational phase

For the purpose of reducing or avoiding possible impacts on soil during the operational phase, the following is recommended: regular monitoring of the flow of stormwater, adequate waste management, and maintenance of vegetation in the vicinity of the road.



7.5 Noise and Vibration Protection Measures

Construction phase

During performance of earthwork and construction work, the basic indicator limits for noise caused by construction machinery and motor vehicles will be exceeded.

The noise occurring during the construction phase as a result of the operation of machinery and transport activities will have an adverse, albeit short-term, impact on sensitive hearing receptors and living organisms in the vicinity of the road section.

All of the machinery engaged in the activities, and all transport vehicles must be in good operable condition, which is a prerequisite for reduced noise pollution.

In addition, as a basic measure for reducing adverse impacts caused by increased noise levels, it is advisable to turn-off the engines in vehicles and construction machinery when they are not needed.

It is recommended that construction activities are only performed during the day, according to a specified time schedule.

It is also advisable to inform the locals of the time and location of performance of construction work.

Operational phase

The noise levels on the road are expected to be reduced after its rehabilitation, as a result of using modern materials and improving the driving and dynamic conditions; thus, no noise and vibration protection measures have been specified in the Environmental Protection Program.

7.6 Measures to Reduce Impacts on Biodiversity

Construction phase

A recommended measure for reducing impacts caused by the use of construction machinery (vibration, noise, and increased amount of exhaust gasses) is the use of operable construction machinery with adequate technical characteristics, and use of adequate propellants.

Operational phase

Impacts in this phase will generally not differ from existing impacts, since the road is an existing road that has served vast amounts of traffic in the past.

Measures to reduce impacts on Historic-Cultural Monuments

In case of discovery, during construction, of an archaeological site, or items of archaeological significance, the contractor must act in accordance with Article 65 of the Law on Protection of Cultural Heritage (Official Gazette of RM No.: 20/04, 115/07, and 18/11), and is required to report such discovery within the meaning of Article 129(2) of the Law on Protection of Cultural Heritage (Official Gazette of RM No.: 20/04, 115/07, and 18/11), to stop any work, to secure the site against possible damage or destruction and against authorized access, and to keep the findings in the location and in the state in which they were found.

Pursuant to the Law on Spatial and Urban Planning (Official Gazette of RM No. 70/13 – consolidated text, and 55/13 – amendment and supplement), the following must be specified in the



spatial and urban plans based on the documentation of immovable cultural heritage: planning measures for protection of cultural monuments, and guidelines for determining the scope of their protection.

The incorporation of an appropriate regime of protection of immovable cultural heritage in a spatial and urban plan is made in accordance with the protection and conservation bases for cultural heritage (Pursuant to Art. 71 of the Law on Protection of Cultural Heritage).

Immovable cultural heritage, whether it is an architectural unit or an individual structure, should, as a common cultural wealth of the world, be treated in the spatial and urban plans in a way that will ensure its successful integration in the spatial and organizational fabric of cities, populated areas or wider areas, and an emphasis on its structural and aesthetic values.

Risk Management (major failure, accident, or emergency events)

Major failure is an unplanned or unusual event caused by negligence or Force Majeure, in circumstances where there is partial or complete loss of control over the production or handling process, which is limited in space and time, and can have harmful effects on human health and the environment.

In order to prevent possible occurrence of major failures along the route during the process of rehabilitation of the road section:

- Construction workers working at the designated site for rehabilitation of the road section must be provided with adequate personal protective equipment appropriate to the weather conditions (work suit, helmet, gloves, etc.);
- An Occupational Safety and Health Plan must be prepared for workers working on temporary mobile construction sites in accordance with the Regulation on minimal occupational safety and health requirements for working on temporary and mobile construction sites (Official Gazette of RM no. 105/08);
- Installation of fire extinguishers in vehicles and machinery to be used in the rehabilitation process;
- Marking and securing the site in accordance with the legal regulations concerning occupational safety and health;
- Installation of vehicle speed limit signs etc. in accordance with the applicable regulations and standards and the Regulation of road traffic signs, equipment and markings (Official Gazette of RM no.56/08, 47/10);

The implementation of the planned measures is necessary in order to avoid possible occurrence of major accidents, in particular major fires that would have an adverse impact both on the working and on the natural environment due to: emissions of harmful pollutants in the air, material damage, and human casualties.



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MITIGATION MEASURES OF THE IMPACTS TO THE ENVIRONMENT

Table 20: Tabulated list of the mitigation measures

Number	Design activity	Description of the measures	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
NR MANAGEMENT						
1	C	Usage of standardized tool for the rehabilitation and sealing of the macadamization (about 10. m ² in range)	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality ("Official Gazette of RM" no. 57/04, 99/05, 47/11, 59/12, 100/12, 4/13, 103/13, and all its amendments)
2	C	Trucks speed limits within the so called temporary mobile construction site	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer and the competent authorities in the county (Representatives of the Md) have the obligation for monitoring of the measure implementation	Law on ambient air quality ("Official Gazette of RM" no. 57/04, 99/05, 43/11, 59/12, 100/12, 4/13, 103/13, and all its amendments)



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of its impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
3	C	The delivery of construction materials is to be done during the precisely established time intervals and with precisely established plan and regime	Decreasing the external sources in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality (Official Gazette of RM - no 62/08, 92/07, 43/11, 58/12, 100/12, 4/13, 103/13, and all its amendments)
WATER MANAGEMENT						
1	D	Locations for storage of fuel, oil, or other liquid materials, shall be removed from the catch to the surface waters.	Avoided contamination of surface and underground water	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waters (Official Gazette of RM - no 37/08, 8/08, 10/08, 30/10, 13/11, 44/12, 23/13, 103/12, 52/16)
WASTE MANAGEMENT						
1	C	Appropriate management with the generated commercial waste at the location and its disposal with appropriate containers that afterwards shall be submitted to the legal/physical entity that possess permission for commercial waste management.	Proper approach towards the manner of waste management, realization of one of the key principles for feasible management of commercial waste "Owner's Responsibility"	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM - no 60/04, 7/10/4, 15/07, 100/08, 10/08, 09/11, 123/12, 142/14, 92/14, 140/14, 03/16); and Rulebook of the general rules of commercial and other types of non hazardous waste treatment (Official Gazette of



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Number	Design activity	Description of the measures	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
						RMF no. 147/2007, Article 8, Article 10, Article 11
3	C	Spreading of soil at the location of previously spilled motor oil and disposal of the polluted soil by the topographical survey that passes permission for hazardous waste management	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation.	Law on waste management (Official Gazette of RMF no. 68/04, 7/04, 10/07, 10/08, 13/08, 09/11, 13/12, 14/12, 02/13, 15/15, 03/16, and all its amendments)
3	C	Regular vehicles and mechanization servicing during the construction works execution. The Service is to be executed at the indicated location of the project.	Avoidance of excessive spillage of motor oil and/or gasoline	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation	Law on waste management (Official Gazette of RMF no. 68/04, 7/04, 10/07, 10/08, 13/08, 09/11, 13/12, 14/12, 02/13, 15/15, 03/16, and all its amendments)
4	C	If the Contractor has adequate equipment, it is recommended of the filtration, recycling and reuse of the removed existing asphalt layers. If there is no such possibility, the removed asphalt is to be recycled	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation.	Law on waste management (Official Gazette of RMF no. 68/04, 7/04, 10/07, 10/08, 13/08, 09/11, 13/12, 14/12, 02/13, 15/15, 03/16, and all its amendments)



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
		local roads and paths where necessary in cooperation with the Municipality Pochani				
SOIL MANAGEMENT						
1	C	Cover of the working activities during the uncontrolled spillage of fuel, oil, lubricants and chemicals, spreading of sand and disposal of polluted layer of soil, and it is to avoid the polluted material as hazardous waste.	Decreasing the possibility of soil degradation and the soil biodegradability	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 66/04, 7/04, 10/07, 10/08, 13/08, 09/11, 12/12, 14/12, 16/12, 19/12, 02/10, and all its amendments)
2	P C	Placement of mobile toilets along the alignment and conducting a Contract with authorized company that will undertake the fill and carry to the waste treatment plant.	Avoided soil and underground water contamination with coliform bacteria	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 66/04, 7/04, 10/07, 10/08, 13/08, 09/11, 12/12, 14/12, 16/12, 19/12, 02/10, and all its amendments)
NOISE MANAGEMENT						
1	C	Unplugging the vehicles and structural mechanism noises when there is no need of their	Decreasing the noise and their impact to the environment	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the	Law on protection of noise of the environment ("Official Gazette of RM" no. 7/07,



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal regulation
		work performance of the construction activities – daily and with defined time dynamics Informing the population of the construction activities			obligation for monitoring of the measure implementation	154/10, 43/11, 153/13, and all its amendments and Rulebook of noise level limit values at the environment (Official Gazette of RM no. 143/08)
BIODIVERSITY MANAGEMENT						
1	P	Clearance of shrubs and vegetation, preparation of the alignment for the activities of rehabilitation	With purpose of preservation of the vegetation biodiversity (loss)	Before starting the realization of the construction activities	Contractor has the responsibility for the measure implementation	Law on protection of nature (Official Gazette of RM no. 63/04, 14/06, 84/07, 33/10, 43/11, 143/11, 55/12, 13/13, 153/13, 52/16, and all its amendments)
2	C	Usage of properly and regularly serviced construction mechanization	With purpose of decreasing the impacts of vibrations, noise and increased quantities of emission of exhaust gases	Construction phase	Contractor has the responsibility for the measure implementation	Law on environment (Official Gazette of RM no. 53/05, 81/05, 24/07, 123/08, 83/09, 46/10, 126/10, 54/11, 123/10, 52/13, 183/13, 42/14, 44/15) Law on protection of nature (Official Gazette of RM no. 63/04, 14/06, 84/07, 33/10,



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
						40/11, 40/111, 50/10, 13/10, 18/10, 52/10, and of its amendments
RSC MANAGEMENT						
1	P	Occupational safety and health plan at temporary and mobile construction sites	Decreasing the possibility of accidents	Before starting the process of rehabilitation of the subject section	Contractor has the responsibility to prepare and implement the Occupational safety and health plan Supervising Engineer has the responsibility to approve and to monitor implementation of the Occupational safety and health plan	Requirements of national requirements for occupational safety and health at temporary and mobile construction sites (Official Gazette of RMP no. 186/08)
3	C	Placement of traffic signs for traffic speed limits and similar	Decreasing the possibility of accidents	During the rehabilitation of the subject section	Contractor has its responsibility for the measure implementation Supervising Engineer and the competent authorities in the country (Representatives of the MA) have the obligation to monitoring of the measure implementation	Requirements on traffic signs (Official Gazette of RMP re. 58/08)

Legend



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P – Preliminary phase
C – Construction phase
O – Operation/phase



8. ENVIRONMENTAL AND SOCIAL ASPECTS MANAGEMENT PLAN

Table 27 Environmental and Social Aspects Management Plan

Number	Description of the emission	Purpose of the measure proposed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
PRELIMINARY PHASE					
SOIL MANAGEMENT					
1	Placement of mobile toilets along the alignment and concluding a Contract with authorized company that will undertake the lift and carry to the waste treatment plant	Avoided soil and underground water contamination with coliforms bacteria	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 88/04, 7/04, 10/07, 10/08, 10/08, 09/11, 12/02, 14/11, 03/11, 09/10, 03/09, and all its amendments)
BIODIVERSITY MANAGEMENT					
1	Demarcation of shrubs and vegetation, preparation of the alignment for the activities of rehabilitation	With purpose of preservation of the vegetative biodiversity (flora)	Before starting the realization of the construction activities	Contractor has the responsibility for the measure implementation	Law on protection of nature (Official Gazette of SR no. 07/04, 14/05, 04/07, 32/10, 4/11, 14/11, 09/12, 12/11, 18/10, 03/10, and all its amendments)
RISK MANAGEMENT					
1	Occupational safety and health plan at temporary and mobile construction sites	Decreasing the possibility of accidents	Before starting the process of establishment of the subject matter	Contractor has the responsibility to prepare and implement the Occupational safety and health plan	Subsection of minimal requirements for occupational safety and health at temporary and mobile construction sites



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Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
				Supervising Engineer has the responsibility to approve and to monitor implementation of the Construction safety and health plan	(Official Gazette of RM no. 106/04)
CONSTRUCTION PHASE					
MR MANAGEMENT					
1	Usage of standardized belt for the rehabilitation and sealing of the road surface (when it is not in usage)	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality (Official Gazette of SRM - no. 41/94, 32/97, 42/11, 09/12, 18/10, 4/13, 16/10, and all its amendments)
2	Traffic speed limits within the so called temporary traffic construction site	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authority in the country (Representation of the MR) have the obligation for monitoring of the measure implementation	Law on ambient air quality (Official Gazette of RM - no. 42/94, 32/97, 42/11, 09/12, 18/10, 4/13, 16/10, and all its amendments)



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Number	Description of the measure	Purpose of the measure proposed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
3	The delivery of construction materials is to be done during the previously established time intervals and with previously established plan and regime.	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality (Official Gazette of RM - no. 0704, 0907, 4711, 5912, 10612, 4112, 10210, and all its amendments)
WATER MANAGEMENT					
1	Locations for storage of fuel, oil, or other liquid chemicals, shall be removed from the vicinity to the surface waters.	Avoided contamination of surface and underground water	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waters (Official Gazette of RM - no. 0705, 0909, 10109, 0249, 0411, 4410, 2013, 00015, 0215)
WASTE MANAGEMENT					
1	Appropriate management with the generated commercial waste of the location and its disposal with appropriate containers that afterwards shall be submitted to the legally-physical entity that covers jurisdiction for commercial waste management.	Proper approach towards the issues of waste management, realization of one of the key principles for waste management of commercial waste "Owner's Responsibility"	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM - no. 0004, 7104, 10707, 10205, 15408, 0011, 00113, 14710, 10713, 10510, 0210) and Handbook of the general rules of commercial and other types of non-hazardous waste treatment (Official Gazette of RM - no. 141001), Article 6, Part 10.



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Number	Description of the measure	Purpose of the measure approved through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
					Article 11
2.	Spreading of soil at the location of unaccountably spilled motor oil and disposal of the polluted soil by the legal/physical entity that possess permission for hazardous waste management	Proper approach towards the source of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 66/04, 71/04, 103/05, 103/06, 134/08, 08/11, 123/12, 147/13, 183/13, 156/15, 63/16, and all its amendments)
3.	Regular vehicles and mechanization working during the construction works execution. The Service is to be executed at the authorized location of that purpose	Avoidance of unaccountably spillage of motor oil and/or gasoline	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation	Law on waste management (Official Gazette of RM no. 66/04, 71/04, 103/05, 103/06, 134/08, 08/11, 123/12, 147/13, 183/13, 156/15, 63/16, and all its amendments)
4.	If the Contractor has adequate equipment, it is recommended of this. Elsewise, recycling and reuse of the removed existing asphalt layers. If there is no such possibility, the removed asphalt is to be used for local roads and paths where necessary in cooperation with the Municipality Kodžani.	Proper approach towards the source of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 66/04, 71/04, 103/05, 103/06, 134/08, 08/11, 123/12, 147/13, 183/13, 156/15, 63/16, and all its amendments)



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupshite - Pyshtip**

Number	Description of the measure	Purpose of the measure proposed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligations
SOIL MANAGEMENT					
1	Cease of the working activities during the uncontrolled spillage of fuel, oil, lubricants and chemicals, spreading of sand and stopped of polluted layer of soil, and to treat the polluted material as hazardous waste	Decreasing the possibility of soil degradation and the soil leachings	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 66/04, 7/04, 10/03, 10/08, 10/08, 08/11, 12/12, 10/13, 10/13, 15/15, 03/16, and all its amendments)
2	Placement of mobile tanks along the alignment and concluding a Contract with authorized company that will undertake the cultural sowing to the waste treatment plant	Avoided soil and underground water contamination with hydrocarbon substances	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 66/04, 7/04, 10/03, 10/08, 10/08, 08/11, 12/12, 10/13, 10/13, 15/15, 03/16, and all its amendments)
NOISE MANAGEMENT					
1	Unhugging the vehicles and structural mechanization means when there is no need of their work performance of the construction activities – daily and with defined time intervals Informing the population of the construction activities	Decreasing the noise and dust impact to the environment	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on protection of noise at the environment (Official Gazette of RM no. 18/07, 10/10, 07/11, 10/13, and all its amendments) and Regulation of noise level limit values at the environment (Official Gazette of RM no.



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip**

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
					147000
INCIDENTS MANAGEMENT					
1	Usage of properly and regularly controlled construction mechanization	With purpose of decreasing the impacts of vibrations, noise and increased quantities of emission of exhaust gases	Construction phase	Contractor has the responsibility for the measure implementation	Law on environment (Official Gazette of RM no. 53/05, 61/05, 24/07, 10/08, 03/09, 48/10, 04/10, 5/11, 12/12, 6/13, 18/13, 42/14, 6/15) Law on protection of nature (Official Gazette of RM no. 67/04, 14/06, 8/07, 20/10, 4/11, 14/11, 5/12, 12/13, 18/14, 6/15, and all its amendments)
RISK MANAGEMENT					
1	Placement of traffic signs for traffic speed limits and similar	Decreasing the possibility of accidents	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authorities in the county (Representatives of the MEd) have the obligation for monitoring of the measure implementation	Rulebook on traffic signs (Official Gazette of RM no. 5/08)



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupahle - Problehp**

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Legal obligation
OPERATIONAL PHASE					
SOC. MANAGEMENT					
1	Regular following of the rain water flow, adequate waste management and maintenance of the by-road vegetation	Decreasing or avoiding of possible soil impacts	During the operational phase of the subject section	Investor has the responsibility for the measure implementation	Law on environment (Official Gazette of RM no. 52/05, 01/06, 24/07, 15/08, 03/09, 48/10, 124/10, 31/11, 123/12, 89/13, 183/13, 42/14, 44/14) Law on protection of nature (Official Gazette of RM no. 07/04, 14/06, 04/07, 32/10, 47/11, 188/11, 58/12, 12/13, 30/13, 83/15, and all its amendments)



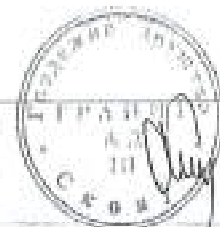
9. List of lawful regulations and measures for environmental protection

- Law on environment ("Official Gazette of the RM" no. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 93/13, 187/13, 42/14 and 44/15);
- Rule for modification of the Rule for the functions and the activities of which preparation of elaborate is obligatory, and the authority for professional issues of the environmental field is competent for approval ("Official Gazette of the RM" no. 36/12);
- Rulebook for the form and content of the elaborate for environmental protection in accordance with the types of business activities and the activities for which the elaborate is preparing, as well as according to the instigator of the activities and the scope of the business activities and the activities that are instigated by the physical and legal entities, the procedure of its approval, as well as the manner of keeping the register of approved elaborates ("Official Gazette of the RM" no. 44/13);
- Law on waters ("Official Gazette of the RM" no. 87/08, 6/09, 161/09, 83/10, 51/11, 44/12, 23/13, 163/13, 52/16);
- Rule for classification of the waters ("Official Gazette of the RM" no. 18/99);
- Law on potable water supply and sewerage of urban waste waters ("Official Gazette of the RM" no. 68/04; 28/06; 17/11);
- Law on waste management ("Official Gazette of the RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12, 147/13, 163/13, 156/15 and 63/16);
- Law on packaging and waste of packaging ("Official Gazette of the RM" no. 161/09, 17/11, 47/11, 136/11, 6/12, 39/12, 163/13);
- Rulebook for the general rules for communal and other types of non-hazardous waste treatment ("Official Gazette of the RM" no. 147/07);
- Rulebook for the procedures and the manner of collection, transporting, processing, storage, treatment and disposal of waste oils, manner of keeping record and submission of data ("Official Gazette of the RM" no. 156/07);
- Rulebook for the form and the content of the daily log for waste treatment, form and content of the exemplar for identification and transportation of waste and the content of the formats for annual reports for waste treatment ("Official Gazette of the RM" no. 07/06);
- Law on ambient air quality ("Official Gazette of the RM" no. 67/04; 92/07; 47/11, 59/12, 100/12, 4/13 and 163/13);
- Rule for limit values of the level and types of polluting substances in the ambient air and the alarming thresholds, deadlines of reaching the limit values, margins of limit value tolerance, target values and long term targets ("Official Gazette of the RM" no. 50/05 and 4/13);
- Rulebook for the maximal permitted concentrations and quantities of harmful substances that can be emitted in the air at the separate sources of pollution ("Official Gazette of the SRM" no. 03/90);
- Law on environmental protection of noise ("Official Gazette of the RM" no. 79/07, 124/10,



47/11, and 163/13);

- Rulebook for the limit values of the noise level at the environment ("Official Gazette of the RM" no. 147/08);
- Law on protection and well-being of the animals ("Official Gazette of the RM" no. 113/07 и 149/14);
- Law on protection of the plants ("Official Gazette of the RM" no. 25/98, 6/00);
- Law on protection of the nature ("Official Gazette of the RM" no. 67/04, 14/06, 84/07, 35/10, 47/11, 148/11, 59/12, 13/13, 163/13 and 63/16);
- Law on construction ("Official Gazette of the RM" no. 70/13, 79/13, 137/13, 163/13, 27/14, 28/14, 42/14, 115/14, 149/14, 187/14, 144/15, 120/15(1), 120/15(2), 217/15, 30/16, 31/16 and 39/16);
- Law on occupational safety and health ("Official Gazette of the RM" no. 92/07, 136/11, 23/13, 25/13 and 53/13) and all the rulebooks originated of the law;
- Law on protection and rescue ("Official Gazette of the RM" no. 93/12);
- Law on fire protection (Law on firefighting) ("Official Gazette of the RM" no. 67/04 и 81/07);
- Rulebook for the liquid fuels quality ("Official Gazette of the RM" no. 88/07, 81/09);
- Law on public roads ("Official Gazette of the RM" no. 84/08; 52/09; 114/09; 124/10, 23/11, 53/11, 168/12, 163/13, 187/13, 39/14, 42/14, 166/14 and 44/15);
- Rulebook for the technical elements for construction and reconstruction of public roads and the structures at the road ("Official Gazette of the RM" no. 110/09, 163/08, 26/10, 163/10, 94/11 and 146/11);
- Law on the roads traffic safety ("Official Gazette of the RM" no. 54/07; 86/08; 98/08; 64/09 and 169/15).



10. Conclusion

Generally, from the rehabilitation of the state road R1205, section Krupishte - Probishtip, as well as from its operation, significant negative impacts to the quality of the environment are not expected, considering that the same are of temporary character. The expected impacts to the quality of the environment are during the Construction phase – repair and rehabilitation, as well as during the Operational phase – traffic flow along the alignment and the alignment maintenance in functional condition.

There are possible insignificant impacts, which are resulted by the manner of management with the: air, water, soil, waste, noise, biodiversity.

With that purpose, Program for environmental protection has been herein prepared, wherein proposed activities for surpassing the possible deficiencies, as well as time schedule for their implementation.

The Contractor shall implement all measures of precaution as it has been listed within this Report and the Program for environmental protection; consistently shall apply those in practice, which shall eliminate possible disorder of the quality of the environment.

During the construction activities, the Contractor shall proceed in accordance with the Design for organization of the construction / rehabilitation works, above all taking into consideration the safety of the citizens, the goods and the environment.

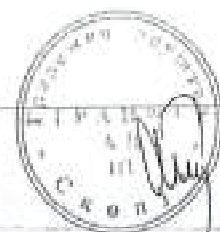
At the same time, it should be noted that during this project realization, it is necessary to keep to the contracted technical conditions regarding the construction, as well as the sequence execution of the works, according to the contract conditions and obligations, as well as according to the lawful articles and regulations for construction of this type of works.

The Client, I.E. the Public Enterprise for state roads of the Republic of Macedonia, has prescribed technical conditions for construction of this type of works, which are integral part of the contract obligations for the Contractor. It is necessary that the Contractor adhere with all prescribed contract conditions with following all the procedures. During the construction, the materials that are to be incorporated in accordance with the technical conditions, shall be supported with attestations and certificates for prove the materials quality, in accordance with the law of the Republic of Macedonia.

It should be noted, that with the rehabilitation of this section, the road infrastructure at this region shall be improved, and the traffic safety shall be increased.

10.1 List of used literature

- Ministry of Environment and Physical Planning (<http://www.moepp.gov.mk/>);
- Spatial Plan of the Republic of Macedonia, 2002;
- Web site of the State Statistical Office (http://www.stat.gov.mk/PrikaziPublikacija_1.aspx?rbx=627);
- Web site for information exchange that refer to the environmental networks (http://biodiverzitet-chim.mk/?page_id=1396);



*Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte – Probishtip*

- Design documentation for Construction of express road A3, section Shtip – Kochani, with technical number of the design 800 – 07 – 15 dated July 2015, prepared by the Gradezen Institut "Makedonija" AD Skopje;
- National Plan for Protection of the Ambient air of the Republic of Macedonia for period from 2013 until 2018, December, 2012;
- Web site of the World Bank (<https://policies.worldbank.org/sites/ppf3/Pages/Manuals/Operational%20Manual.aspx>);
- Web site of the municipality Probishtip (<http://probishtip.gov.mk/>);
- Web site of the municipality Karbinci (<http://opstinakarbinci.gov.mk/>);
- Web site of the Public Communal Enterprise "Nikola Karev" (<http://kpnikolakarev.com.mk/>);
- Web site of the Public Enterprise "Plackovica" (<http://opstinakarbinci.gov.mk/>);
- Web site of the Fund for health insurance of the Republic of Macedonia (<http://www.fzo.org.mk/default.asp?ItemID=6963489D7433AA4BA000BC9E200B9829>);



B. Graphycal part (Attachments)



Attachment 1

**Opinion number 11 – 2251/2 dated
27.06.2017, issued by the Department
of Environment at the MOEPP**



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip**



Република Македонија
Министерство за животна средина
и природни ресурси

РЕПУБЛИКА МАКЕДОНИЈА
ЈАВНО ПРЕТПРИЈАТИЕ ЗА ДРЖАВЕН ПАТНИЦА
СКОПЈЕ

Архивски број: П- 2251/2

Дата: _____

Првено	11111111		
Име	4386/2	Скопје	Македонија

ДО: Јавно претпријатие за државен патница
Ул. Даме Груев бр.1А
1000 Скопје

ПРЕДМЕТ: Доставување на мислење

ВРСКА: Ваш број 08-4386/2 од 27.04.2017 година.

Почитувани,

Во прилог на овај допис Ви доставуваме Мислење со број П- 2251/2, по Ваше известување за намера за изведување на проектот Реконструкција и санација на државен пил R1205, делница Круписhte-Probishtip, за потребите на јавно претпријатие за државни патници на Скопје.

Со почит,



Министер Соледа Дуфачки
Директор на Управата за животна средина
и природни ресурси
Тел: 02/3211400



Република Македонија
Министерство за
животна средина
и природни
ресурси

Ул. Тимотирев бр.11,
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Република Македонија
Тел: 02/3211400
Факс: 02/320165
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info@mjpr.gov.mk
http://mjpr.gov.mk



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip**



Република Македонија
Министерство за животна средина
и просторно планирање

Државен број: П - 2251/2

Дата: 17.08.2017

Почитувани,

Во прска со Вашето известување за намера со број П-2251/1 од 27.04.2017 година, кое се однесува за изведување на проектот: Рекултивација и санација на државен пат R1205, делница Круписhte-Пробисhtiп, за потребите на Јавно претпријатие за државни патници од Скопје, Управата за животна средина при Министерството за животна средина и просторно планирање со издава следното

МИСЛЕЊЕ

За изведување на проектот: Рекултивација и санација на државен пат R1205, делница Круписhte-Пробисhtiп, за потребите на Јавно претпријатие за државни патници од Скопје, инвеститорот е должен да изготви Елаборат за заштита на животната средина,

Образложение

- Од Ваша страна беше доставено известување за намера за рекултивација и санација на државен пат R1205, делница Круписhte-Пробисhtiп, за потребите на Јавно претпријатие за државни патници од Скопје.
- Државниот пат R1205, делница Круписhte-Пробисhtiп, е дел од државната патна мрежа во Р. Македонија. Вкупната должина на трасата е околу 19 km.
- Согласно Законот за животната средина ("Сл. весник на Република Македонија" бр. 53/2005, 81/2005, 24/2007, 159/2008, 83/2009, 48/2010, 124/2010, 51/2011, 123/2012, 93/2013, 42/2014, 44/2015, 129/2015 и 39/2016) и Уредбата за определување на проектите и за критериумите при основа на кои се утврдува потребата за спроведување на постапката за оцена на влијанието врз животната средина ("Службен весник на Република Македонија" бр. 26/12, 109/2009, 164/2012 и 203/2016) овој проект спаѓа во Проект П - Проекти за кои се утврдува потреба за спроведување постапка за оцена на влијанието врз животната средина (генерално определени проекти) точка 10. Инфраструктурни проекти,



Република Македонија
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Е-пошта:
info@mkd.gov.mk
Сайт: www.mkd.gov.mk





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Сайт: www.mkd.gov.mk

Според тоа инвеститорот се задолжува да изготви Елаборат за
заштита на животната средина, со што ќе се предадат сите решенија
за заштита на животната средина при процесот на изградба и работа.
Истиот треба да биде доставен до Управата за животна средина на
вечна основа и издавање на согласност на истиот.

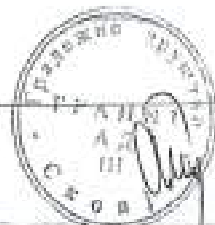
Елаборатот за заштита на животната средина потребен е да се
изготви согласно Правилникот за формата и содржината на
Елаборатот за заштита на животната средина согласно со видовите
на дејностите или активностите за кои се изработува елаборат, како
и согласно со вршателите на дејноста и обемот на дејностите и
активностите дој ги вршат правните и физичките лица, поставените
за тивно одобрување како и начинот на водење на регистарот за
одобрени Елаборати (Службен весник на Република Македонија бр.
44/2013 и III/2014).

Ова основа на горенаведеното ги издаваме мислењето како по
доследниот и укажуваме на обврската на инвеститорот за
исполнување на Елаборат за заштита на животната средина.

Со почит,

Министар: Савко Нанев
Контролор: Александар Петровски
Советник: Татјана Петровска

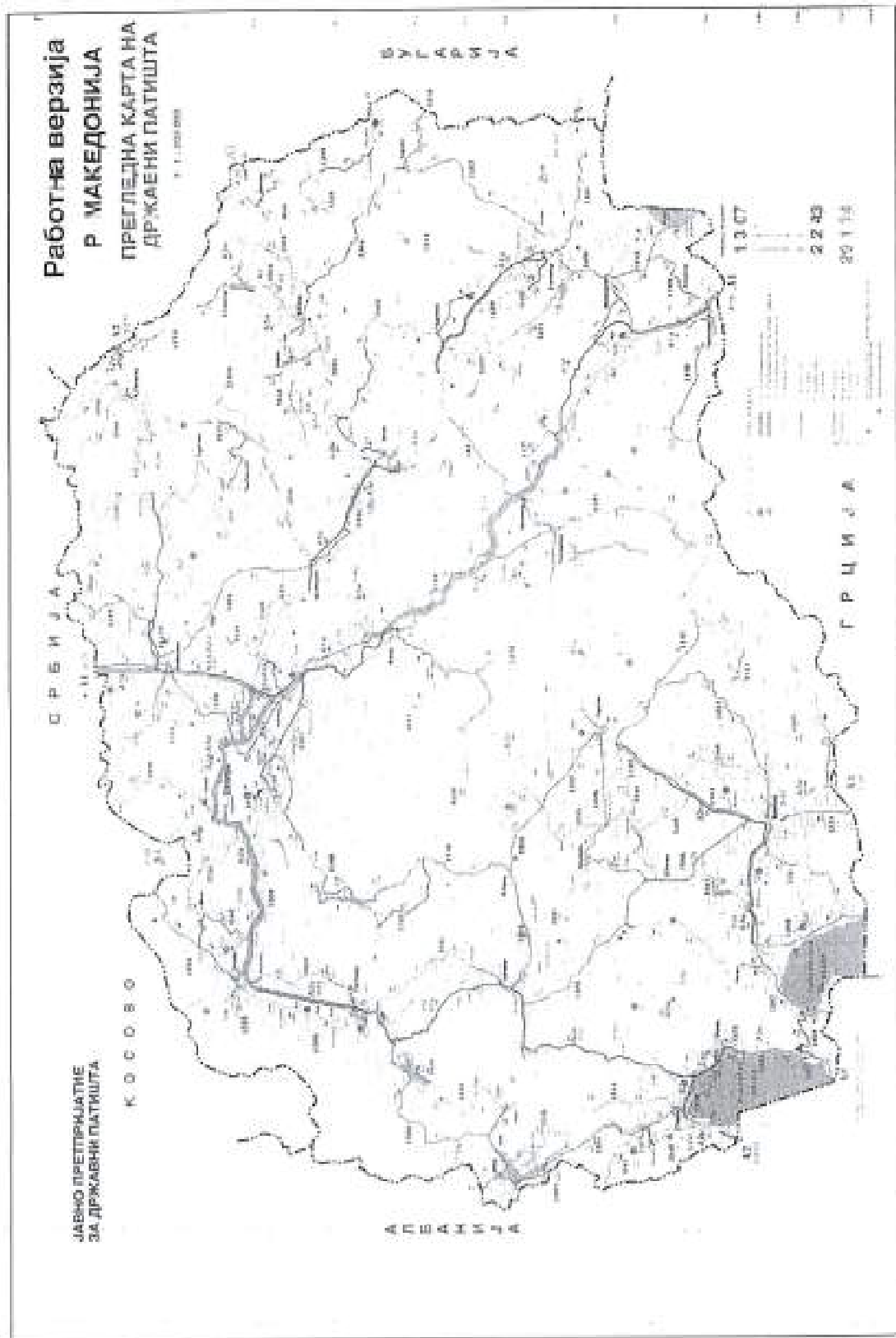
и.д. Директор на
Управа за животна средина
Тони Марчиновски



Attachment 1.1

Orientation – communication map





Attachment 1.2 Overview map of the region

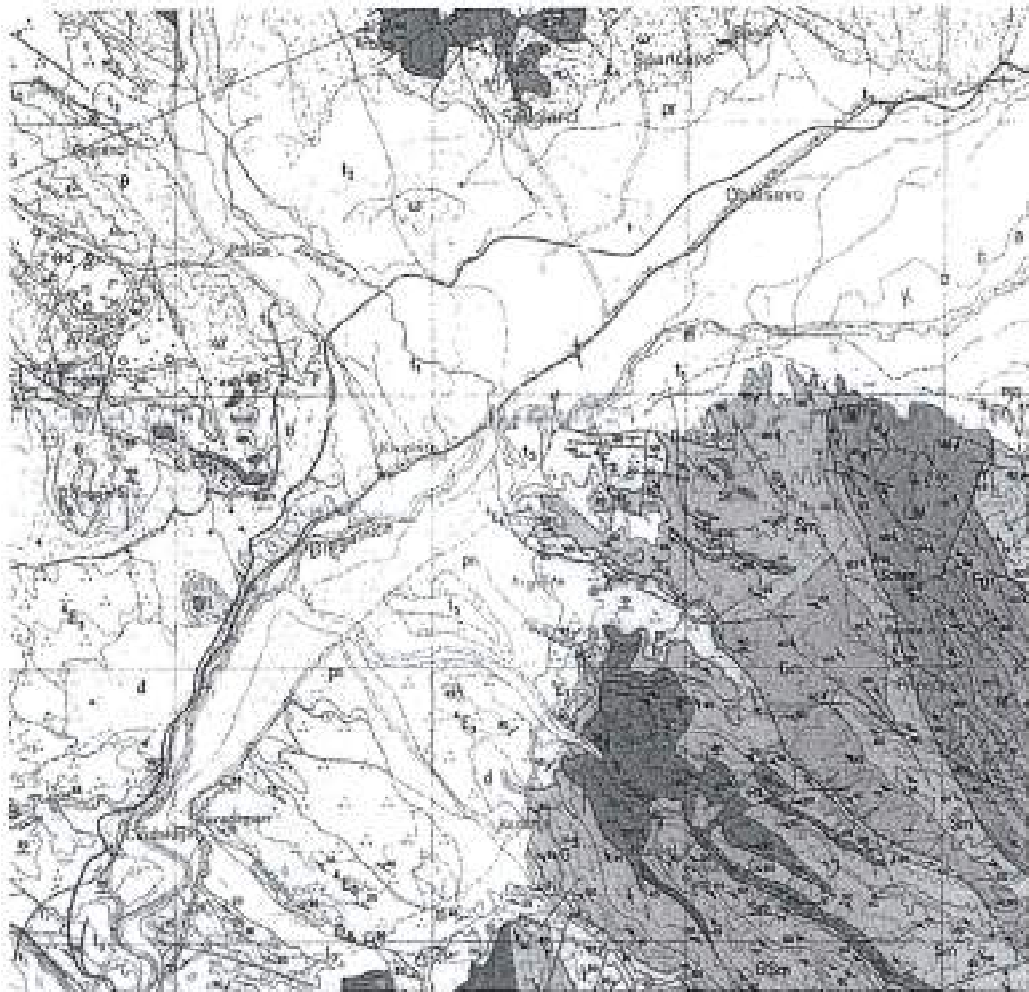


*Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip*



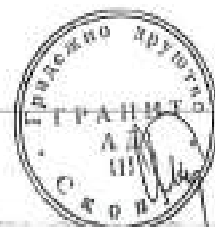
Attachment 1.3 Geological map of the wider area





легенда :

al алувиум	водна траса
d долуинум	изворски седименти
pr пролувиум	кајанити и базалти
t₁ пониска речна тераса	андезитски бречи
t₂ повисока речна тераса	θ андезитски туф
t₃ постара речна тераса	4E₃ горна зона на флиш: песочници и глинци
	2E₃ долна зона на флиш: конгломерати, песочници и глинци



Attachment 1.4

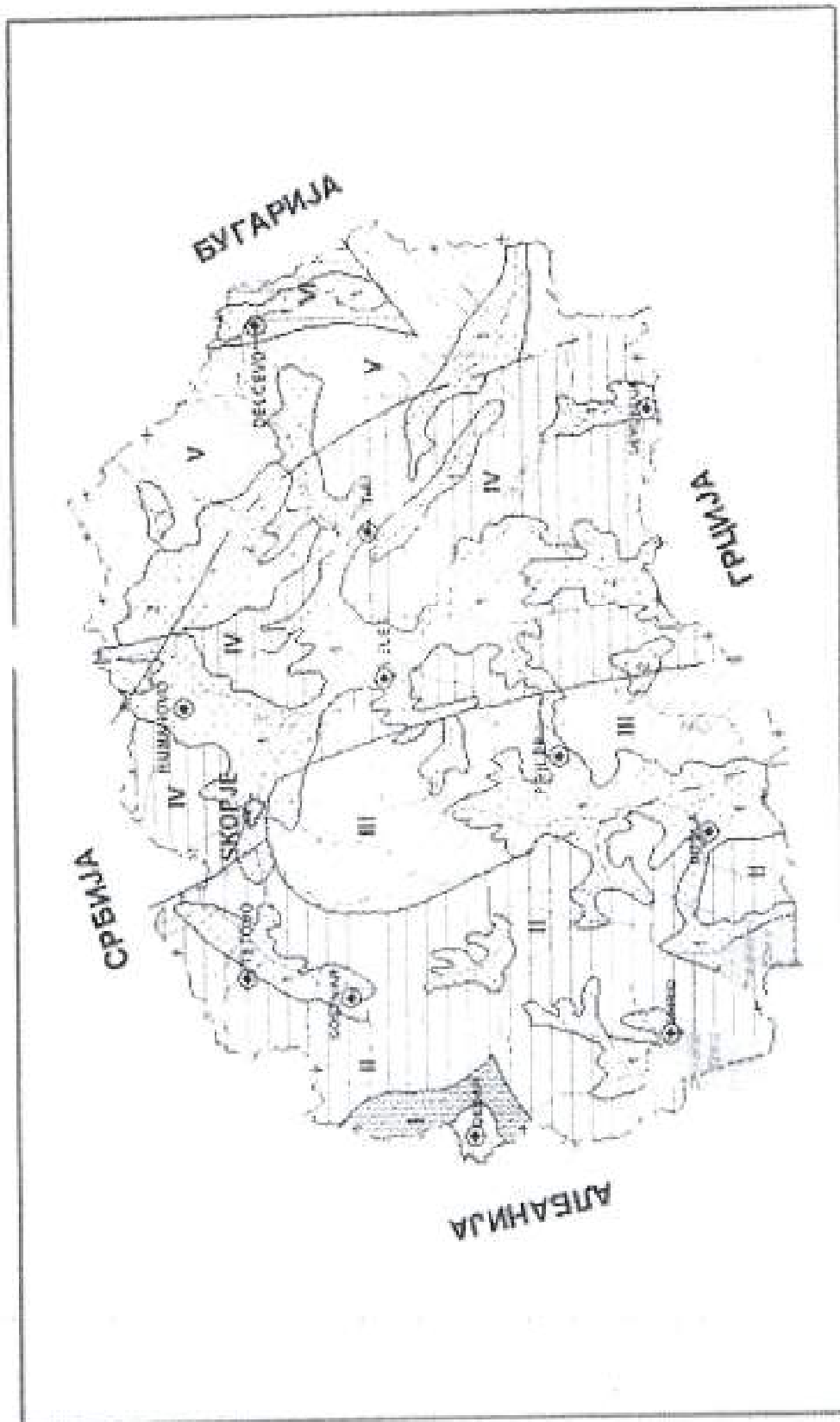
Hydrological map of the wider area





Attachment 1.5 Seismological map of the wider area





**Attachment 1.6
Territory of the Municipality
Probishtip and Municipality Karbinici
with village Krupishte**



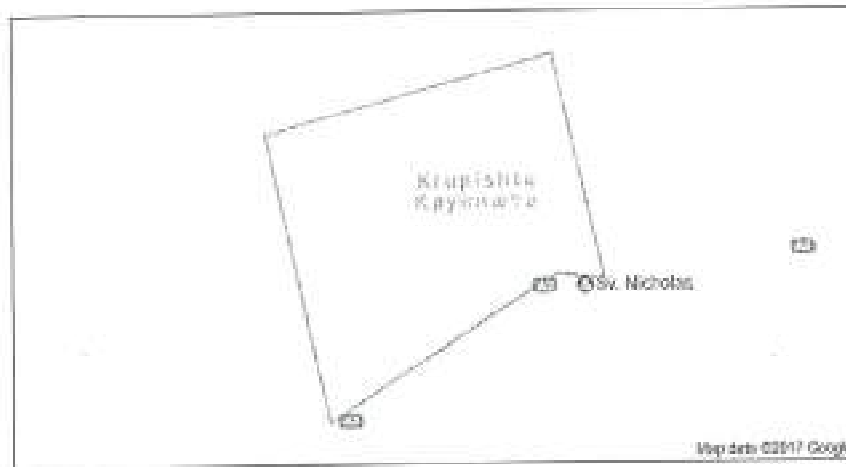
Municipality Probishtip



Municipality Karbinci



Village Krupishte

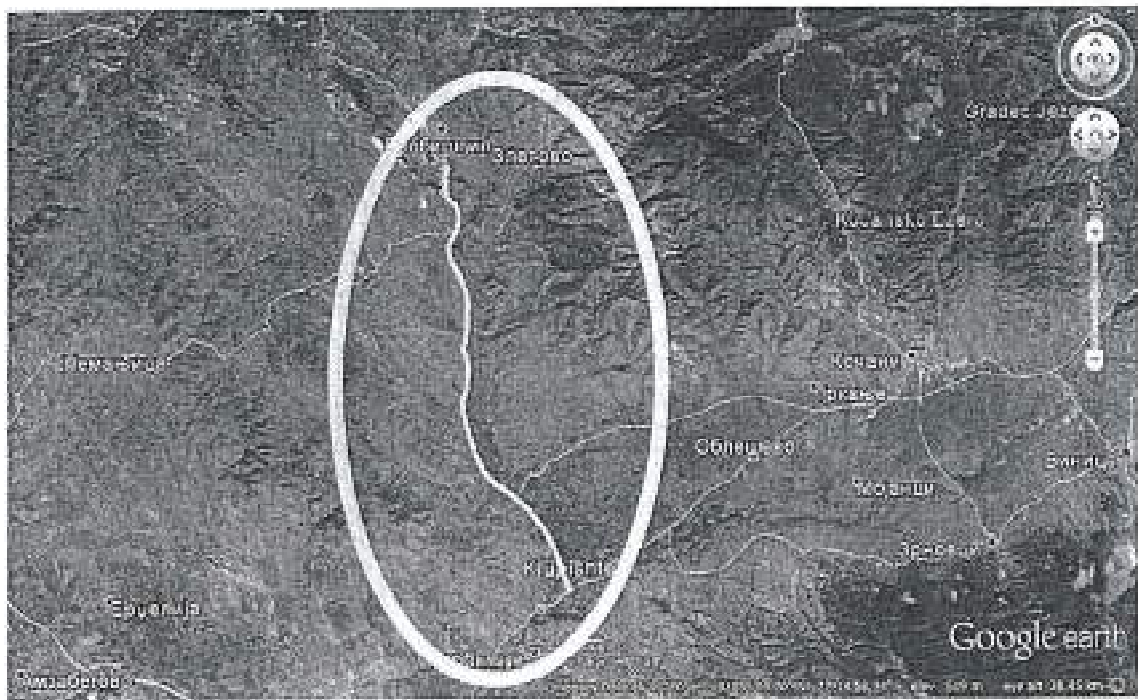


Attachment 1.7

Macro location od state road R1205 section Krupishte - Probishtip



**Environmental and Social Assessment Report for
Repair and rehabilitation of state road R1205, section Krupishte - Probishtip**



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Abbreviations

BP	-	Bank Procedures
DPLR	-	Department for Property-Legal Relations (Ministry of Finance)
ESIA	-	Environmental and Social Impact Assessment
EMP	-	Environmental Management Plan
IBRD	-	International Bank for Reconstruction and Development
MTC	-	Ministry of Transport and Communications
NGO	-	Non-governmental Organization
OP	-	Operational Policy
PAP	-	Project Affected People/Persons/Parties
PESR	-	Public Enterprise for State Roads
PIU	-	Project Implementation Unit
PS	-	Performance Standard
RAP	-	Resettlement Action Plan
RIU	-	RAP Implementation Unit
RPF	-	Resettlement Policy Framework
RM	-	Republic of Macedonia
SEA	-	Strategic Environmental Assessment
SEP	-	Stakeholder Engagement Plan
WB	-	World Bank



1. Introduction

The Environmental Management Plan (EMP) for the Repair and rehabilitation of state road R1205, section Krupishte - Probishtip, is presented in this Chapter. It has been prepared so that all relevant stages of the Project are implemented in compliance with applicable laws and regulations, the World Bank and their Operational Policies, and in accordance with the Report for environmental protection prepared for the Repair and rehabilitation of state road R1205, section Krupishte - Probishtip upon the Opinion number 11 – 595/1 dated 01.02.2017, issued by the Department of Environment at the MoEPP, under the requirements of the corresponding legislation of the Republic of Macedonia.

The EMP describes the environmental mitigation and monitoring measures, the criteria for their successful implementation and the organizational measures to be implemented during the preparatory (preliminary or pre-construction) phase, construction (rehabilitation) phase and operation phase; of this Project.

The EMP adopts a long-term and phased process in the sense that it will need to be regularly reviewed and updated as the Project evolves to reflect any changes in the Project implementation and organization as well as in regulatory requirements.

Implementation of effective environmental management system provides gradual improving of the environment and the social aspects. The impacts to the quality of the environment and the social aspects are expected during the Construction phase (rehabilitation), as well as during the Operational phase - (traffic along the subject section and maintaining it in functional condition, removal of all detected irregularities i.e. defects).

Almost all impacts can be mitigated through implementation of the mitigation measures, considering that it is expected those to be of temporary character without permanent negative impacts neither to the environmental mediums nor to the social aspects.

The effective mitigation measures have been designed with purpose of decreasing or eliminating the expected impacts of separate activities by the Contractor for the rehabilitation of this road section. The mitigation measures shall be effective only with adequate implementation and establishment of monitoring system for their implementation, all with purpose of providing that each mitigation measure shall result with the planned effect.

The costs for the mitigation measures implementation shall be included within the Contractor's unit prices for the rehabilitation works. The costs for the monitoring of the mitigation measures implementation shall be those of the Supervising Engineer, both selected by the PESR.

The state road R1205, section Krupishte - Probishtip (old mark R206), which is constructed with two traffic lines with width from 5.5m to 7.0m, is already in bad condition with existence of routings, longitudinal deformations of the pavement structure, cross cracks and other deformations that have been resulted by the traffic.

The rehabilitation starts very close to the junction of the state roads A3 and R1205, from km 0+000.00 to the end of the section at km 17+789.17 at the gas station on the south of the Probishtip. Along the alignment there are existing five (5) bridges, and fifty one (51) culvert.

On the existing state road in current conditions in certain parts there have been established intensive ravelling, longitudinal and transverse cracks and rutting.



Therefore there is a need to perform repair and rehabilitation (without extension), which would be of a great importance, since there is intensive traffic on this state road. The rehabilitation of the state road R1205, section Krupishte – Probishtip, will be performed pursuant to the purpose of the road, thereby ensuring safe and uninterrupted traffic, pursuant to the provisions of the Law on Public Roads ("Official Gazette of RM" No. 84/08, 114/09, 124/10, 23/11, 53/11, 44/12, 168/12, 169/15) and the regulations on the design and construction. The implementation of the rehabilitation on this road will enable in the future fast, cost effective, comfortable and safe traffic meeting the needs of the traffic fitness and capacity.

2. Responsibilities

The project activities occur in three phases:

- Preparatory phase –preparatory works (preparation of the subject section for the rehabilitation);
- Construction phase (repair and rehabilitation);
- Operations phase (traffic along the subject section and maintaining it in functional condition, removal of all detected irregularities i.e. defects).

2.1 Preparatory Phase

The EMP comprises the actions identified in the Elaborate for environmental protection i.e. the Environmental and Social Assessment Report, which need to be undertaken during the preliminary (preparatory), construction (rehabilitation) and operational phase.

Furthermore, the approval process for the Project is ongoing with the environmental process, which involves the issuance of the Decision by the Ministry of Environment and Physical Planning (MOEPP) of the Elaborate for environmental protection; i.e. issuance of "No objection" by the WB. The Decision i.e. the "No objection" contain an assessment of whether the above listed Elaborate i.e. Report, fulfill the applicable requirements as well as measures for prevention and reduction of the negative impacts.

The EMP will need to be updated for any additional environmental requirements identified in the Decision i.e. "No objection" when received. The responsible body to ensure that these actions are undertaken is PESR.

Implementation of EMP will be a contractual commitment of a selected Contractor. The Contractor will be required to provide the required plans and procedures to PESR for approval prior to construction commencing.

2.2 Construction Phase (Repair and Rehabilitation)

The construction work will be undertaken by Contractor to be appointed by PESR. The EMP will need to be reviewed at contract award to ensure it fully reflects the project circumstances. During construction, the actual implementation of most of the EMP requirements will be the responsibility of the Contractor(s), with PESR having a supervising role.



The requirements for environmental protection contained within the EMP and relevant project documentation and approvals will be an obligatory part of the conditions of contract for the Contractor.

The Contractor will be obliged to adopt and follow relevant national legislation, Acts, Regulation and relevant EU legislation/Good practice/International organization's standards during construction and minimize potential impacts on environmental and social receptors.

PESR is ultimately responsible for the implementation of measures outlined within the EMP, with the objective of ensuring effective implementation of the EMP and other project requirements.

PESR will appoint resources to undertake environmental reviews and audits of the Contractor's environmental performance during the construction phase. Where responsibility for actions is assigned to the Contractor, the Contractor will be responsible for ensuring its sub-contractors understand the requirements contained within the EMP and have contract conditions in place to ensure applicable elements of the EMP are achieved.

2.3 Operational Phase

The EMP details environmental measures for the operation of the road section, including the requirement to establish and implement an Environmental Management System and Monitoring Plan.

Details regarding the management of the operation of the road section are not confirmed at this stage however PESR will ultimately be responsible for the operational management and monitoring. PESR will also be responsible for ensuring its Contractor understand the requirements contained within the EMP and have contractual conditions in place to ensure applicable elements of the EMP are achieved.

2.4 Public reporting

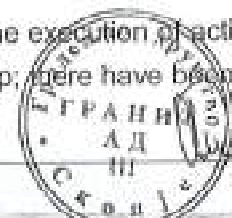
PESR and the selected Contractor for the Repair and rehabilitation of the state road R1205, section Kruposhte - Probishtip, will be required to publicly report on the environmental performance of the project on at least an annual basis.

3. Project's environmental impact

The preparation of the Report is aimed at locating and determining the existence of any harmful effects on the environment as a result of project activities that will take place at the rehabilitation of the subject section. Environmental impact of this type of project activities occurs in three stages:

- Preparatory stage –preparatory works (preparation of the subject section for the repair and rehabilitation);
- Construction stage (repair and rehabilitation);
- Operations stage (traffic along the subject section and maintaining it in functional condition, removal of all detected irregularities i.e. defects).

From the above described activities, which will take place during the execution of activities or repair and rehabilitation of state road R1205 section Kruposhte - Probishtip; there have been examined the



sources of emissions in the basic media and environmental areas in terms of their environmental impacts.

3.1 Emissions

During the execution of the projected construction activities for rehabilitation of the road in subject, the following emissions are expected:

Preparatory stage (preparation of the road in subject for repair and rehabilitation)

- exhaust fumes from construction machinery;
- occurrence of fugitive dust emissions from clearing the respective section;
- municipal and construction waste;
- wastewater from the construction workers and waste water drainage;
- noise and vibration from the work of construction machinery.

Construction stage (repair and rehabilitation)

- fugitive dust emissions from construction activities;
- emissions from construction machinery;
- municipal and construction waste;
- wastewater from construction workers and waste water drainage;
- noise and vibration from the work of construction machinery;
- impact on biodiversity (disturbance).

Operational stage

- exhaust fumes from mobile sources of pollution (vehicles);
- waste rain water;
- noise.

3.1.1 Air emissions

Under the Law on Ambient Air Quality ("Official Gazette" No.67 / 04, 92/07, 47 / 11, 59 / 12, 100/12, 163/13 and 4/13 new amendments, additions) and the by-laws arising from it, air emissions are categorized into: emissions from boilers, particles emissions from stationary and mobile sources, potential and fugitive emissions. Emissions of harmful pollutants in the air will occur in two stages: construction and operation (traffic flow along this road).

Construction stage

In the process of rehabilitation of the subject section, the following air emissions will occur: fugitive dust emissions during cleanup and removal of ground vegetation, fugitive dust emissions during scratching the existing asphalt, its removal and replacement, dust emission during loading and transport of excavated material, emissions from mobile sources of pollution or the construction machinery and fugitive emission of volatile organic components during the application of bitumen emulsion and the application of asphalt mixture.



From all the above impacts, fugitive dust has utmost importance according to the environmental impacts. Dust will be generated by mechanical operations of construction machinery, as well as from mechanization fuel combustion, during the preparation of the terrain it affects the nearby and distant surroundings depending on the size (aerodynamic diameter) of the particles and the meteorological conditions during the activities, primarily wind flow velocity (affects their dissemination i.e. transmission). The impact of the fugitive dust emissions generated from the activities of the construction machinery (asphalt scratching) will be further enhanced as it will be accompanied by emissions from construction machinery.

The fine particles or particles which can be inhaled with diameter $D_s \leq 2.5 \mu m$ that are created during the combustion of fuel in the motor vehicles is transmitted over a long distance and they contain organic components and heavy metals that have negative influence on human health and the environment.

The following table presents the limit values and margin of tolerance for suspended dust with a diameter of 10 micrometers PM10 according to the Ordinance on limit values of levels and types of pollutants in ambient air and alert thresholds, deadlines for achieving limit values, margins of tolerance for the limit values, target values and long-term goals ("Official Gazette" no. 50/05 and 4/13).

Table 1 Limit values and margin of tolerance for suspended dust PM10

Pollutant	Average period	Limit value which has to be reached in 2012	Permitted number of exceeding during the year
PM10	24 hours	50 $\mu g/m^3$	35
	1 year	40 $\mu g/m^3$	0

The impacts of fugitive emissions of volatile organic components from the application of bitumen emulsion and asphalt mixture will be less severe because these compounds are volatile and briefly detained in the air and are not transmitted or emitted.

Gases and pollutants present in them are emitted into the ambient air through the system for disposing the exhaust fumes from the means of transport and construction machinery on the site. The quantity and composition of the exhaust fumes depends on several parameters such as the type and age of the vehicle, the technical characteristics of the vehicle, the type of fuel used, the characteristics of the fuel distribution network, the presence of additives, the degree of combustion of fuel and so on.

During full combustion of fuel there are produced SO₂, CO₂, H₂O, aromatic hydrocarbons, and catalysts are used Pb₂O₃ and the like is produced. In case of incomplete combustion of fuel CO is produced as well as hydrocarbons, suspended dust etc. During long-term exposure to the above mentioned toxic substances, they have harmful effects on human health. Therefore, smoke affects the respiratory organs and the skin, lead affects the respiratory and central nervous system and blood system and bones. The particles that appear in the process of combustion of fuels also have cancerous effect.

Herein below is a table showing the limit values for the pollutants from the construction machines, pursuant to the directive 97/68/EC:



Table 3 Distribution of the emissions of motor vehicles depending on the traffic conditions (%)

Pollutant	Urban environment	Motorway
Carbon monoxide	54	24
Nitrogen oxides	24	51
Hydrocarbons	60	21
Sulphur dioxide	31	46
Solid particles	17	59
Aldehydes	51	29

The condition of the traffic systems in our towns is specific because to the great extent it does not meet the basic principles, which are closely connected to the environmental models in the modern cities. Namely, such roads, since with the reduction of the motor vehicles speed more fuel is spent, and that entails release of greater amount of pollutants. The pollution from the vehicles depends on the type and number of motor vehicles.

Having into consideration that the traffic continuously takes place and such traffic contributes to the decrease of the air quality along the section, the newly projected activities are not expected to have additional impacts to the air quality; at the respective state road R1205 section Krupishte – Probishtip.

3.1.2 Emissions to Water and Sewer

Construction phase

Water pollution during the rehabilitation of the road section can be physical, chemical, or biological. Physical pollution is manifested by the presence of solid particles from earth and sand debris, solid particles from tire friction, debris from car accidents, disasters and the like. Physical pollution of liquids means the presence of fats and oils. During the washing of the road surface, solid particles are deposited in the gutters and drains and can cause clogging, while the fats and oils rise to the surface and reach the recipient. Here they create a film, and the inlet of oxygen in the water flow is blocked which constrains the natural creation of the aquatic flora and fauna in the recipient.

Chemical pollution occurs as a result of the dissolution of pollutants in air. These pollutants are the result of vehicle exhaust gasses, emissions from polluting components of nearby industrial and manufacturing capacities, dilution of individual components from the surrounding land, application of agro-chemical materials and pesticides, as well as animal and plant waste. Chemical pollution can be manifested as a highly acidic, or a low acidic neutral medium and all the variations ranging from a highly basic to a highly acidic medium.

Biological pollution is caused by the decomposition of organic matter that serves as food for various organisms. They can be the result of food discarded by reckless road users, leaves blown by the wind, or other biodegradable waste, feathers and other substances that are present in the nearby environment.

Mechanical impurities from soil weathering due to heavy rainfall and surface water flow will cause filling of the beds and water turbidity, which will reduce the penetration of light to greater depths and will change the living conditions in streams.

The most dangerous pollutants to surface and groundwater are non-degradable components of organic matter and heavy metals.



The locations planned for accommodation for the workers and for maintenance and cleaning of the machinery can be potential sources of pollution caused by sewage water, solid waste, and improper maintenance and cleaning of the machinery.

Given their intensity and duration, the planned activities for rehabilitation will not have a negative impact on the quality of River Bregalnica as a water resource running in the vicinity of the route.

Groundwater and soil pollution can also occur in case of car accidents and disasters.

Operational phase

During the operational phase, the sources of emission to water will generally be same as during normal use of the road.

3.1.3 Waste Generation

Waste management is one of the most serious environmental problems in Macedonia. The regular waste collection service is restricted to urban areas, and very little attention is paid to rural settlements - 70% of the total urban population benefits from the regular waste collection service, whereas only 20% of the population in rural areas is covered by the service.

Municipal waste management is entirely controlled by the local government. It is directly connected to the urban plans for use of local land and should be in accordance with the national strategic documents – the National Plan for Waste Management and the National Strategy for Waste Management, as well as other relevant documents.

Proper waste management in accordance with the widely accepted international norms will reduce the impact of waste on soil (caused by uncontrolled waste disposal), groundwater (directly contaminated over time as a result of uncontrolled waste disposal) and air (caused by burning waste in the open).

The current method of municipal waste management on the territory of the Municipalities of **Probishtip** and **Karbinci** including **village Krupishte** is far from the required level. Only procedures for collecting, transporting and removal of municipal waste are carried out, and there are no procedures for reducing waste from the source of generation. The total quantities of produced municipal, industrial and other non-hazardous and inert waste are collected, transported by PCE „Nikola Karev“ on the territory of municipality Probishtip, and PE “Plackovica” on the territory of the municipality Karbinci; and disposed of.

It can be concluded from the above that on the territory of the Municipalities of Probishtip and Karbinci including village Krupishte there is no organized waste management system, and waste management only involves collection, transport, and disposal of waste to a local landfill, without any pretreatment or implementation of sanitary measures during removal.

The general situation with regard to waste management is evaluated as partially satisfactory due to incompliance with the criteria set out in the European waste directives, primarily with regard to the waste collection service coverage, the lack of an integrated waste management system, the situation with the municipal landfills, and the emergence of a large number of illegal dumps.

Construction phase



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The process of rehabilitation of the road section analyzed in this Report will result in the generation of mixed municipal waste by the workers and construction waste.

Waste generators shall, as far as possible, avoid waste generation and reduce any adverse impacts of waste on the environment, human life and health².

Municipal waste generators shall enter into a separate waste collection and transport agreement with the service provider PCE „Nikola Karev“ on the territory of the Municipalities of Probishtip and PE „Плачковица“ on the territory of municipality of Karbinci including village Krupishte.

The types of waste that will be generated during construction and rehabilitation of the road section, and the method of treatment of different types of waste are shown in the table below:

Table 4 Types and quantities of waste

Phase	No.	Waste type	Number in the List of Wastes (Official Gazette No. 100/2005)	Amount of waste per year (in tons or liters)	Waste treatment method (Processing, storage, transfer, removal, etc.)	Name of the entity handling the waste and waste disposal location (landfill)
Конструктивна фаза	1	Mixed municipal waste	20 03 01	Cannot be determined ³	Waste is stored temporarily in bags until its disposal in containers located nearby	PCE Nikola Karev – Probishtip PE Plackovica – Karbinci
	2	Contaminated soil as a result of possible release of oil from construction machinery	17 05 05*	Cannot be determined (only in incidental situations)	Contaminated soil is covered with inert material and removed (similar to hazardous waste treatment)	Legal/natural person who holds a license for such type of waste
	3	Removed asphalt	17 03 02	Cannot be determined during this phase	Waste is stored to an adequate location until its disposal to a construction waste landfill and/or used for local access roads (best practice)	PCE Nikola Karev – Probishtip PE Plackovica – Karbinci

*Hazardous waste in accordance with the List of Wastes (Official Gazette of RM No. 100/05)

Operational phase

The operational phase of the road may lead to generation of waste as a result of the cleaning of culverts (earth, rocks, organic waste, etc.) and as a result of maintaining the road in proper condition, such as backfilling holes and the like.

² According to the Law on Waste Management (Official Gazette of RM No. 68/04, 71/04, 107/07, 102/08, 134/09, 109/11, 111/12, 120/12)
³ The amount of municipal waste generated will depend on the number of performers of construction works during the rehabilitation, the time schedule for construction, and the time required for implementation of the planned activities



3.1.4

Emissions to soil

Impacts on soil during the process of repair and rehabilitation of state road R1205 section Krupishte - Probishtip are expected to be negligible since it does not involve extension of the road section, and because it is an existing road that has served vast amounts of traffic in the past.

Impacts caused by road traffic along the road section resulted in its degradation, colonization, reduction in the organic material content, loss of soil biodiversity, etc.

Construction phase

Impacts to the quality of soil during the rehabilitation of the road section are a result of construction activities set out as part of this phase, and may be caused by:

- Fugitive dust emissions during scraping and removal of asphalt;
- Emission of exhaust gasses from the construction machinery engaged in the implementation of activities;
- Leakage of fuel and lubricants from the construction machinery which, apart from their impact on soil, will result in groundwater contamination after their seepage and filtration through the soil;
- Contamination of groundwater and soil may also occur in case of accidents and major failures.

Operational phase

Emission of exhaust gasses is expected during the operational phase, caused by traffic moving along the road section.

3.1.5 Noise, Vibration, and Non-ionizing Radiation

Construction phase

During the process of rehabilitation of the road section, the maximum allowable noise levels will be exceeded significantly.

Noise will be produced as a result of the construction machinery which will be employed during this phase, and the vehicles for delivery and transport of construction material and generated waste. The specificity of the impact will mostly depend on the type of equipment, and the type and operating condition of the construction machinery.

The distance from populated areas, the geological conditions, and the terrain configuration are crucial with regard to the environmental impact of noise.

Weather conditions have a major effect on the noise and airblast intensity. Airblasts are influenced by wind direction and speed, whereas sound propagation is influenced by wind speed and temperature, in relation to terrain elevation and configuration.

Table 24 gives a list of noise, vibration, and non-ionizing radiation sources.

Table 5 List of noise, vibration, and non-ionizing radiation sources



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Source of emission	Emission type (noise, vibration, or non-ionizing radiation)	Equipment – device with maximum output description	Intensity of noise emitted (dB) indicated by the value designated on the equipment	Intensity of vibration and non-ionizing radiation emitted	Periods of emission (number of hours per day)
Heavy vehicles	Noise (84 dB)	Bulldozer, excavator, trucks	/	/	8

The environmental noise basic indicator levels are set out in the Regulation on noise level limits (Official Gazette of RM No.147/08). According to the noise protection degree, the environmental noise basic indicator limits should not exceed:

Table 6 Legend

Legend			
Basic noise indicators:			Additional noise indicator
Ld day (from 07:00 to 19:00)	Lv evening (from 19:00 to 23:00)	Ln night (from 23:00 to 07:00)	LAmaz

Table 7 Noise levels per area

Area differentiated according to the noise protection level	Noise level in dBA		
	Ld	Lv	Ln
First degree area	50	50	40
Second degree area	55	55	45
Third degree area	60	60	55
Fourth degree area	70	70	60

Table 8 Room noise levels

Room types	Noise level in dBA		
	Ld	Lv	Ln
Hospital room, intensive care units, operating rooms	30	30	30
Rooms in residential buildings, recreational rooms for children, bedrooms in old age and retirement homes, hotel rooms	35	35	30
Medical offices in health facilities; conference halls, movie theaters, theater and concert halls	40	40	35
Schoolrooms, reading rooms, lecture theaters, classrooms, rooms for scientific research work	40	40	40
Work premises in administrative buildings, offices	50	50	50
Theater and cinema lobbies, hairdressing and beauty salons, restaurants, pastry shops	55	55	55

Table 9 Room noise levels

Room types	Noise level in dBA	
	LAmaz day	LAmaz night
Residential zone (outdoors)	/	60
Rooms in residential buildings, recreational rooms for children, bedrooms in old age and retirement homes, hotel rooms (indoors)	/	45
Hospitals and other stationary treatment facilities	/	45
Industrial, commercial, shopping, and traffic areas	110	



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Room types	Noise level in dBA	
	L _{Amax} day	L _{Amax} night
Public gatherings, festivals, concerts, discos	110	110

Table 10 Noise level per area

Area types	Noise level in dBA		
	L _d	L _v	L _n
Areas exposed to intensive road traffic	60	55	50
Areas exposed to intensive rail traffic	65	60	55
Areas exposed to intensive air transport	65	65	55
Areas with intensive industrial activity	70	70	70
Quiet areas outside agglomerations	40	35	35

Areas identified according to the noise protection degree are defined in the Regulation on locations of measuring stations and measuring points (Official Gazette of RM No. 120/08).

- Areas with I degree of noise protection are areas intended for tourism and recreation, areas in the vicinity of hospitals, and national park and nature reserve areas;
- Areas with II degree of noise protection are areas primarily intended for residence, i.e. residential areas, areas nearby buildings designed for educational activity, social protection facilities intended for accommodation of children and the elderly, facilities for primary health protection, playgrounds and public park areas, public greenery spaces and recreational areas, and local park areas.
- Areas with III degree of noise protection are areas where construction activities in the surrounding area are allowed and noise generation causes minor interference: commercial/business/residential areas, which are also designed for accommodation, i.e. areas with buildings that have protected spaces, crafts and related production activities (mixed areas), areas designed for agriculture activities and public centers for administrative, commercial, service and catering activities.
- Areas with IV degree of noise protection are areas where construction in the surrounding area that can cause noise interference are allowed, areas without apartments, designed for industrial, crafts or other similar production activities, transport activities, storage activities, service and communal activities causing significant noise.

According to the classification of areas according to the noise protection degree, the project activity belongs to areas with III degree of noise protection, which are areas where construction activities in the surrounding area are allowed and noise generation causes minor interference: commercial/business/residential areas, which are also designed for accommodation, i.e. areas with buildings that have protected spaces, crafts and related production activities (mixed areas), areas designed for agriculture activities and public centers for administrative, commercial, service and catering activities.

The Decision on determining in which cases and under which conditions it will be deemed that noise pollution has caused disturbance of peace (Official Gazette of RM No. 01/89) identifies actions



which, in case they emit noise exceeding the noise level limits, are deemed to cause disturbance of peace.

In the absence of a developed state monitoring network, there are no data on environmental noise measurements in the wider area of the project location. Consequently, there are no planning documents for noise management, such as a strategic map and an action plan.

Given that the road is an existing road, any noise emitted will not have a significant impact on the population living nearby. During construction activities there will be vibration caused primarily by the movement of construction and transport machinery.

Operational phase

The rehabilitation of the road section is expected to reduce the level of existing noise caused by the current condition on the road, the heavy axle loads on the road and its deteriorated state, as a result of the improved technical characteristics of the road section, and the use of modern construction materials for the rehabilitation.

3.1.6 Biodiversity (flora and fauna)

The implementation of the planned project activities on the road section will also result in impacts on the surrounding flora and fauna. These impacts are expected during the preparatory, construction, and operational phases. Impacts on wildlife during the preparatory and rehabilitation stages will be manifested as increased noise levels and vibration caused by the construction machinery and the presence of construction workers, and will result in temporary displacement of animals. Impacts caused by the rehabilitation of the road section will be minor and short-term, since the road section is an existing structure located in an area where there are no endangered or protected animal and plant species.

Construction phase

During this phase, an increased noise and vibration intensity and an increased amount of emitted exhaust gasses and dust are expected as a result of the use of construction machinery, causing impact on the surrounding flora and fauna.

Impacts caused by noise, vibration, and exhaust gasses from propulsion fuels will certainly also appear during the operational phase, during use of the road section covered by the project activities. However, it is important to note that the impacts expected during the operational phase are already present and appear during use of the road section.

Operational phase

There are no rare or endangered plant and animal species living within the road section area, and given that the area along the road route is dominated by ruderal species and agricultural arable land, impacts on biodiversity can be deemed as negligible.

4. Environmental Protection Program

The implementation of an efficient environmental management system allows for gradual improvement and enhancement of the environmental and social aspects. Most project activities



have the potential to create environmental and social impacts. Such impacts can be beneficial or adverse, range from insignificant to highly significant, or range from short to long-term.

Environmental and social impacts are expected during the Construction Phase - reconstruction and rehabilitation, and during the Operational Phase - movement of traffic along the route and maintaining the route in operating condition.

Almost all impacts can be reduced by implementing mitigation measures, given that such impacts are expected to be temporary and without any lasting adverse impacts on environmental media and social aspects.

The effective impact mitigation measures have been designed for the purpose of reducing or eliminating the expected impacts caused by individual activities by the Contractor for rehabilitation of the road. Impact mitigation measures will be effective only if applied properly, in order to ensure that each impact mitigation measure will have the planned effect.

4.1 Air Pollution Prevention Measures

Construction phase

Fugitive dust emissions and emissions from mobile sources in the air (during combustion of oil derivatives from internal combustion engines) will arise during performance of construction activities for repair and rehabilitation of the state road R1205, section Krupishte - Probishtip.

During the installation of asphalt and the bitumen emulsion there will also be fugitive emission of organic volatile components depending on the composition of the bitumen emulsion. This emission will be minor and short-term given that the bitumen emulsion is a regenerative agent applied on the old asphalt layer on top of which the new asphalt layer is installed; thus the emission of such components will be minimal.

Expected impacts from air emissions in this phase will be local and are expected to be minimized by implementing the following protection measures:

- Use of standardized fuels for the machinery and turning off the engines when not in use, for the purpose of reducing exhaust gas emissions;
- Route planning and the loading and unloading factor are of great importance for reducing fuel consumption, as well as exhaust gas emissions and fugitive dust emissions;
- Avoiding operation of the machinery when "idling";
- Determining the operating hours for the machines;
- Residents/sensitive receptors will be informed of Contractor's construction activities and work hours;
- Implementing a Traffic Management Plan.

4.2 Water Pollution Prevention Measures

Construction phase

The road rehabilitation process will result in generation of wastewater from personal hygiene practices by employees at the site, as well as storm wastewater. The amount of wastewater

generated is expected to be minimal; thus it will not cause environmental contamination requiring further analysis.

Drainage is a fundamental protection measure for collection and draining of stormwater from the road surface. Drainage on the road section will be performed using the existing flat and arched culverts along the section.

During exploitation, culverts must be cleaned regularly. Culverts must not be clogged with mud or branches, and water must be able to flow freely. In case of clogging for any reason whatsoever, the culvert must be cleaned (flushed). This ensures free flow of water and collection from the stream, which also leads, to a large extent, to self-cleaning.

Operational phase

No adverse environmental impacts are expected during the operational phase; thus, the Environment Program does not define any measures.

4.3 Waste Management Improvement Measures

Waste management activities must prevent environmental emissions and harmful and other adverse effects on the health and well-being of people, animals, vegetation, habitats, and nature, by means of technical measures with a special goal of ensuring protection of agricultural land and water resources which are designated as goods of special national interest.⁴

Construction phase

Management of waste generated during construction activities must be in accordance with the Law on Waste Management, Chapter II - Waste management, where the obligations for waste management of the waste generator have been defined in accordance with **Article 26**:

1. With regard to the waste, its generator or owner shall:
 - a) select it;
 - b) classify it according to the List of Wastes;
 - c) determine the waste characteristics;
 - d) control the impacts of waste on the environment and human life and health;
 - e) store it in locations designated for that purpose
 - f) process the waste, and if waste processing is not technically feasible or cost-effective, hand over the waste to a legal or natural person authorized to collect, transport, process, dispose of, and/or export the waste.

2. If the waste has one or more hazardous properties, its generator and/or owner shall classify it as hazardous waste and treat it as such.

In order to improve waste management during the construction process, in accordance with the laws dealing with waste management, the following measures are recommended:

- Selection and classification of all types of waste in accordance with the Law on Waste Management (Official Gazette of RM no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12);

⁴ National Waste Management Strategy of the Republic of Macedonia (2008 – 2020), page 49



- Entering into an Agreement for municipal waste management and handing over the waste to a legal or natural person who has a Permit for collection and transport of municipal or any other non-hazardous waste in accordance with **Article 45** of the Law on Waste Management (Official Gazette of RM no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12);
- For further treatment of selected waste generated from construction activities (construction waste), the Contractor must proceed in accordance with **Article 54** of the Law on Waste Management (Official Gazette of RM no. 68/04; 71/04; 107/07; 102/08; 143/08; 124/09; 09/11, and 51/11);
- For further treatment of selected packaging waste (temporary storage of various packagings in a particular designated location), the Contractor must proceed in accordance with **Article 30(2)** of the Law on Packaging and Packaging Waste Management (Official Gazette of RM no. 161/09);
- Regular servicing of vehicles and machinery during the construction activities in order to avoid any leakage of motor oil and/or fuel. Vehicle service must be performed in places authorized for that purpose;
- Soil contaminated with waste oil and/or fuel (hazardous waste) must be removed in case of accidental spillage from the machinery, and treated as hazardous waste.

Operational phase

No adverse environmental impacts are expected during the operational phase; thus, there are no measures specified in the Environment Program.

4.4 Soil Protection Measures

Construction phase

The most serious pollution of the soil and, indirectly, of groundwater may occur in case of spillage of fuel, oil, and lubricants from the machinery, or chemicals used in construction.

In addition, spilled fuel, oil, lubricants, and some chemicals used in construction are highly volatile and flammable in high outdoor temperature, and can cause fire.

Because of the above impacts, the following measures are recommended:

- Inspecting the operability of the construction machinery and transport vehicles;
- Stopping all work in case of uncontrolled spillage of fuel, oil, lubricants, and chemicals;
- Installation of an adequate number of portable toilets along the route. The toilets will be emptied by an authorized company that will be required to transport the fecal matter to a treatment plant, which will provide sustainable wastewater management ensuring that wastewater is kept to a minimum and avoiding possible soil contamination.

For the purpose of preservation of the surrounding land areas affected by the spread of emulsions during the paving process, it is advisable to carefully store and handle the bitumen emulsion and the asphalt mass, and apply them only on specified surfaces.

Operational phase



For the purpose of reducing or avoiding possible impacts on soil during the operational phase, the following is recommended: regular monitoring of the flow of stormwater, adequate waste management, and maintenance of vegetation in the vicinity of the road.

4.5 Noise and Vibration Protection Measures

Construction phase

During performance of earthwork and construction work, the basic indicator limits for noise caused by construction machinery and motor vehicles will be exceeded.

The noise occurring during the construction phase as a result of the operation of machinery and transport activities will have an adverse, albeit short-term, impact on sensitive hearing receptors and living organisms in the vicinity of the road section.

All of the machinery engaged in the activities, and all transport vehicles must be in good operable condition, which is a prerequisite for reduced noise pollution.

In addition, as a basic measure for reducing adverse impacts caused by increased noise levels, it is advisable to turn-off the engines in vehicles and construction machinery when they are not needed.

It is recommended that construction activities are only performed during the day, according to a specified time schedule.

It is also advisable to inform the locals of the time and location of performance of construction work.

Operational phase

The noise levels on the road are expected to be reduced after its rehabilitation, as a result of using modern materials and improving the driving and dynamic conditions; thus, no noise and vibration protection measures have been specified in the Environmental Protection Program.

4.6 Measures to Reduce Impacts on Biodiversity

Construction phase

A recommended measure for reducing impacts caused by the use of construction machinery (vibration, noise, and increased amount of exhaust gasses) is the use of operable construction machinery with adequate technical characteristics, and use of adequate propellants.

Operational phase

Impacts in this phase will generally not differ from existing impacts, since the road is an existing road that has served vast amounts of traffic in the past.

Measures to reduce impacts on Historic-Cultural Monuments

In case of discovery, during construction, of an archaeological site, or items of archaeological significance, the contractor must act in accordance with Article 65 of the Law on Protection of Cultural Heritage (Official Gazette of RM No.: 20/04, 115/07, and 18/11), and is required to report such discovery within the meaning of Article 129(2) of the Law on Protection of Cultural Heritage (Official Gazette of RM No.: 20/04, 115/07, and 18/11), to stop any work, to secure the site against possible damage or destruction and against authorized access, and to keep the findings in the location and in the state in which they were found.

Pursuant to the Law on Spatial and Urban Planning (Official Gazette of RM No. 70/13 – consolidated text, and 55/13 – amendment and supplement), the following must be specified in the spatial and urban plans based on the documentation of immovable cultural heritage: planning measures for protection of cultural monuments, and guidelines for determining the scope of their protection.

The incorporation of an appropriate regime of protection of immovable cultural heritage in a spatial and urban plan is made in accordance with the protection and conservation bases for cultural heritage (Pursuant to Art. 71 of the Law on Protection of Cultural Heritage).

Immovable cultural heritage, whether it is an architectural unit or an individual structure, should, as a common cultural wealth of the world, be treated in the spatial and urban plans in a way that will ensure its successful integration in the spatial and organizational fabric of cities, populated areas or wider areas, and an emphasis on its structural and aesthetic values.

Risk Management (major failure, accident, or emergency events)

Major failure is an unplanned or unusual event caused by negligence or Force Majeure, in circumstances where there is partial or complete loss of control over the production or handling process, which is limited in space and time, and can have harmful effects on human health and the environment.

In order to prevent possible occurrence of major failures along the route during the process of rehabilitation of the road section:

- Construction workers working at the designated site for rehabilitation of the road section must be provided with adequate personal protective equipment appropriate to the weather conditions (work suit, helmet, gloves, etc.);
- An Occupational Safety and Health Plan must be prepared for workers working on temporary mobile construction sites in accordance with the Regulation on minimal occupational safety and health requirements for working on temporary and mobile construction sites (Official Gazette of RM no. 105.08);
- Installation of fire extinguishers in vehicles and machinery to be used in the rehabilitation process;
- Marking and securing the site in accordance with the legal regulations concerning occupational safety and health;
- Installation of vehicle speed limit signs etc. in accordance with the applicable regulations and standards and the Regulation of road traffic signs, equipment and markings (Official Gazette of RM no.56/08, 47/10);

The implementation of the planned measures is necessary in order to avoid possible occurrence of major accidents, in particular major fires that would have an adverse impact both on the working and on the natural environment due to: emissions of harmful pollutants in the air, material damage, and human casualties.



5. Structure of the EMP

It is the requirement of the Terms of Reference that the project is undertaken in line with national legislation and the WB requirements. The requirements described in this EMP, therefore, reference the Republic of Macedonia legislation and are supplemented, where necessary, with measures needed to meet international law and conventions, World Bank, their Operational Policies and the good international practices.

The Environmental Management Plan (EMP) has been structured with the requirements for particular mitigation measure, purpose of the mitigation measure, time schedule of the mitigation measure implementation and monitoring, delegated responsibility of implementation and monitoring of particular mitigation measure, and corresponding lawful obligation.

The costs for the mitigation measures implementation shall be included within the Contractor's unit prices for the rehabilitation works. The costs for the monitoring of the mitigation measures implementation shall be those of the Supervising Engineer, selected by the PESR.



MITIGATION MEASURES OF THE IMPACTS TO THE ENVIRONMENT

Table 11 Tabulated list of the mitigation measures

Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
AIR MANAGEMENT						
1	C	Usage of standardized fuel for the mechanisation and switching off the mechanisation (when it is not in usage)	Decreasing the exhaust gasses in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality ("Official Gazette of RM" no. 67/04, 92/07, 47/11, 59/12, 10/12, 4/13, 163/13, and all its amendments)
2	C	Traffic speed limits within the so called temporary mobile construction site.	Decreasing the exhaust gasses in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authorities in the country (Representatives of the MoI) have the obligation for monitoring of the measure implementation	Law on ambient air quality ("Official Gazette of RM" no. 67/04, 92/07, 47/11, 59/12, 10/12, 4/13, 163/13, and all its amendments)



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
3	C	The delivery of construction materials is to be done during the precisely established time intervals and with previously established plan and regime.	Decreasing the exhaust gases in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation.	Law on ambient air quality ("Official Gazette of RM" no. 87/04, 92/07, 47/11, 59/12, 100/12, 4/13, 163/13, and all its amendments).
WATER MANAGEMENT						
1	C	Locations for storage of fuel, oil, or other liquid chemicals, shall be removed from the outlets to the surface waters.	Avoided contamination of surface and underground water	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation.	Law on waters ("Official Gazette of RM" no. 87/08, 6/09, 161/09, 63/10, 5/11, 44/12, 23/13, 163/13, 62/16).
WASTE MANAGEMENT						
	C	Appropriate management with the generated communal waste at the location and its disposal with appropriate containers that afterwards shall be submitted to the legal/physical entity that possess permission for communal waste management.	Proper approach towards the manner of waste management, realization of one of the key principles for feasible management of communal waste "Owner's Responsibility"	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation. Supervising Engineer has the obligation for monitoring of the measure implementation.	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12, 147/13, 163/13, 156/15, 63/16); and Handbook of the general rules of communal and other types of non hazardous waste treatment ("Official Gazette of



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
2	C	Spreading of soil at the location of eventually spilled motor oil and disposal of the polluted soil by the legal/physical entity that possess permission for hazardous waste management.	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	RM ⁿ no. 147/2007, Article 9, Article 10, Article 11 Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 08/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)
3	C	Regular vehicles and mechanization servicing during the construction works execution. The Service is to be executed at the authorized occasion of that purpose	Avoidance of eventually spillage of motor oil and/or gasoline	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)
	C	If the Contractor has adequate equipment, it is recommended of this Elaborate, recycling and reuse of the removed existing asphalt layers. If there is no such possibility, the removed asphalt is to be used for	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 08/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
		local roads and paths where necessary in cooperation with the Municipality Kochani.				
SOIL MANAGEMENT						
1	C	Cease of the working activities during the uncontrolled spillage of fuel, oil, lubricants and chemicals, spreading of sand and disposal of polluted layer of soil, and is to treat the polluted material as hazardous waste	Decreasing the possibility of soil degradation and the soil biocenosis	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/16, 08/11, 123/12, 147/13, 183/13, 156/15, 63/16, and all its amendments)
2	P C	Placement of mobile toilets along the alignment and concluding a Contract with authorized company that will undertake the silt and carry to the waste treatment plant	Avoided soil and underground water contamination with colyform bacteria	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/16, 08/11, 123/12, 147/13, 183/13, 156/15, 63/16, and all its amendments)
NOISE MANAGEMENT						
	C	Unplugging the vehicles and structural mechanization motors when there is no need of their	Decreasing the noise and their impact to the environment	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the	Law on protection of noise at the environment ("Official Gazette of RM" no. 79/07,



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
		works performance of the construction activities – daily and with defined time dynamic informing the population of the construction activities			obligation for monitoring of the measure implementation	124/10, 47/11, 163/13, and all its amendments) and Rollback of noise level limit values at the environment (Official Gazette of RMF no. 147/08)
BIODIVERSITY MANAGEMENT						
1	P	Clearance of shrubs and vegetation, preparation of the alignment for the activities of rehabilitation	With purpose of preservation of the vegetative biodiversity (flora)	Before starting the realization of the construction activities	Contractor has the responsibility for the measure implementation	Law on protection of nature (Official Gazette of RMF no. 87/04, 14/05, 84/07, 35/10, 47/11, 148/11, 58/12, 13/13, 163/13, 63/16, and all its amendments)
	C	Usage of property and regularly controlled construction mechanization	With purpose of decreasing the impacts of vibrations, noise and increased quantities of emission of exhaust gasses	Construction phase	Contractor has the responsibility for the measure implementation	Law on environment (Official Gazette of RMF no. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 93/13, 187/13, 42/14, 44/15) Law on protection of nature (Official Gazette of RMF no. 67/04, 14/06, 84/07, 35/10,



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Number	Design activity	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
RISK MANAGEMENT						
1	P	Occupational safety and health plan at temporary and mobile construction sites	Decreasing the possibility of incidents	Before starting the process of rehabilitation of the subject section	Contractor has the responsibility to prepare and implement the Occupational safety and health plan Supervising Engineer has the responsibility to approve and to monitor implementation of the Occupational safety and health plan	Rulebook of minimal requirements for occupational safety and health at temporary and mobile construction sites ("Official Gazette of RM" no. 105,08)
2	C	Placement of traffic signs for traffic speed limits and similar.	Decreasing the possibility of incidents	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authorities in the country (Representatives of the MoI) have the obligation for monitoring of the measure implementation	Rulebook on traffic signs ("Official Gazette of RM" no. 58/08)



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Legend

- P – Preliminary phase
- C – Construction phase
- O – Operational phase



ENVIRONMENTAL AND SOCIAL ASPECTS MANAGEMENT PLAN

Table 12 Environmental and Social Aspects Management Plan

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
PRELIMINARY PHASE					
SOIL MANAGEMENT					
1	Placement of mobile toilets along the alignment and concluding a Contract with authorized company that will undertake the silt and carry to the waste treatment plant.	Avoided soil and underground water contamination with coliform bacteria	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12, 147/13, 163/13, 156/15, 63/16, and all its amendments)
BIODIVERSITY MANAGEMENT					
1	Clearance of shrubs and vegetation, preparation of the alignment for the activities of rehabilitation	With purpose of preservation of the vegetative biodiversity (flora)	Before starting the realization of the construction activities	Contractor has the responsibility for the measure implementation	Law on protection of nature (Official Gazette of RM no. 67/04, 14/04, 84/07, 35/10, 47/11, 148/11, 56/12, 13/13, 163/13, 63/16, and all its amendments)



Environmental Management Plan (EiMP)
for the Repair and rehabilitation of state road R1205, section Krupishte - Prochishuj

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
1	Occupational safety and health plan at temporary and mobile construction sites	Decreasing the possibility of incidents	Before starting the process of rehabilitation of the subject section	Contractor has the responsibility to prepare and implement the Occupational safety and health plan Supervising Engineer has the responsibility to approve and to monitor implementer of the Occupational safety and health plan	Rulebook of minimal requirements for occupational safety and health at temporary and mobile construction sites (Official Gazette of RM no. 105/08)
CONSTRUCTION PHASE					
AIR MANAGEMENT					
1	Usage of standardized fuel for the mechanisation and switching off the mechanization (when it is not in usage)	Decreasing the exhaust gasses in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambiental air quality (Official Gazette of RM no. 67/04, 92/07, 47/11, 69/12, 100/12, 4/13, 163/13, and all its amendments)
2	Traffic speed limits within the so called temporary mobile construction sites	Decreasing the exhaust gasses in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authorities in the country (Representatives of the MIA) have the obligation for monitoring of the measure	Law on ambiental air quality (Official Gazette of RM no. 67/04, 92/07, 47/11, 69/12, 100/12, 4/13, 163/13, and all its amendments)



Environmental Management Plan (EMP)
for the Repair and rehabilitation of state road R1205, section Krupishte - Probishtip

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
3	The delivery of construction materials is to be done during the precisely established time intervals and with previously established plan and regime	Decreasing the exhaust gasses in the atmosphere	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on ambient air quality ("Official Gazette of RM" - no. 67/04, 92/07, 47/11, 59/12, 100/12, 4/13, 163/13, and all its amendments)
WATER MANAGEMENT					
1	Locations for storage of fuel, oil, or other liquid chemicals, shall be removed from the outlets to the surface waters.	Avoided contamination of surface and underground water	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waters ("Official Gazette of RM" no. 87/08, 608, 161/09, 93/10, 51/11, 44/12, 23/13, 163/13, 52/16)
WASTE MANAGEMENT					
1	Appropriate management with the generated communal waste at the location and its disposal with appropriate containers that afterwards shall be submitted to the legal/physical entity that possess permission for communal waste management	Proper approach towards the manner of waste management, realization of one of the key principles for feasible management of communal waste "Owner's Responsibility"	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management ("Official Gazette of RM" no. 68/04, 71/04, 107/07, 102/08, 134/08, 09/11, 123/12, 147/13, 163/13, 158/14, 63/16); and Rulebook of the general rules of communal and other types of non



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Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
2	Spreading of soil at the location of eventually spilled motor oil and disposal of the polluted soil by the legal/physical entity that poses permission for hazardous waste management	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 69/04, 71/04, 107/07, 102/08, 134/08, 08/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)
3	Regular vehicles and mechanization servicing during the construction works execution. The Service is to be executed at the authorized location of that purpose	Avoidance of eventually spillage of motor oil and/or gasoline	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation	Law on waste management (Official Gazette of RM no. 69/04, 71/04, 107/07, 102/08, 134/08, 08/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)
	If the Contractor has adequate equipment, it is recommendation of this Elaborate, recycling and reuse of the removed existing asphalt layers. If there is no such possibility, the removed asphalt is to be used for local roads and paths where necessary in cooperation with	Proper approach towards the manner of waste management	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RM no. 69/04, 71/04, 107/07, 102/08, 134/08, 08/11, 123/12, 147/13, 163/13, 158/15, 63/16, and all its amendments)



Environmental Management Plan (EMP)
for the Repair and rehabilitation of state road R1205, section Krupishka - Proshishka

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
SOIL MANAGEMENT					
1	Causes of the working activities during the uncontrolled spillages of fuel, oil, lubricants and chemicals, spreading of sand and disposal of polluted layer of soil, and is to treat the polluted material as hazardous waste	Decreasing the possibility of soil degradation and the soil biocoenoses	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RMF no. 68/04, 71/04, 107/07, 102/08, 134/03, 08/11, 123/12, 147/13, 163/13, 156/15, 63/16, and all its amendments)
2	Placement of mobile toilets along the alignment and concluding a Contract with authorized company that will undertake the fill and carry to the waste treatment plant	Avoided soil and underground water contamination with colyphorm bacteria	Before starting the realization of the construction activities and during the realization of the construction activities	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on waste management (Official Gazette of RMF no. 68/04, 71/04, 107/07, 102/08, 134/03, 08/11, 123/12, 147/13, 163/13, 156/15, 63/16, and all its amendments)
NOISE MANAGEMENT					
1	Unplugging the vehicles and structural mechanization motors when there is no need of their work performance of the construction activities – daily and with defined time dynamic Informing the population of the	Decreasing the noise and their impact to the environment	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer has the obligation for monitoring of the measure implementation	Law on protection of noise at the environment (Official Gazette of RMF no. 78/07, 124/10, 47/11, 163/13, and all its amendments) and



**Environmental Management Plan (EMP)
for the Repair and rehabilitation of state road R7205, section Krupishte - Probishtip**

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
	construction activities				Rulesbook of noise level limit values of the environment (Official Gazette of RMF no. 1-7/04)
BIODIVERSITY MANAGEMENT					
1	Usage of properly and regularly controlled construction mechanization	With purpose of decreasing the impacts of vibrations, noise and increased quantities of emission of exhaust gasses	Construction phase	Contractor has the responsibility for the measure implementation	Law on environment (Official Gazette of RMF no. 53/05, 81/05, 23/07, 19/08, 83/09, 48/10, 1-34/10, 81/11, 123/12, 93/13, 157/13, 42/14, 44/15) Law on protection of nature (Official Gazette of RMF no. 57/04, 14/06, 54/07, 35/10, 47/11, 148/11, 39/12, 13/13, 163/13, 63/14, and all its amendments)
RISK MANAGEMENT					
1	Placement of traffic signs for traffic speed limits and similar.	Decreasing the possibility of incidents	During the rehabilitation of the subject section	Contractor has the responsibility for the measure implementation Supervising Engineer and the competent authorities in the country (Representatives of the MoI) have the obligation for	Rulesbook on traffic signs (Official Gazette of RMF no. 58/08)



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for the Repair and rehabilitation of state road R1205, section Krupishte - Probishtip

Number	Description of the measure	Purpose of the measure expressed through mitigation of the impacts to the environment	Time schedule of the improvement plan realization	Responsibility	Lawful obligation
OPERATIONAL PHASE					
SOIL MANAGEMENT					
1	Regular following of the rain water flow, adequate waste management and maintenance of the by-road vegetation	Decreasing or avoidance of possible soil impacts	During the operational phase of the subject section	Investor has the responsibility for the measure implementation	Law on environment ("Official Gazette of RM" no. 53/05, 81/05, 24/07, 159/08, 63/09, 48/10, 124/10, 51/11, 123/12, 93/13, 187/13, 42/14, 44/15) Law on protection of nature ("Official Gazette of RM" no. 87/04, 14/06, 84/07, 35/10, 47/11, 148/11, 50/12, 13/13, 163/13, 63/16, and all its amendments)

