

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

“ELABORATION OF JOINT PROGRAMME FOR MANAGEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN CROSS BORDER REGION PIRDOP AND PALILULA”



March 2022



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Contents:

1. ABOUT THE PROJECT “JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”.....	3
2. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN PIRDOP MUNICIPALITY.....	5
2.1. General characteristics of the municipality of pirdop	5
2.2. Relief	8
2.3. Climate	9
2.4. Soil	9
2.5. Water courses	11
2.6. Water supply and sanitation	12
2.7. Condition of air	13
2.8. Noise, radiation and pollution	14
2.9. . Environmental protection investments by aurubis bulgaria at pirdop.....	15
3. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN PALILULA MUNICIPALITY.....	20
3.1. General characteristics of the municipality of palilula	20
3.2. Geographical position	21
3.3. climate	22
3.4. Water courses	23
3.5. Condition of air	30
3.6. Soil	38
3.7. Forests	40
4. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN CROSS-BORDER REGION BULGARIA-SERBIA	42
4.1. Natural heritage.....	47
4.2. Cultural heritage	48
4.3. Environment and resource efficiency.....	50
5. DEFINE THE OBJECTIVES OF THE PROGRAMME	58
6. DEFINE THE MEASURES FOR IMPROVEMENT THE QUALITY OF AIR, SOILS AND WATERS IN PIRDOP AND PALILULA.....	60

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Palilula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

1. ABOUT THE PROJECT “JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

The Interreg-IPA Bulgaria-Serbia Cross-Border Cooperation Program (www.ipacbc-bgrs.eu) was adopted by the European Commission and finances projects related to the development of sustainable tourism, youth and environmental protection in the border region of Bulgaria and Serbia. The cross-border region includes the Bulgarian districts of Vidin, Montana, Vratsa, Sofia, Pernik and Kyustendil, as well as the Serbian districts of Bor, Zajecar, Nisava, Toplica, Pirot, Jablanica and Pcinja. Eligible beneficiaries of the Program are local, regional and national institutions, agencies and bodies, protected area administrations, local / regional forest holdings, cultural institutions, non-governmental organizations, educational institutions - universities, schools, libraries, etc.



City Municipality of Palilula, City of Nis is a project partner in the project "Joint Initiatives for Nature Protection through Improving Air, Land and Water Quality in the Cross-Border Region", contract number RD-02-29-85, which is implemented in partnership with the municipality of Pirdop from Bulgaria.

The total budget of the project is 303,494.74 EUR of which 284,758.21 EUR are donation from the European Union, while 18,736.53 EUR is the participation of project partners in the project.

The main goal of the project is to point out the problem of environmental pollution in the cross-border region through joint activities, to encourage the importance of environmental protection, increase public awareness of the negative consequences for air, soil and water quality and to create preconditions for monitoring and prevention of natural disasters.



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Environmental protection is the basis for future development and sustainable growth of the cross-border region, so that the project implemented activities that promote the protection of nature and natural resources, namely:

1. Conducting of joint Conference “Public policies and long-term measures against the air pollution” in the municipality of Pirdop, Bulgaria
2. Supply of specialized equipment for improving the quality of air " in the municipality of Pirdop, Bulgaria
3. Organizing of joint Roundtable for discussing the problems and measures for improvement the quality of soils and water in the city municipality of Palilula, Serbia
4. Supply of equipment for maintenance of green infrastructure in the city municipality of Palilula, Serbia
5. Organizing of joint initiative “Think Green” in Pirdop and Palilula
6. Provision of joint training for capacity building of the local authorities of the partners in the city municipality of Palilula, Serbia
7. Workshop for exchange of good practices in the municipality of Pirdop, Bulgaria
8. Preparation of “Elaboration of joint programme for management of the quality of air, soil and water in CB region Pirdop and Palilula”

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

2. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN PIRDOP MUNICIPALITY

2.1. GENERAL CHARACTERISTICS OF THE MUNICIPALITY OF PIRDOP



Municipality of Pirdop is located in the central part of Bulgaria (Southwestern region of level 2) and occupies the eastern part of Zlatitsa-Pirdop valley, respectively enclosed in the north and south by Stara Planina and Sredna Gora, from the west and east by the mountain slopes of Koznitsa and Galabets. The town of Pirdop is administratively part of Sofia province. The village of Dushantsi also falls within the administrative boundaries of

Pirdop municipality. The area occupied by the municipality of Pirdop is 152,435 km², where the town of Pirdop has an area of 90,148 km² and the village of Dushantsi have 62,287 km².

The population of Pirdop municipality according to the latest data as of 31.12.2019 is 7236 people, of which 3476 men and 3760 women.

Municipality of Pirdop borders the municipalities of Koprivshtitsa and Panagyurishte to the south, the municipality of Zlatitsa to the west, the municipality of Teteven to the north and the municipality of Anton to the east, as can be seen from the map. The favorable geographical position of the municipality contributes to the good communication and transport connections that connect it with the neighboring municipalities, the capital and other major cities in Bulgaria. Through the territory of the municipality, from west to east passes a section of the route of the railway line Sofia - Karlovo - Bourgas from the Railway Network of Bulgaria with a length of 6.4 km. A section of 7 km

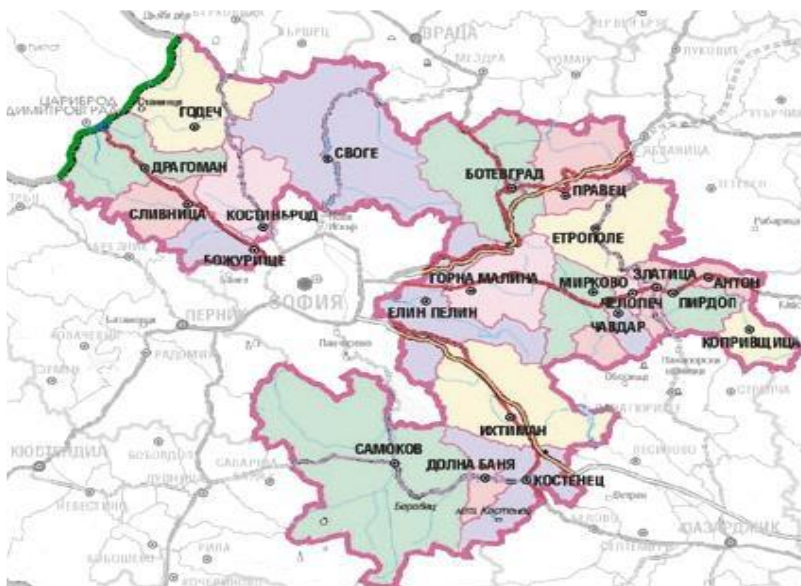
“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

of the Republican Road I-6 (from km 204.5 to km 211.5) of the Republican Road Network of Bulgaria passes through the municipality.

The strongest spatial and functional connections in a regional context are along the west-east axis, or the capital - the city of Burgas, along the so-called "Sub-Balkan Road" / first class road I-6.

It is important for the region and provides a sustainable backbone of the communication and transport system of the municipality of Pirdop and its neighbors Zlatitsa, Anton, Chelopech. The railway route Sofia - Karlovo - Burgas / Varna passing through the territory of the municipality also plays a key role in its spatial connectivity.

The territory of Pirdop municipality falls within the Srednogorska metallogenic zone, which is characterized by deposits of copper and industrial materials and the Panagyurishte ore region, which is characterized by deposits of copper and copper-pyrite ores (Chavdar - Pirdop) and is determined by the presence of Cu, Au, Mo. Around the Topolnitsa River there are technogenic dimensions of the relief in the form of inert materials, granite and gravel pits. There are no registered ore and non-ore deposits in the municipality.



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

The total area of Pirdop municipality is 15250.10 ha, which represents 2.2% of the territory of Sofia district. The urbanized territory has a total area of 754.72 ha, representing 4.9% of the total area of the municipality. The land of the municipality of Pirdop occupies 59.2% of the territory of the municipality, and that of the village of Dushantsi - 40.8%. Forests with their area of 9077.12 ha or 59.52%, occupies the largest part of the municipality.

The economic image of the municipality of Pirdop is determined by private business and the majority of the population in the municipality receives employment in this area. The town of Pirdop is a center of honey production. In the northwestern outskirts of the city is located a copper mining plant privatized in 1997 by (Union Minier -> Cumerio -> Aurubis Bulgaria). Aurubis Bulgaria AD is the largest copper mining company in Southeast Europe and the third largest company in Bulgaria. The potential for agricultural development in the territory is relatively small, as determined by many factors.

The main limiting factor is the relief and climatic features of the municipality of Pirdop. The territories in the northern part of the municipality reach over 1520 m above sea level, for the most part they are high mountain pastures. Another factor limiting the intensification of agriculture in the municipality of Pirdop is the fragmentation of land and the presence of large slopes.

Regarding the tourism sector, the municipality of Pirdop has significant potential for development. At the moment on the territory of the municipality is developed mainly one-day tourism, but efforts are being made to develop the tourism sector in all aspects. All forms of alternative tourism have a basis for development. The development of the industry will lead on the one hand to new opportunities for development of small and medium business in the municipality, job creation, promotion and use of local natural resources. On the other hand, significant investments are needed to improve the surrounding infrastructure and the tourist sites are marketed properly.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

2.2. RELIEF



The territory of Pirdop municipality falls within the Stara Planina, Trans-Balkan valleys and Sredna Gora and occupies the eastern part of the Zlatitsa-Pirdop valley area. The relief is characterized by hilly-low mountain to mid-mountain and high Sub-Balkan fields. It is closed from the north by the Balkan Mountains, on the south by the

slopes of Sredna Gora, and east – west by the thresholds of Koznitsa-Galabets. The minimum altitude for the municipality of Pirdop is 595 m, the average altitude is 1429 m and the maximum altitude is 2024 m. The flat part of the territory of the municipality is suitable for the development of agricultural and other economic activities. The distribution of vegetation and animal species depends on the soil, climate and other natural conditions. Despite the small area of Pirdop municipality, it has a favorable ecological environment allowing the unique fauna to develop and reproduce, which creates favorable conditions and opportunities for development of hunting and other tourism. The favorable development of the flora in the municipality of Pirdop depends on the climatic conditions, the soil cover and other natural conditions. The forest fund largely determines the climatic situation in the municipality, helps to limit erosion processes on the soil cover and regulates the water regime of rivers. Forests play an important role and are of great importance for the realization and development of tourism and recreation of the population in the municipality of Pirdop.

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

2.3. CLIMATE

The relief and the altitude determine the climatic situation in the municipality of Pirdop. Territories above 1000 m above sea level are characterized by a mountainous climate, and below 1000 m above sea level the climate is defined as temperate continental. The Mediterranean climatic influence is deterred by Sredna Gora, and the Balkan Mountains serve as a climatic border and prevent the penetration of winds coming from the north. The climate is characterized by cool summers, relatively mild winters, sunny autumns and relatively rainy springs. The annual temperature amplitude of the air is 22.2 ° C, the average annual air temperature is 9.3 ° C and the minimum annual air temperature is -28.4 ° C. The precipitation regime is characterized by summer precipitation maximum and winter precipitation minimum. The microclimate is favorable for the development of agriculture and tourism.

2.4. SOIL

In the territory of Pirdop municipality the soil cover is diverse. The typical types of soils for the territory of the municipality are:

- brown forest soils - dark, transitional and light, cover large areas in the municipality; suitable crops for growing: potatoes, annual fodder crops, meadows and fiber flax;
- cinnamon forest soils also occupy a large part of the municipality, suitable crops for growing: wheat, corn, oats, barley and some fruit species;
- alluvial soils - distributed around rivers; suitable crops for growing: orchards, strawberries, corn and vegetables;
- mountain meadow soils are spread on the ridge of Stara Planina, they are rich in organic matter and with a well-formed turf.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Intensive erosion processes have not been found on the territory of Pirdop municipality, despite the predominant dismembered mountainous character of the terrain, with the exception of the lands above the town of Pirdop. This is mainly due to the large afforestation of the area and the good soil and climatic conditions. In places in the lower parts of the municipality on steep, mainly



southern and western slopes with small forest cover, surface erosion has developed. Streamline and ravine erosion are rare. In the last 15-20 years a number of measures have been taken to stop the erosion processes (afforestation, weather barrage fortifications, etc.).

The quality of soils and their good ecological condition is a major factor in environmental protection. To a large extent the presence of Cu, Zn, Cd, As in the soils on the territory of Pirdop municipality is determined by the activities in the industry. In some places on the territory of the municipality the degradation of lands and soils (acidity, salinization) is relatively strong. For this reason, the municipality of Pirdop is carrying out activities to improve the soil layers.

Possible measures to reduce soil pollution include: the use of biofertilizers, which help increase soil fertility; promoting the use of herbicides that do not have a negative effect on soils; pre-treatment of toxic waste to minimize its toxicity before disposal. Waste recycling is also one of the factors contributing to reducing soil pollution as well as reducing the use of single-use plastic products. Organic farming also contributes to protecting soils from pollution.

Soil erosion is also a problem in soil protection. Taking measures to prevent it is also part of the soil protection process. Modern approaches to soil protection often include measures such as the construction of modern facilities for wastewater treatment, waste gases and others. Among the recommended measures is the optimization of the norms for fertilization and watering according to

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Palilula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

the modern requirements and good practices, as well as the application of little waste or non-waste technologies in industry and agriculture and others.

2.5. WATER COURSES

The territory of Pirdop municipality is located in the catchment area of the river Topolnitsa springing from Sredna Gora. The main tributaries of the Topolnitsa River are the Pirdopska River, the Chelopesha River and the Zlatishka River, which spring from the Balkan Mountains.

The rivers Debelska, Topolnitsa, Slavtsi, Manjarin, Kufarita and the river Manina pass through the territory of Pirdop municipality. The rivers Slavtsi, Selska, Buzola and Manjarin flow through the central part of the town of Pirdop, and the rivers Pufte and Odzhov dol flow through the northwestern part of the village of Dushantsi.

Measures have been taken to prevent the risks of floods from the Slavtsi, Madjarin, Buzola and Selska rivers in the town of Pirdop and the Odzhov dol and Pufte rivers in the village of Dushantsi through grants under the Operational Program "Growing Regions".

The dams "Dushantsi" and "Zhekov vir" are located on the territory of Pirdop municipality, which are used mainly for industrial needs. The settlements in the municipality of Pirdop are supplied with drinking water from captured springs and the quantitative norms of the water for drinking are sufficient to meet the household and industrial needs of the population in the municipality.

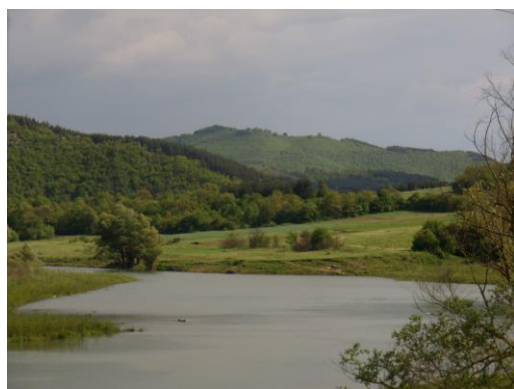
The condition of surface and groundwater depends on the concentration of urban areas and industrial activities, as well as the degree of construction of sewerage and treatment infrastructure. The hydrographic network in the municipality is formed by the larger rivers Slavtsi, Topolnitsa and others.

The sources of pollution in the valley of the river Topolnitsa are from industrial waters from the production companies on the territory of the municipality and released domestic water from the sewers of the town of Pirdop and the village of Dushantsi. As a result, the waters are variable PH, As and others. type of organic pollutants. To improve the quality of drinking water in both

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

settlements of the municipality, measures have been taken to build treatment facilities in accordance with regulatory requirements. To ensure the successful completion of the launched projects, it is necessary to provide own financial resources for the financing of the activities up to the stage of reimbursement of the EU programs.

2.6. WATER SUPPLY AND SANITATION



The Pirdop-Zlatitsa region is located in the catchment area of the Topolnitsa River, which springs from Sredna Gora and flows south to the Plovdiv lowlands. The main tributaries of the Topolnitsa River are the Pirdop, Zlatishka and Chelopeska rivers. Drinking water for the population in the region is provided by gravity from mountain catchments built on the southern slopes of Stara Planina.

The rivers Topolnitsa, Debelska, Manjarin, Slavtsi, Manina and Kufarita flow through the territory of the municipality. Dushantsi Dam is built on the Topolnitsa River above the village of Dushantsi, its waters are used for industrial needs and also serve the production of Aurubis Bulgaria AD. In recent years, the water intake of the Kufarita River has been reconstructed for water supply.

The construction of the sewerage network for wastewater in the town of Pirdop began in 1962, when the first projects were prepared. In May 2012, construction began under the Operational Program Environment 2007-2013. for reconstruction of the sewerage network and replacement of accompanying water supply systems, representing 50% of the water supply network of the town of Pirdop and the village of



Pirdop wastewater treatment plant

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Dushantsi. Facilities built under "Integrated Water Projects" for the Town of Pirdop and the village of Dushantsi have been put into operation, including WWTPs with off-site facilities and networks, completed and reconstructed sewerage network and reconstruction of the accompanying water supply network. Pirdop and the accompanying water supply network has been replaced. The existing concrete sewer pipes have been replaced with new polypropylene ones. To drain the surface water, a new rainwater sewerage network has been built with overflow shafts in sections where the sewerage will be of mixed type. The water supply system accompanying the sewerage network was replaced.

The total length of the reconstructed and built routes is 32,000 meters. The integrated water project contributes to improving the quality of drinking water, reducing its losses and improving the state of the environment.

2.7. CONDITION OF AIR

The air quality in the municipality of Pirdop is determined primarily by the sources of harmful substances (emitters) located near it. They can be divided into 3 groups.

- Large industrial sources:

Aurubis Bulgaria AD - Pirdop (powder; heavy metals - Cu, As, Pb, Cd; sulfur dioxide; sulfuric acid mist - sulfur dioxide and sulfur trioxide; nitrogen oxides; CO; CO₂; hydrogen sulfide);

Tailings facility, owned by Eco Medet, Assarel Medet, given on concession to MBS - Sofia (unorganized dust emissions);

- Fuel and production processes in small industrial enterprises and in everyday life;
- Road transport.

The location of several large sources of harmful emissions into the atmosphere in the relatively small valley makes it a "hot spot" in terms of pollution. The air monitoring carried out in the region shows that the concentration of sulfur dioxide and dust in the atmosphere often exceeds the standards approved in Bulgaria.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

The greatest pollution with dust, sulfur dioxide and heavy metals is observed in the northern part of the valley, due to the specifics of the geographical location. Excessive use of solid fuels for heating homes is one of the main sources of air pollution, especially in adverse weather conditions. The increase in traffic flows, the aging and wear and tear of a large proportion of motor vehicles are an unfavorable prospect for the deterioration of the environmental performance of the air in the areas adjacent to the roads.

To improve air quality, action needs to be taken to provide a new energy source for industry, the public sector and household.

2.8. NOISE, RADIATION AND POLLUTION

On the territory of the municipality of Pirdop the radiation situation is monitored by the local structure of the Civil Protection. Beta and gamma radiation measured in P / h are measured twice a day. The normal gamma background for Bulgaria is about 0.030 mR / h. For the town of Pirdop the readings vary from 0.020 to 0.022 mR / h. There are no data on non-ionizing radiation and impact on humans and the environment.



Waste collection

The generation of household waste depends on the place of waste generation and the standard of living of the population and varies by season. In total for the territory of the municipality about 5450 tons of waste are generated annually. The relative share of glass, plastic and paper waste is 40% of the total volume of waste generated. The generated construction waste is about 950 tons per year. The waste collection system has covered the entire territory of Pirdop municipality. Garbage collection in the municipality of Pirdop is carried out by a municipal unit based on determined schedule.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Municipal solid waste is disposed at a landfill for solid waste, which was put into operation in 1986. The landfill was built in accordance with the requirements of the then regulations and currently has overfulfilled capacity. A project on technical assistance for closure and recultivation of a municipal landfill, located in Sulumanitsa, as well as conducting morphological analysis of municipal waste generated in the municipality of Pirdop is underway.

On 30.10.2020 the project “Implementation of a demonstration project for waste management on the territory of Pirdop municipality has started. The project has a total value of BGN 373,307.69 and will be implemented for a period of 23 months. The activities in the project proposal are aimed at preventing the generation of municipal waste and separation of waste.

One of the largest projects in the Srednogorie region has started in January 2021. Project "Construction of a composting plant and an installation for pre-treatment of municipal waste in the municipality of Zlatitsa for the municipalities of Zlatitsa, Anton, Koprivshitsa, Mirkovo, Pirdop, Chavdar and Chelopech. Successfully constructed composting installation and installation for pre-treatment of municipal waste was implemented by the Municipality of Zlatitsa, in partnership with the municipalities of Anton, Koprivshitsa, Mirkovo, Pirdop, Chavdar and Chelopech.

2.9. ENVIRONMENTAL PROTECTION INVESTMENTS BY AURUBIS BULGARIA AT PIRDOP



Aurubis Bulgaria is the largest copper producer in southeastern Europe and the second largest company in Bulgaria which has its production in Pirdop municipality. Since the Pirdop site was officially opened in 1958, mainly copper anodes, copper cathodes, and sulfuric acid have been produced from primary raw materials.



**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

In the last two decades, the plant has been converted into a highly modern, environmentally friendly operation. For example, following the plant's privatization in 1997 and acquisition by Aurubis in 2008, over € 600 million has been invested so far in modernizing the processes and improving the environmental performance of the site.

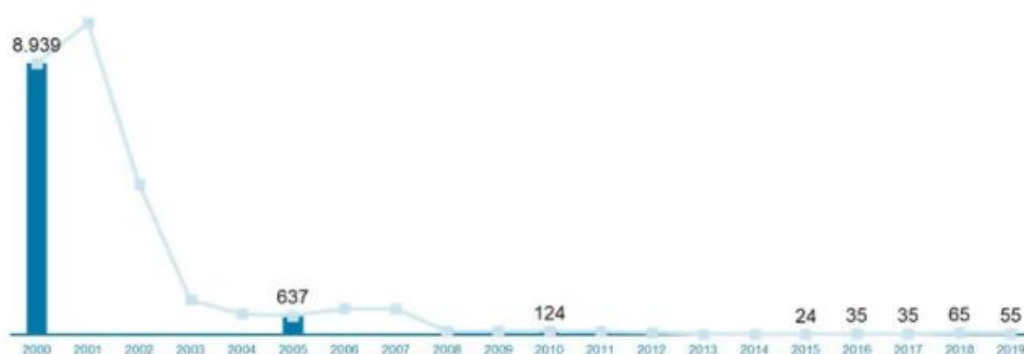
Because improving environmental protection remains a very important objective, about 20 % (€ 35.5 million) of all investments at the site in the last five years have been allocated to environmental protection projects.

In the course of the extensive modernization, three significant, state-of-the-art environmental protection facilities have been built in the last several years.

In November 2014, a new rainwater treatment plant was commissioned. The facility treats rain and drainage water from the 4 km² plant premises in order to continue reducing emissions to water (link: see water emissions graphic).

A new additional treatment system for secondary hood off-gases has been in operation since March 2016. The new system utilizes a modern procedure known as Sulfacid technology, which is unique in Bulgaria and in the entire copper smelting industry. In addition, a new converter slag cooling optimization project (using ladle/pot cooling instead of the pit cooling) was introduced and commissioned in the beginning of 2020. This project will continue in the coming years to also optimize the flash smelter furnace slag cooling process. This new facility further reduces the sulfur dioxide emissions and fugitive emissions from the smelting processes.

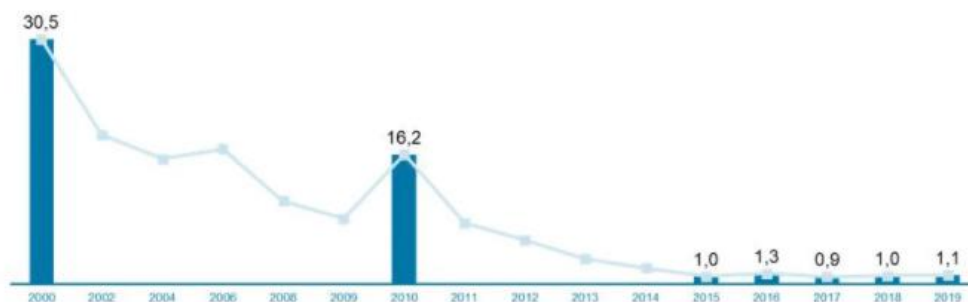
“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”



Dust emissions per ton of copper output have been reduced by 99.4 % since 2000.

Key factors in the reduction of dust and SO₂ emissions include:

- a number of modernizations in both lines of the Sulfuric Acid Plant (2001-2014)
- the replacement of the heavy oil dryer with a steam dryer (2001-2002)
- the first (conventional) off-gas cleaning system for secondary hood off-gases (2007)
- the new additional (Sulfacid) off-gas cleaning system for secondary hood off-gases (2016).
- the new facility for cooling converter slag in pots (2020)

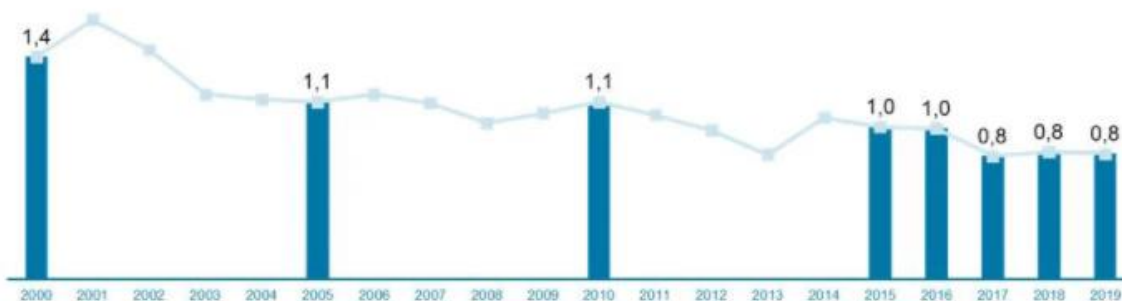


The specific metal emissions to water per ton of copper output have been reduced by 96,5 % since 2000.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Key factors in the reduction of metal emissions to water include:

- the commissioning of the second and third stages of the treatment plant for industrial wastewater (2005-2006)
- the modernization of the wastewater system for acidic wastewater (2006-2008)
- the modernization of the wastewater systems for domestic sewage (2010-2011) and rainwater (2012-2013)
- the commissioning of the rainwater treatment plant (2014).
- the commissioning of a new sand bed filter unit in the industrial wastewater treatment plant (2020)



The specific CO₂ emissions per ton of copper output have been reduced by 43 % since 2000.

Key factors in the reduction of CO₂ emissions include the following projects (examples):

- change of fuel burners in the anode furnaces to increase efficiency
- installation of a steam turbine to produce electricity from waste heat

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

- changes in process control to optimize electricity consumption

In the future, the planned gasification of the Pirdop plant and the installation of a solar power plant will contribute to further reduction of CO₂ emissions.



SO₂ emissions per ton of copper output have been reduced by 95 % since 2000.

3. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN PALILULA MUNICIPALITY

3.1. GENERAL CHARACTERISTICS OF THE MUNICIPALITY OF PALILULA



The city municipality of Palilula is one of the five city municipalities of the city of Nis, established on September 2004. It is located in the southern part of the city of Nis and includes the narrower part of the city on which 15 rural settlements lean. The city municipality of Palilula is a natural-geographical combination of lowland, in the Nisava and South Morava basins and hilly-mountainous relief at the foot of Selicevica mountain.

<i>Area (km²)</i>	<i>117,2</i>
<i>Population according to the 2011 Census</i>	<i>73.801</i>
• <i>urban part</i>	<i>54.597</i>
• <i>rural part</i>	<i>19.204</i>
<i>Number of settlements</i>	<i>15</i>
<i>Number of households according to the 2011 Census</i>	<i>24.777</i>
• <i>urban part</i>	<i>18.894</i>
• <i>rural part</i>	<i>5.883</i>

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

<i>Average number of household members</i>	2,97
<i>Adult population</i>	60.363
<i>Average age of the population (years)</i>	42,59
<i>Population density (population / km²)</i>	619
<i>Natural increase rate</i>	-7

The area of the municipality is 117.37 square kilometers, and according to the 2011 census, it has a population of 73,801, of which 54,597 live in urban areas and 19,204 in rural areas.

Neighboring municipalities are: City municipalities of Mediana, Niska Banja and Crveni Krst than Gadzin Han, Doljevac and Merosina.

The municipality of Palilula is primarily a residential settlement with basic public services, however, for all others, primarily communal services, the citizens of Palilula are referred to the services and institutions of the City Administration of the City of Nis.

3.2. GEOGRAPHICAL POSITION

The area of the City municipality of Palilula stretches between the plain part in the basin of the rivers Nisava and South Morava in the southwest and the hilly-mountainous part at the foot of the mountain Selicevica in the east. The lowest point is located in the area of the village of Lalinac and rises 178 m above sea level, and the highest 698 m above sea level in the village of Berbatovo on the slopes of the mountain Selicevica.

The urban part of the City municipality of Palilula stretches from east to southwest and is located at an average altitude of 190 m. Urban settlements stretch from a narrow flat area to the surrounding hills.

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

3.3.CLIMATE

City municipality of Palilula has a temperate-continental climate, characterized by warm summers and moderately cold winters. According to the data of the Republic Hydrometeorological Institute of Serbia in 2020, on the territory of the CSO Palilula, the average annual temperature was 11.78 ° C. The warmest month was July with an average temperature of 22.49 ° C, and the coldest December with an average daily temperature of -1.11 ° C.

On the territory of the Palilula, according to the data of the Republic Hydrometeorological Institute of Serbia, an average of 567.25 mm of rain and snow per square meter fall annually. In 2020, the total amount of precipitation was 751.52 mm / m², or 62.62 mm / m² on average per month. The highest precipitation was in May 93.33 mm / m², and the lowest in December 10.45 mm / m².

There are 123 rainy days and 43 snowy days a year.

The total amount of precipitation varies in somewhat regular cycles, however, the distribution of precipitation during the year has changed a lot, so in the previous decade it was noticed that it often happens that a large amount of precipitation falls in a given month, which often causes torrential floods that after causing great damage to agricultural production and turbidity of drinking water sources.

The average annual humidity in Nis is 70.4%, the highest in January (80.0%) and the lowest in August (61.9%). The average annual cloud cover of the wider area of the city is 5.7% of the sky coverage with clouds, the highest cloud cover is in winter, and the lowest during summer. According to the values of annual frequencies, wind directions and silences, it can be concluded that the highest frequency of occurrence in the wider area of the city of Nis has silences (S), which are represented by 29.7%. The most frequent winds are from the northwest (NW) with 11.2%, which occurs most often in summer (24.2%) and the least in autumn (14.8%), while the lowest frequency is southeast wind (SE) with 1.5 %. The highest mean wind speed occurs from the

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Palilula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

northwest direction NW (3.1 m / sec) and the lowest from the south (S) and southwest direction (WSW) (1.4 and 1.5 m / sec).

3.4. WATER COURCES

The territory of the city municipality of Palilula is bounded by two larger rivers: South Morava and Nisava. The municipal area is also characterized by a number of rivers (Gabricovačka river, Suvodolska river ...), streams, and torrents with constant and occasional river flows.

South Morava flows through its natural riverbed in the length of about 14,000 m in the administrative area of the City Municipality of Palilula. It has the characteristics of a typically lowland river with numerous meanders and reefs, relatively poor in water. South Morava belongs to the III real class of watercourse quality. The maximum flows of the South Morava occur in March as a result of melting snow, and the minimum in August due to small amounts of precipitation during the summer and high evaporation due to high temperatures.



In its lower course, the river Nisava flows through the area of the Palilula in the length of about 13,600 m. The hydrological characteristics of the Nisava are defined by the flow of small and large waters. Nisava belongs to the II / III real class of watercourse quality. It is important in the hydrography of this area, both for drainage of atmospheric and industrial waters and for water supply and land irrigation.

Most of the arable fertile land of the Palilula is located in the basin of these two rivers, and at the same time there are 10 rural settlements with about 15,000 inhabitants.



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Also, groundwater is the most important resource for irrigating agricultural land. On the territory of Palilula, most of the groundwater is located in the wider zone of alluvial plateaus along the South Morava and Nisava, together with narrow coastal belts.

Groundwater pollution usually takes place in several ways: leaching of hazardous and harmful substances from traffic areas, runoff from unregulated and illegal landfills formed in most cases near watercourses or in the immediate vicinity of settlements, discharge of wastewater from households and small industrial plants into culvert devices for receiving these waters or spilling them on the ground or discharging directly into watercourses and infiltrating polluted surface waters into the subsoil along rivers and streams, which adversely affects the living world in the flow and biodiversity in the immediate vicinity of watercourses.

On the profiles of hydrological stations on the rivers South Morava, Nisava, the characteristic parameters of water quality mostly exceed the normative values, and are most often in class III, but are often categorized "out of class" (the reason is inadequate wastewater treatment and discharge of various pollutants). Dry residue levels are variable but differ significantly. The levels of suspended solids are variable and occasionally exceed the limit values. Acidity (pH) and nitrate and phosphorus levels are generally not alarming.

The use of pesticides and fertilizers in agricultural areas is limited due to the economic situation of farmers. Increased activity can lead to increased use of pesticides, with a negative impact on groundwater quality. Groundwater quality is generally satisfactory.

Table - Test results of the Nisava River - sampling on September 16, 2021.

Parameter	Unit of measure	Prescribed MDK values *					Nišava 300 m downstream from wastewater collectors
		I class Excellent ecological status	II class Good ecological status	III class Moderate ecological status	IV class Poor ecological status	V class Weak ecological status	

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

							O-354
Water temperature	°C						14.0
Noticeable color							without
Basic parameters							
pH		6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	<6.5 ili >8.5	7.7
Suspended substances	mg/L	25	25	-	-	-	<25
Oxygen - least	mgO ₂ /L	8.5	7	5	4	<4	9.4
Oxygen saturation	%sat.	70-90	50-70	30-50	10-30	<10	91.4
BPK ₅	mgO ₂ /L	1.8	4.5	7	25	>25	2.3
HPK	mgO ₂ /L	10	15	30	125	>125	<10
Total organic carbon (TOC)	mg/L	2	5	15	50	>50	1.6
Nutrients							
Total nitrogen	mgN/L	1	2	8	15	>15	6.85
Nitrates	mgN/L	1.5	3.0	6	15	>15	6.4
Nitrites	mgN/L	0.01	0.03	0.12	0.3	>0.3	0.069
Ammonium ion	mgN/L	0.05	0.1	0.6	1.5	>1.5	0.25
Total phosphorus	mgP/L	0.05	0.20	0.4	1	>1	0.102
Orthophosphate	mgP/L	0.02	0.1	0.2	0.5	>0,5	0.313

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

s							
Salinity							
Chlorides	mg/L	50	100	150	250	>250	11
Residual chlorine	mg/L HOCl	0.005	0.005	-	-	-	<0,10
Sulfates	mg/L	50	100	200	300	>300	25.7
Total mineralization	mg/L	<1000	1000	1300	1.500	>1.500	361
Electrical conductivity on 20°C	mS/cm	<1000	1000	1500	3.000	>3.000	602
Total hardness	mg/L						272
Parameter	Unit of measure	Prescribed MDK values *					Nišava 300 m downstream from wastewater collectors O-354
		I class Excellent ecological status	II class Good ecological status	III class Moderate ecological status	IV class Poor ecological status	V class Weak ecological status	
Organic substances							
Phenolic compounds	µg/L	<1	1	20	50	>50	<0.1
Total hydrocarbons	µg/L						2
Surface active substances	µg/L	100	200	300	500	>500	<0.03

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Metals							
Arsen	µg/L	<5	10	50	100	>100	<1
Bor	µg/L	300	1000	1000	2500	>2500	<140
Copper	µg/L	5 (T=10) 22 (T=50) 40 (T=100) 112(T=300)	5 (T=10) 22 (T=50) 40 (T=100) 112 (T=300)	500	1.000	>1.000	<10
Zinc	µg/L	30 (T=10) 200 (T=50) 300(T=100) 500(T=500)	300 (T=10) 700 (T=50) 1000(T=100) 2000(T=500)	2000	5.000	>5.000	<10
Chrome	µg/L	25	50	100	250	>250	<2
Iron	µg/L	200	500	1000	2.000	>2.000	1260
Manganese	µg/L	50	100	300	1.000	>1.000	176
Lead	µg/L						<1
Cadmium	µg/L						<0.5
Nickel	µg/L						<1
Bacteriological testing							
Total coliform bacteria	cfu/100 ml	500	10 000	100 000	1.000.000	>1.000.00 0	33.500
Fecal coliform bacteria	cfu/100 ml	100	1 000	10 000	100.000	>100.000	4.850
Intestinal enterococci	cfu/100 ml	200	400	4 000	40.000	>40.000	524

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Aerobic heterotrophic bacteria	cfu/1 ml	500	10 000	100 000	750.000	>750.000	
---------------------------------------	----------	-----	--------	---------	---------	----------	--

Table - Results of testing the quality of the river South Morava - sampling 16.09.2021.

Parameter	Unit of measure	Prescribed MDK values *					South Morava behind the Dakom O-341
		I class Excellent ecological status	II class Good ecological status	III class Moderate ecological status	IV class Poor ecological status	V class Weak ecological status	
Water temperature	°C						14.1
Noticeable color							without
Basic Parameters							
pH		6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	<6.5 ili >8.5	6.9
Suspended substances	mg/L	25	25	-	-	-	1
Oxygen - least	mgO ₂ /L	8.5	7	5	4	<4	9.9
Oxygen saturation	%sat.	70-90	50-70	30-50	10-30	<10	96.3
BPK₅	mgO ₂ /L	1.8	4.5	7	25	>25	2.7
HPK	mgO ₂ /L	10	15	30	125	>125	<10
Total organic carbon (TOC)	mg/L	2	5	15	50	>50	1.8
Nutrients							
Total nitrogen	mgN/L	1	2	8	15	>15	<2

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Nitrates	mgN/L	1.5	3.0	6	15	>15	2
Nitrites	mgN/L	0.01	0.03	0.12	0.3	>0.3	0.041
Ammonium ion	mgN/L	0.05	0.1	0.6	1.5	>1.5	0.25
Total phosphorus	mgP/L	0.05	0.20	0.4	1	>1	0.066
Orthophosphates	mgP/L	0.02	0.1	0.2	0.5	>0,5	0.202
Salinity							
Chlorides	mg/L	50	100	150	250	>250	15.5
Residual chlorine	mg/L HOCl	0.005	0.005	-	-	-	<0,10
Sulfates	mg/L	50	100	200	300	>300	19.3
Total mineralization	mg/L	<1.000	1000	1300	1.500	>1.500	190
Electrical conductivity on 20°C	mS/cm	<1.000	1000	1500	3.000	>3.000	312
Total hardness	mg/L						112

Wastewater from the city of Nis and the City Municipality of Palilula is drained through two city collectors into the river Nisava. The increased number of heavy rains for a short period of time and the local torrential floods that result from it, are a big problem for the city's sewage system. Industrial wastewater, as well as leachate from landfills, poses a threat to the ecological system and these problems should be solved by choosing the optimal pre-treatment for wastewater treatment and reducing it to the level of sanitary, which can be treated at the central plant.

Within various economic branches, one of the most significant causes of water pollution is inadequate sewerage infrastructure, ie collection and treatment of wastewater. Deterioration of water quality is also affected by agricultural activities, as well as floods. Waste from agricultural

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Palilula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

production is heavily loaded with nutrients, biodegradable organic carbon, pesticide residues and fecal coliform bacteria. Drainage of water from the barn is an extreme source of water contamination. Urban wastewater often contains high concentrations of organic carbon, phosphorus and nitrogen and may contain pesticides, toxic chemicals, salts, inorganic particles and pathogenic bacteria and viruses. Sediments consisting mainly of inorganic particles are leached into springs as a result of land cultivation, construction works, as well as demolition of buildings.

3.5. CONDITION OF AIR

Intensified energy use, population growth, as well as accelerated industrial development in recent decades have contributed to changes in air quality, which is not conducive to general health. The fact that the World Health Organization (WHO) estimates that 2 million people die every year as a result of air pollution tells us how important air quality is when it comes to human health. Of additional concern is the fact that indoor air can be up to 100 times more polluted than outdoor air. It is clear that we cannot escape the problem of poor air quality, but the fight to improve this important parameter for man is a challenge that needs to be faced with all available means.

According to the Environmental Protection Agency (SEPA), approximately 2.5 million people, or one third of Serbia's population, breathed excessively polluted air. These data should be taken with a grain of salt as insufficient availability of valid hourly data has been achieved within the national air quality monitoring network - 48% of stations have sent enough data. Most of the cities and municipalities that had excessively polluted air had a challenge in terms of particulate pollution, i.e. excessive concentrations of PM10 and PM2.5 particles, which are primarily caused by the use of solid fuel for heating in individual households and small heating plants.

Sources of air pollution can be classified into two groups: stationary sources and mobile sources. Stationary sources of pollutants in the City municipality of Palilula and generally in the City of Nis are:

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

- individual fireboxes in households,
- boiler rooms of JKP "Gradska toplana" Nis and
- individual boiler rooms in public institutions and companies, then industry and city landfill.

Mobile sources of pollution are vehicles that have internal combustion engines.

In the municipality, the sources of pollution are mostly artificial and superficially distributed. Heating and traffic have the largest share in air pollution.

In the municipality of Palilula, the number of vehicles has increased significantly in the last few years. The problem is that in our country as a whole, lower quality vehicles are used, which emit larger quantities of pollutants and vehicles that have been in use for a long time, often for over 20 years. The condition of the streets and roads is very bad, the roads are uneven, the streets are narrow, there is not enough greenery or adequate signalization, and all this additionally affects air pollution. The use of public transport is great, but it is impossible to reduce the use of passenger vehicles to move around the city, because public transport has neither the capacity nor the conditions to promote this type of transport.

Despite the reduced volume of production, the industry is also a significant source of air pollution. In some parts of the city, due to omissions in urban planning, there was an intertwining of the residential zone and industry.

According to all this, the biggest air pollutants in the municipality of Palilula are individual boiler rooms and fireboxes in public institutions and companies, households that use wood and coal of different origin and quality, as well as the city landfill. Also, numerous small and medium production processes contribute to air pollution in the municipality, such as bakeries, pizzerias, fast food stores, barbecues and kebab shops that use fossil fuels during their activities.

City municipality of Palilula has a very unfavorable geographical position from the aspect of maintaining the best possible and improving the existing air quality, since the entire surface of the built part of the city is located in a valley, which is closed on three sides by mountain and hilly massifs. As the speed and direction of winds significantly affect the spread of pollutants, and

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

during the year in the Nis area, the northwest wind usually blows, pollutants from the air are carried directly to the city part of the Nis valley. Nis has a moderate continental climate, with frequent temperature inversions that prevent vertical air flow. Therefore, the air quality in Palilula is often worse. Temperature inversions usually occur in the period from October to March. Then the vertical flow of emitted pollutants is difficult, the positive effects of solar radiation are reduced. As a result, smog occurs - a special type of air pollution. More than 100 days a year are days with fog and haze. All these characteristics (position in the valley, temperature inversion, little precipitation, frequent fog) affect the accumulation of pollutants in the air of the city municipality of Palilula.

According to the data obtained, the annual mortality rate from respiratory diseases in the municipality of Palilula has increased, and they state that vulnerable groups that can be affected by children of preschool and school age, the chronically ill, pregnant women and the elderly.

Air quality testing in Palilula has been performed for several years, systematically and in accordance with a special program, by the Institute of Public Health, Nis. The layout of measuring points and the choice of parameters was made in accordance with the identified sources of pollution, city zones and abiotic environmental factors (microclimate and orographic characteristics of the terrain).

In order for the data obtained from air monitoring to be used in exposure assessment, it is necessary to set measuring points at so-called "hot spots" that are directly next to large emitters of air pollution, as well as background locations to better determine the exposure of the entire population. Depending on the pollutant observed, it is necessary to cover a larger number of locations of different types in order to get a complete picture of the total exposure. The number of measuring points is never adequate because it is limited by the material possibilities of the program financiers.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

City municipality of Palilula	Measuring points			
	Palilula ramp	Railway station	Gabrovac village	Elementary school "Kole Rasic"
SO ₂ µg/m ³ /day	<4,0	<4,0	<4,0	<4,0
ЧАТ µg/m ³ /day	from 2 to 21	from 3 to 43	from 2 to 38	from 2 to 30
Sedimentary substances				
• Undissolved mg/m ³ /day				
-total	118	29	134	69
-ashes	96	11	111	50
- combustible	22	18	23	19
• • Diluted mg/m ³ /day				
- total	40	16	6	40
- ph	6,7	6,3	6,8	6,7
- SO ₄	8,4	4,7	9,3	11,0
- chlorides	< 3,6	5,2	<6,4	<3,7
- calcium	5,8	8,4	10,2	5,9
Total sediment	158	45	140	104

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

mg/m ³ /day				
Heavy metals in sediments				
- Tin Pb	<1,82	<2,62	<3,2	<1,83
- Cadmium Cd	<1,82	<2,62	<3,2	<1,83
- Nickel Ni	5,46	7,85	12,8	5,5
- Chromium Cr	2,62	2,62	35,2	<1,83

The measuring point Palilula ramp is located along the traffic intersection in the wider city center. Near the measuring point there is a bus station at a distance of 100 m and a railway at a distance of 300 m.

The mean annual (2020-2021) soot concentration was lower than the maximum allowable value and was 7.6 $\mu\text{g} / \text{m}^3$, the median was less than 6 $\mu\text{g} / \text{m}^3$, and the percentile C98 was 25 $\mu\text{g} / \text{m}^3$. Soot concentrations ranged less than 6 $\mu\text{g} / \text{m}^3$. In the examined period, one day (0.3%) had soot values higher than the daily maximum allowed value.

Table - Value of soot in the season and out of the season of heating by measuring points for the period June 2020 - May 2021.

Test period	Heating Season					Out of heating season			
	15.10.2020. – 15.04.2021.					01.06.2020. - 14.10.2020. 16.04.2021. - 31.05.2021.			
Measuring point	\bar{X}	C5	C98	% >GV	\bar{X}	C50	C9		
1 MEDIANA MK "Dusko Radovic"	32.2	15	138	27.5%	31.7	28	80	20.3%	

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

2	PALILULA Palilula ramp	7.5	<6	28	0.5%	7.7	<6	24	0.0%
3	CRVENI KRST Municipal building	6.7	<6	27	0.0%	6.9	<6	14	0.0%
4	PANTELEJ Elementary school "Čegar"	11.0	<6	49	1.6%	6.4	<6	12	0.0%
5	NIŠKA BANJA Health station	7.0	<6	20	0.0%	7.7	<6	19	0.0%

Test results of sediment and heavy metals (lead, nickel, cadmium and chromium) in sediment
Sedimentary substances or aerosediment are pollutants of organic and inorganic origin whose particles are larger than 10 25 $\mu\text{g} / \text{m}^3$, and their weight is deposited on the surface.

Concentrations of sediments change according to meteorological conditions. Lower concentrations are registered when there is atmospheric precipitation and increase in the summer months when the soil is dry and windy. The concentration of aerosediment is also affected by the way the streets and large areas are kept clean, as well as the greenery.

According to the Decree on conditions for monitoring and air quality requirements (Official Gazette of RS No. 11/10, 75/10 and 63/13), the monthly maximum allowed value of total sediment is 450 $\text{mg} / \text{m}^2 / \text{day}$. The maximum permissible value for total sediments at the annual level is 200 $\text{mg} / \text{m}^2 / \text{day}$.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Table - Total sedimentation substances ($\mu\text{g} / \text{m}^2 / \text{day}$) by months for the period June 2020 - May 2021.

No.	Measuring point	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	Проек
1	MEDIANA	81	27	25	17	26	10	32	10	21	73	87	12	28
	MK "Dusko Radovic"	0	6	2	9	8	4	5	1	7	1		2	9
2	MEDIANA	27	18	20	14	26	52	28	37	10	30	12	12	17
	National Theater	0	7	5	7	4		7		1	2	1	6	5
3	MEDIANA King Alexander Square	33	36	23	11	27	62	26	17	83	56	66	10	22
		6	2	4	7	5		9	3		9		7	1
4	MEDIJANA intersection Bul. Dr. Zoran Djindjic and st. Zetske	27	58	18	98	12	59	31	<3	36	26	53	18	15
		5		4		2		8	5		7		1	0
5	PANTELEJ intersection near the kindergarten "Bubamara"	28	32	14	10	21	85	75	<3	89	28	57	95	16
		0	7	9	5	1			5		2			0
6	PALILULA Palilula ramp	29	81	19	11	62	49	30	24	38	28	70	10	15
		8		4	9			0	9		0		4	4

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

7	CRVENI KRST	36	22	29	12	20	96	33	<3	75	35	14	21	22
	Faculty of Economics and Justice	7	3	6	8	1		9	5		9	9	9	3
8	NIŠKA BANJA	25	79	19	10	14	64	27	<3	41	21	10	11	20
	Kindergarten "Pahuljica"	1	0	1	4	8		1	5		7	2	2	8

The average annual (2020-2021) value of total sediments at the measuring point Palilula ramp was lower than the maximum allowed value and amounted to 154 mg / m² / day. Individual values per month ranged from 38 mg / m² / day (February) to 300 mg / m² / day (December). In the reporting period, all monthly values were lower than the maximum allowed value.

Traffic is a significant source of air pollution. During the operation of engines in vehicles and the movement of vehicles on a certain surface, a large number of pollutants are emitted into the air, among which the most important are: carbon monoxide, carbon dioxide, lead, ozone, nitrogen oxides, particles, sulfur dioxide, volatile organic substances and others.

Exhaust gases of motor vehicles were measured once a week at six measuring points, at a time of increased vehicle frequency. The sampling period was one hour. Sulfur dioxide and nitrogen dioxide were examined from the parameters.

The Decree on Conditions for Monitoring and Air Quality Requirements (Official Gazette of RS No. 11/10, 75/10 and 63/13) prescribes permitted concentrations of nitrogen dioxide for a sampling period of one hour. According to the Regulation, the limit value for nitrogen dioxide is 150 µg / m³. The annual limit value for nitrogen dioxide is 40 µg / m³.

According to the Decree on conditions for monitoring and air quality requirements (Official Gazette of RS No. 11/10, 75/10 and 63/13), the limit value for sulfur dioxide in a one-hour air sample is 350 µg / m³. The annual limit value for sulfur dioxide is 50 µg / m³.

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Palilula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

The average annual (2020-2021) concentration of sulfur dioxide at the measuring point Palilula ramp was lower than the limit value and amounted to 9.0 $\mu\text{g} / \text{m}^3$. The average annual concentration of nitrogen dioxide was lower than the limit value and amounted to 18.7 $\mu\text{g} / \text{m}^3$. All measured values of sulfur dioxide and nitrogen dioxide in the examined period were less than the prescribed values for the sampling period of one hour.

3.6. SOIL

Land protection is provided and achieved through the implementation of strategic, planning and land protection documents. Land protection is achieved by implementing measures and activities in the procedures of planning, management, use, monitoring and protection against pollution and degradation of land in order to preserve its natural properties and functions. The concept of land security is studied through five dimensions: land capacity for biomass production and provision of ecosystem services, current state of land modified by anthropogenic activities, then economically expressed land services in relation to health, environment and food production, social connection between land managers and land users and strategies for providing services and defining land security policies.

In March 2015, based on the program of systematic monitoring of land quality, the Directorate for Economy, Sustainable Development and Environmental Protection of the City of Nis conducted an examination with a final report on land quality, both throughout the city and in the City Municipality of Palilula.

Land is one of the most important natural resources and is an invaluable asset to all of humanity, not one generation, group or individual. Land degradation can be defined as a set of processes caused by human activity, which reduce the current and future potential of land. Once the functions and quality of the soil are impaired, regeneration can be very long, difficult and expensive. The soil is a thin loose surface layer of the earth's crust formed by long-term interaction of the parent rock (geological base), climate (macro, meso and micro-climate) and living beings (plants, animals and

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

microorganisms). It is one of the conditionally renewable resources due to the long-term processes of origin and development. The soil is characterized by fertility, ie the presence of substances (water, minerals and organic matter, oxygen) that are necessary for the growth and development of plants; the land provides about 90% of food for humanity and is a condition for the survival of the living world on earth. For that reason, it is necessary to maintain its functions and quality. In order to protect and preserve the properties of the soil and prevent its degradation, the following parameters are controlled, ie. their presence in the land itself:

- Total nitrogen
- Phosphorus
- Total organic carbon
- RSV and RAS
- Pesticides
- Heavy metals

On the territory of the City municipality of Palilula, the monitoring of the quality control of the land was done, by testing at 14 measuring points. It is mainly about examining non-agricultural land, especially around and inside schools, kindergartens, high-frequency roads, as well as in front of larger residential and business buildings.



Based on the examined parameters and the obtained results, it is concluded that the sampled soil at certain measuring points contains concentrations of heavy metals above the level at which sustainable soil quality has been achieved, which indicates a certain degree of degradation. On the other hand, these measured concentrations are much lower than the

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

values that indicate that the basic functions of the soil are endangered (remediation values). However, what indicates that the quality of land (non-agricultural) in the City Municipality of Palilula is relatively good is that most of the measured values are the concentration of tested parameters below the limit values, remediation values and values that may indicate significant contamination prescribed by the System Monitoring Program soil quality, indicators for assessing the risk of land degradation and methodology for developing remediation programs.

3.7. FORESTS



The territory under the forest of the Palilula is 2,630 ha, and the degree of coverage overgrown with forest vegetation is about 22% of the total territory. Over 90% of forests are deciduous, and the rest are conifers.

Forests have a very important function in improving the quality of the environment and preserving biodiversity, as the most dominant type of green areas in the territory of the City Municipality of Palilula.

Of the total area of forests and forest land, about 7% of forest land is covered by planned use and management through the state sector. Forests are mainly distributed on lands of V to VI quality class of land. Preserved and more stable forests are located mainly along the perimeter of urban units and they form a valuable protective, exploitation and sanitary zone. Uneven representation of forest complexes in cadastral municipalities is a significant problem in terms of improving air quality and the environment in general. Thus e.g. The cadastral municipality of Bubanj has the least forest in relation to the total area, and the main forest complexes are located in the hilly and mountainous zone, in the southeastern part of the municipality of Palilula, on the slopes of Suva planina, within the cadastral municipalities of Berbatovo, Vukmanovo, Gabrovac and Donje Vlase. The importance of forests for the inhabitants of Palilula is shown by the fact that the municipality has an average of

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

5 m² per inhabitant of landscaped green areas, while it is estimated that a minimum value of 12 m² per inhabitant is necessary. It is necessary that the increase of forest complexes takes place at an average annual rate of 3-5%, and it is planned that the planting of new forests will be carried out on neglected and overgrown agricultural lands of lower categories.

The largest % of green areas on the territory of Palilula is the Memorial Park "Bubanj" with a total area of about 50 ha, city park areas (Railway Station, Court of Appeals, Ice Rock ...) and inter-block greenery. The maintenance of these areas is the responsibility of JKP "Mediana". There is a constant tendency to increase green areas in urban areas, but this is limited by various factors. On the territory of the City municipality of Palilula, the protected area is the Monument of Nature "Lalinačka slatina, Monument of Nature since 2015 with an area of 251 ha and is under the jurisdiction of PE" Directorate for Construction of the City of Nis "Nis, and since 2003 the Monument of Nature elm tree "Novoselski elm" located on the territory of the settlement "9. May ". The watercourse and the coastal belt of South Morava, which is included in the List of Ecological Corridors of International Importance, have been entered in the international lists of importance for nature protection.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

4. PREVIEW OF THE BACKGROUND RELATED WITH THE NATURAL RESOURCES IN CROSS-BORDER REGION BULGARIA-SERBIA

The border area between Bulgarian and Serbia covered by this Neighbourhood Programme is situated in the South–Eastern Europe, in the center of the Balkan Peninsula. It borders to the north with Romania and to the south with the Republic of North Macedonia.



More than half of the territory is hilly or mountainous. The mountainous border area is characterized by a clean and preserved natural environment. The Stara Planina (Balkan mountain range), an extension of the Carpathian mountain range, is characterized by its natural potentials and biodiversity, useful for the development of agriculture, energy and tourism. The principle river draining both countries is the Danube River (representing also northern borders of the both

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

countries with Romania). Other important rivers that cross the border area are Nišava, Timok, Erma, Struma, Ogosta and Lom. The relief on the Bulgarian side of the border is characterized by great diversity due to the presence of several other mountains (Rila, Verila, Konyavska and Zemenska mountains, the border mountains of Osogovo and Vlahina, as well as Vitosha and Lyulin near the capital of Sofia), as well as numerous plains and valleys situated in-between, the most important ones being the Kyustendil and Dupnitsa Valley, the Danube Plain and Sofia plain and inner-Balkan valleys.

The border region benefits of its diverse and well-preserved nature. There are numerous natural sites to encourage the development of tourism, including the Gorge on the river Erma, as well as the seven Rila Lakes, the Stob Pyramids, the Belogradchik Rocks, the Magura Cave and other natural landmarks, including natural parks and protected sites. Adding to the natural wealth of the region are its healthy mineral springs (Kjustendil, Sapareva Banja, Vurhez, Rudarzi, etc. in Bulgaria, Niska spa, Vranska Banja, Zvonacka spa, etc. in Serbia).

The mineral resources in the region comprise of coal, marble, clay, dolomite and mixed ores, as well as iron ore around the municipality of Chiprovtsi. One of the most important deposits of sedimentary origin is the gypsum field near the village of Koshava, not far from the city of Vidin. The explored deposits of the region of Pernik include brown coal, the mining of which began at the end of the 19th century, limestone, dolomite, gold, fire clay, and barite. Alongside the riverbeds (esp. Danube) some inert materials are derived. The area of Bor and Majdanpek in Serbia is the other mining center in the region developed since the beginning of 20th century.

The border area is characterized by clean natural environment, the level of various forms of pollution is relatively low. Most of the area can be described as a mountainous and hilly region. It possesses a great biological diversity in its plant and animal life. Numerous plant species are endemic, i.e. their dispersal is limited to within the region. The area is also heavily forested (>30%). The variety of relief (landscape, and resources with therapeutic potential), access to the Danube River, and continental-temperate climate also favour tourism during the whole year. Additionally,

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

cultural heritage (architecture, monuments and traditions) might be a base for the development of various forms of tourism. On the other hand, the tourism infrastructure and services are still insufficiently developed.



At the Bulgarian side of the border there are several protected areas and only one national park (Rila National Park). The area of Chuprene is a natural reservation with a territory of 1 439 hectares. It is included in the UNESCO and UNO list of protected areas. In the district of Vidin there are also 3 other protected sites, 12 natural sites and 5 historical spots. Kyustendil district could also be noted for its landmarks, which are deemed to be part of the world's heritage. The principal cultural and historical site is the famous Rila Monastery, which is included in UNESCO's list of world heritage. Other protected sites are the seven Rila Lakes, and the Stob Pyramids.

From the geographical point of view, the Serbian border area includes mostly hills and mountains and important rivers that cross the border area, namely the Nišava, Timok and the largest, the Danube. There is one national park (Djerdap) located in the eligible area near towns of Golubac, Kladovo and Majdanpek, with the area of 64 000 ha and varying from 70 m to 806 m of height above the sea level. Vidlic region in Serbia is currently under procedure for designation of biosphere reserve.

At the beginning of the nineties of the last century the environmental situation of the programme area improved thanks to the decrease of industrial activities, which seriously damaged the environment. Generally, the level of various forms of pollution in the region is relatively low. The main causes of soil contamination include the effects of the densely populated urban settlement areas (i.e. land use, waste disposal sites, insufficient sewage disposal, and traffic pollution) and

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

intensive agriculture and industry. Cross-border pollution of rivers in the area, however, causes problems (pollution of the Timok and Nisava rivers). In addition, industrial complexes in the Negotin and Bor area (SRB) impose serious air-pollution problems. The major environmental pollution at the Bulgarian side of the border is again related to coal mining industry, namely in the municipality of Bobovdol and the industrial area of Pernik, which cause substantial damages to the environment. Other regional problems are the damaging of valuable arable land, as well as the industrial and urban wastewater pollution at the middle and down streams of the rivers.

For the border region as whole the most visible and well-known environmental problem existing is the case of Bor, which through the Timok River causes trans-border pollution also at the Bulgarian side (municipality of Bregovo).



The city of Bor is located in the north-eastern part of Serbia. A hundred years of mining has left polluted air, lifeless rivers, damaged and destroyed agricultural soil, with over 11 thousand tons of waste per citizen of the city. The smelter plant, which processes copper concentrate, emits high quantities of SO₂

(20 thousand tons/year), arsenic (300 tons/year) and heavy metals (incl. 150 kg mercury/year) into the atmosphere. Monitoring of air quality is limited only to sulphur dioxide emissions, air monitoring equipment is deteriorated and/or partly operating, and no adequate response system exists in case of accidental air pollution emissions. The municipality lacks systems for sound management of water resources and proper water quality monitoring. The excessive exploitation of underground springs affects the rivers, which in turn disrupts biological balances and endangers unique life forms in surface and ground waters. Due to past leaking of old tailing ponds large quantities of flotation tailing reached the Bor and Timok rivers destroying over 20 000 ha of the most fertile

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

agricultural soils. In addition, leaching from accumulated flotation tailing on riverbanks contaminates ground waters and surrounding areas. Wastewaters from Bor represent a regional problem as they endanger communities along the rivers in Serbia and Bulgaria and contaminate the river Danube. Therefore, solution of this problem is of great importance not only for Serbia but also for the entire Eastern Balkan region.

In contrast to the heavy environmental problem in the industrial parts of Bor, it should be mentioned that its surroundings with their natural characteristics represent one of the most interesting geographical locations in Serbia. Due to the geological structure, morphology and terrain geology, climate conditions and complex historical development of flora and fauna, the area presents rich natural resources in



geo-diversity and biodiversity. The area has more than 200 explored caves, with two of them accessible for tourists. Lazar Canyon is one of the most important centers of plants and trees diversity in the Balkans. Mountains Mali and Veliki Krs have special importance in the area due to the habitat of 11 species of bird of prey that are endangered species in Europe. With regards to animals, 47 species have been identified in the region. The renewable natural resources and rich biodiversity of the border area represent potential for sustainable development and preservation of this region. Development of new economic branches by sustainable use of these resources is a challenge and chance of survival for the population in this region.

Despite the severe economic problems, the tourism is one of the economic sectors with a potential for future development in the border area, offering new opportunities and challenges. The outstanding natural and cultural features of the region have importance not only as tourism attractions but also as a topic in educational and scientific interest.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

4.1. NATURAL HERITAGE

The border region between Bulgaria and Serbia is characterized with diverse landscape (hills and mountains, but also wide plains), the rich forests (over 30% share of the total regional territory), numerous geomorphologic phenomenon (caves, natural bridges, gorges and canyons), dendrology monuments, thermal springs, as well the outlet to the Danube river, and favor continental-temperate climate, which all are prerequisites for development of various forms of tourism throughout the year. The programme area is also rich in natural parks, protected areas and natural reserves, many of which have been included or proposed for inclusion in the NATURA 2000 areas.



Part of the largest national park of Bulgaria - The Rila National Park as well as Vitosha Nature Park and “Vrachanski Balkan” Nature Park are located in the border region. A smaller nature park “Belogradchishki Skali” is designated in 2004 as a result of local initiative. The area of Chuprene in Bulgaria is a natural reserve which is included in the UNESCO and UNO list of protected areas. Other protected sites are the Seven Lakes of Rila, and the Stob Pyramids. The main Natura 2000 sites on the territory of Bulgaria are: West Balkan, West Stara Planina Mountain and Fore Balkan, The Rila Mountain and Rila monastery, Vrachanski Balkan’ Nature Park, Timok and Ogosta rivers, Plana and Vitosha Mountains, Osogovska and Zemenska Mountains.

Though the Natura 2000 framework in Serbia is still under development, there have been already areas identified to be included for further alignment with 2009/147/EC Birds Directive and 92/43/EEC Habitats Directive under the umbrella of Emerald Ecological Network. Major Nature Reserves and Protected Areas are: Dolina Pcinje, Stara Planina encompassing Zajecar, Dimitrovgrad, Pirod and Knjazevac, Sicevacka Klisura around Niš, Vlasina (Ramsar site), Djerdap

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

National Park, Sicevacka and in process of designation are Kucaj, Jerma and Suva planina. Other environmentally sensitive spots are located along the border with Bulgaria in municipalities of in Majdanpek and Kladovo and in Toplički district and municipalities of Bor, Zagubica and Svrijig. The entire protected area is approx. 400 thousand ha in area.

The natural beauties combined with the rich historical and cultural heritage of the region are unique regional assets which should be built on, invested in and further developed to improve the region's attractiveness as a tourist destination.

4.2. CULTURAL HERITAGE

The rich and unique culture between Bulgaria and Serbia - both tangible (various archaeological sites, monasteries, museums and galleries) and intangible heritage (e.g. traditions, festivals, etc.) is another asset of the programme area, which is a prerequisite for an attractive tourism product and could furthermore be easily utilized as a driving engine for regional development and prosperity. Culture is among the



most important factors in the CBC framework, since it gives a clear view of common features and provides a common identity for the region. Professional cultural institutes are very well developed both in Bulgaria and in Serbia. Traditional cultural organizations such as libraries, museums, galleries, community and cultural centres, etc., have a long-lasting presence and are well recognized by local communities.

The tourism developments in various forms (eco, cultural, winter, spa) has a strong potential for the region which now is lagging behind compared to other areas in Bulgaria and Serbia.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

However, there is still a substantial discrepancy between the tourist potentials and opportunities and the undeveloped tourism in the border area. The total number of nights in the border region in the period 2009-2013 represents only 8% of the total ones realized by both partnering countries. Identical are the figures for the visitors to the programme area, out of which some 4% are the foreigners. As regards the tourists the Bulgarian side is showing substantial disproportions with Sofia district holding 55% of the bed-night realized for the period 2009-2013, followed by Kyustendil district with 17%. Tourist visits on the Bulgarian side show the highest rate of 49% for Sofia district and lowest one of 4% for Pernik district, while the rest 4 districts are attracting between 10% and 16% of the visitors.

The major tourist destinations at the Serbian side are situated in Zaječarski district, which has realized 37% of the nights for the period 2009-2013, followed by Nišavski district (21%) and Toplički district (11%). As regards the visitors to the Serbian side, 3 districts are holding almost equal popularity – Nišavski (27%), Zaječarski (26%) and Borski (21%), while Pirotski district is holding the lowest share of tourist visits (3%).

Despite the significant natural, cultural and historical heritage assets of the border area, the need of investments in tourist destinations development still exists. Many of the potential tourist attractions are not developed in a way to exploit their potential and associated tourism infrastructure is incomplete, outdated, worn or missing. Investments in training of staff working in tourism are also in deficit. The unavailability of qualified personnel in the tourism often implies that the quality of tourist services is not constant.

As a conclusion, the favorable natural characteristics of the programme area combined with the rich historical and cultural heritage are unique regional assets and one of the key factors for the sustainable development of the border area, and the improvement of the its attractiveness as a tourist destination. It provides variety of opportunities for diversification of the currently available tourist products and services for sustainable development of tourism.

**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

Challenges and opportunities

- Promoting the development of niche tourism activities (e.g. eco-, ethno- gourmet tourism) thus valorising the favourable conditions for diversified tourism in the border area;
- Improving access to sites of touristic interest thus stimulating the utilisation of natural and cultural heritage; Exploiting the cultural heritage as a potential generator of new products and employment possibilities;
- Improving the image of the border area as touristic designation through creating common CBC touristic brand.

4.3. ENVIRONMENT AND RESOURCE EFFICIENCY



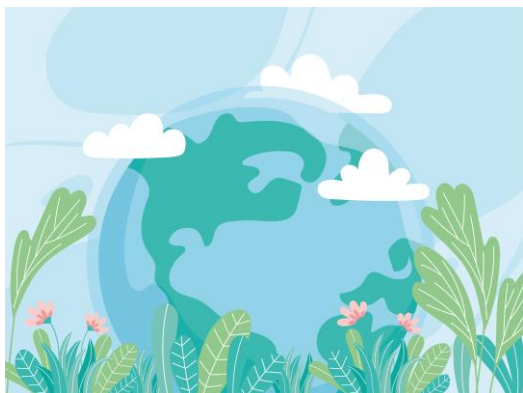
The Programme area is characterized by wide geographical and environmental diversity. Most of the border-region is mountainous. The borderline has few road connections between both sides due to the fact that almost the whole length coincides with the ridgeline of the Western Balkan Mountains.

A big area of the border region could be categorized as economically underdeveloped rural area having clean and preserved natural environment and large biodiversity. Numerous plains and valleys form a strong natural potential for the development of agriculture, forestry and tourism. A variety of unique natural landmarks, natural parks and protected sites, are located in the area. A further credit to the natural wealth of the region bring also its healthy thermal springs, which form a factor with significant added value to the potential for tourism development in the region.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

In relation to the environment and energy efficiency of the programme area, as well as the sustainable use of natural resources the following key elements can be highlighted:

- **Air and climate**



The CBC area is featured with favorable climate conditions. In particular, the climate is temperate continental with very hot summers and cold winters. Due to the ongoing climate change, future increase of natural and man-made disasters has to be assumed for the programme area. The Central and Southern part of the area face significant risks from droughts, fires and landslides in the mountainous regions, while

the Northern part of the area face risks from floods in the plains.

As regards air quality condition, it should be considered as an important indicator for the successful development of the region, for human health and the natural resources protection. With reference to the adopted in December 2013 by the Commission Clean Air Policy Package for the period up to 2030, the main goal of the Ambient Air Purity Act of Bulgaria (reinforced by the Environment Protection Act) is to protect the people's and their generation's health, the animals and the plants, their communities and habitats, the natural and cultural values from harmful effects. In Serbia, the Law on Air Protection regulates air quality management and establishment of environmental protection measures, their organization and control of their implementation, as well as control of air quality improvement.

In general, the level of pollution in the CBC region is relatively low. Since the beginning of the 90's of the last century, the environmental situation in the border region improved mainly due to the decline of the industrial enterprises which seriously damaged the environment. The region is featured by only few regional black spots with heavy industrial pollution, mainly related to coal

The project is co-funded by European union through the Interreg-IPA CBC Bulgaria-Serbia Programme

This study has been produced with the assistance of the European Union through the Interreg-IPA CBC Bulgaria-Serbia Programme, CCI Number 2014TC1615CB007. The contents of this printing material are the sole responsibility of the municipalities of Pirdop and Paličula and can in no way be taken to reflect the views of the European Union or the Managing Authority of the Programme.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

mining and heavy industries still existing. The industrial complexes in Negotin and Bor (Serbia), Sofia and Pernik (Bulgaria) impose serious air pollution problems.

- **Biodiversity, fauna and flora**



A distinctive feature of the Bulgarian-Serbian border region is its wide biological diversity. The most important source of flora and fauna are region's forests which cover a third of the programme area playing a vital environmental role as a source of oxygen, water, timber and non- species and a place for tourism, sports and recreation as well.

The implementation of the NATURA 2000 network in Bulgaria will bring significant positive effects to the biodiversity protection. On the other side, effective management and restoration of sites in the Natura 2000 network requires significant investments. The present Programme is in full compliance with the priorities measure laid down in the Bulgarian priority action framework (PAF) for the financial period 2014-2020.

- **Water**

The programme area is in a better position in terms of availability of water supply resources and infrastructure compared to many of other areas and localities in both countries. The water supply system is much better developed at the Bulgarian side of the border and provides connection for the 98.8% of population, while at the Serbian side about 77% of the population has access to the public drinking water supply. However, the obsolescent equipment, mostly asbestos pipes, leads not only to health and hygienic problems but also to ineffective operation (water losses, frequent

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

need of repairs, etc.). Considering the activities planned (e.g. within mainstream programmes) the situation should improve during next years.



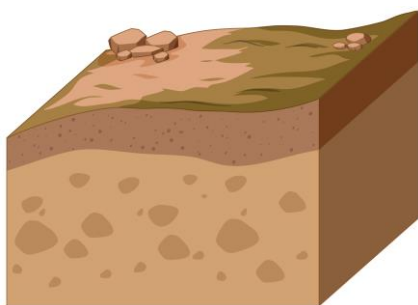
Regarding the sewerage system, only the main settlements (bigger municipalities) have sewerage systems in the CBC region. The majority of waste waters produced in the region flow directly to the rivers causing damages and significant environmental problems. As this issue is strongly connected with improving of the water quality, the significant improvement can be expected during next years. For the water pollution, the municipalities in the eligible region are relatively active in applying for and obtaining financing for construction and reconstruction of the sewerage and water supply network. Although the measures taken, the region still is lagging behind the national average indicators on environment – i.e. population with access to WWTP, waste collection, population connected to sewerage networks, etc. Some WWT facilities are currently under construction, expecting significantly to improve the environmental situation at the Bulgarian CBC region.

Apart from the commitment of Bulgaria and Serbia to comply with EU water and environmental legislation, both countries are effectively involved in trans-boundary cooperation within the frame of international conventions, particularly within the Danube river basin. As signatories to the Danube River Protection Convention, the countries have agreed to co-operate on fundamental water management issues.

In this respect, the programme could provide an opportunity for measures tackling water pollution (including Danube pollution and indirectly Black Sea pollution).

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

- **Soil**



The soil is a constituent part of the environment, together with the atmosphere and the hydrosphere, and it represents the most precious natural resource without which human, animal and plant life would be impossible. However, the influences on soil caused by human activities continuously increase.

This leads to unsustainable level of soil erosion, as well as its chemical contamination and biological degradation.

On Bulgarian territory only local spots of polluted soils are in industrial areas and along the main transport infrastructure. Disrupted territories are at the places of raw material extraction (coal, rocks, and inert materials). According to the National Report on the state and condition of the environment (2014 edition) soils in the country are in good ecological status in the period 2005-2012 as regards the availability of nutrients / organic matter, as well as contamination with heavy metals, metalloids and persistent organic pollutants. At the Serbian side of the border the increase in erosion is one of the major causes of land degradation and its consequent degraded quality. The greatest number of registered sources of localized soil pollution is related to municipal waste disposal sites, storage sites, industrial and commercial sites.

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

- **Natural hazards and manmade environmental risks**



The whole programme area faces the same challenges – how to keep the economy globally competitive, how to protect nature, how to manage multiplying natural hazards and manmade risks, how to create suitable living conditions for the citizens. Although participating regions have favorable climate and geographic position, extreme weather, including storms, thunderstorms, droughts and heavy rainfall implies a growing threat from natural hazards like landslides, mud-flows and floods, as well as substantial forest fires in the summer periods.

Forests in the region preserve the majority of the area's protected plants and endangered animal species, where the fires become a specific risk for the natural heritage of the region. The statistic data shows that in CBC area in Bulgaria a fire engulfed about 32000 ha of forests (only for 2012). On the territory of Serbia, 328 forest fires on the surface of 11,462.73 hectares have been recorded for 2012. According to the Department for Emergency Situations Ministry of Interior, the total damage was around 50 million EUR. The largest part of the fire engulfed areas (around 60%) was reported in the south-eastern part of the CBC area.

The floods are the other menace to the CBC area: the geographical characteristics of the region in its Northern part pre-set conditions for serious floods in the outlet to Danube River. The floods in 2013- 2014 on the territories of Bulgaria and Serbia ones again spotlight the need for establishing joint initiatives towards prevention and mitigation the consequences of natural and man-made disasters in the CBC area.

Although the above issues have already been tackled by the CBC in the past programming period, the open challenges still remain. The consequences of global climate will additionally aggravate

“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

these natural and manmade disasters in future and the risks extend beyond national borders. In that connection that regional cooperation is more than required on disaster prevention, and within the present programme, the local institutions and administrations will have the possibility to tackle together the most pressing challenges.

The green infrastructure as natural flood risk management approach is preferable to grey infrastructure (e.g. dams and dykes) for flood prevention and protection as it is a better environmental option. Green infrastructure for natural water retention, (e.g. restoration of flood plains and wetlands, afforestation, re-meandering), as an effective and cost-efficient solution to contribute to the reduction of the adverse consequences of flooding, will provide additional benefits in terms of water quality, carbon storage and biodiversity. In this respect the requirements of the Water Framework Directive (WFD) and the Floods Directive have to be respected. As regards Serbia, a complementarity with regard to Serbia's participation in the ECRAN network and its Working group 2 – Water, which is focused on providing assistance in the development of transboundary River Basin Management Plans has to be ensured.

- **Challenges and opportunities**



- Decreasing environmental vulnerability to natural hazards (reforestation, land improving etc), including establishing joint risk management structures (drawing/ updating maps for regions / areas with high fire risk / risk management plans);
- Increasing the accessibility of combined emergency (rescue) services in rural areas;
- Better integrated planning of urban environments leading to improved urban environments and reduction of CO2 emissions; - Raising awareness for commune environmental resources at the level of cross border area.



**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

- Balancing the conservation and preservation aspects of natural resources in creating sustainable tourist attractions used to improve the quality of visiting environment.



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

5. DEFINE THE OBJECTIVES OF THE PROGRAMME

The general objective of the “Elaboration of joint programme for management of the quality of air, soil and water in cross border region Pirdop and Palilula” is to reduce the level of pollution and the impact of harmful factors on the environment and human health, preserve and improve existing natural values and put them in function of social and economic development. management and rational use of all natural and created resources and raising the level of public awareness and administrative and technical capacities of local administration and the public to establish an efficient environmental management system that includes cooperation and participation in decision-making of all stakeholders and citizens.

This general objective will be achieved by achieving the following **specific objectives**:

Specific objective 1:	Reduction of harmful effects on health through reduction of exposure to air pollution
Specific objective 2:	Establishment of an integrated municipal waste management system
Specific objective 3:	Establishment an integrated management system for specific waste streams
Specific objective 4:	Closure and reclamation of unsanitary landfills and dumps
Specific objective 5:	Capacity building and raising public awareness on municipal waste management
Specific objective 6:	Provision of sufficient quantities of water of appropriate quality for different categories of users, primarily for the supply of water to the population, while not endangering the environment
Specific objective 7:	Achieve and maintain good status and good ecological potential of



**“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF
AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”**

	surface water bodies and groundwater.
Specific objective 8:	Protection of existing forests and increase of forest areas
Specific objective 9:	Reduction of negative impacts on biodiversity
Specific objective 10:	Strengthen the capacity of all participants in industrial pollution risk management processes at the local level



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

6. DEFINE THE MEASURES FOR IMPROVEMENT THE QUALITY OF AIR, SOILS AND WATERS IN PIRDOP AND PALILULA

SPECIFIC OBJECTIVE 1:	REDUCTION OF HARMFUL EFFECTS ON HEALTH THROUGH REDUCTION OF EXPOSURE TO AIR POLLUTION
Area:	AIR QUALITY
No.	PROJECTS:
Project 1.1.	Designing and implementing a campaign to raise public awareness and education of all participants (public authorities, public administration, population) for the promotion of energy efficient domestic heaters, the use of boilers and devices with the highest combustion effect and use of dry wood.
Project 1.2.	Development of mechanisms for financial incentives for households to adapted to new socio-economic conditions
Project 1.3.	Development of additional criteria (together with the competent ministries for environmental protection) to facilitate the inclusion of municipalities from cross-border region into national energy efficiency improvement projects and air protection
Project 1.4.	Information and awareness raising campaigns on the impact of agricultural residue incineration on air quality and on measures to reduce outdoor incineration in accordance with the National code of good agricultural practice in Bulgaria and Serbia.



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Project 1.5.	Program of education of public administration in both LSGs for capacity building for participation in public calls for air protection
Project 1.6.	Establishment and implementation of a mechanism for financial incentives to replace existing low-power combustion devices used in households (stoves and solid fuel stoves) in both LSGs with new eco-designed devices in accordance with the Eco-Design Directive 2009/125 / EC
Project 1.7.	Expansion of the air quality monitoring network (together with the national Agencies for environmental protection in Bulgaria and Serbia) by installing measuring stations in both LSGs that may be additionally exposed to deteriorating air quality

SPECIFIC OBJECTIVE 2:	ESTABLISHMENT OF AN INTEGRATED MUNICIPAL WASTE MANAGEMENT SYSTEM
Area:	WASTE MANAGEMENT
No.	PROJECTS:
Project 2.1.	Development of local waste management plans for the period 2022 - 203
Project 2.2.	Increasing the coverage of the territory by the service of the organized collection of municipal waste up to 70%, especially in rural areas area.
Project 2.3.	Program for providing adequate administrative and technical capacity at the municipal level for the implementation of regional projects and municipal waste management on a regional basis



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Project 2.4.	Design and construction of recycling yards for municipal waste, including hazardous household waste (at least one in each LSGs) and transfer stations according to the requirements of regional landfills
Project 2.5.	Organic communal composting line construction program waste (composting plants in urban settlements) and the introduction of composting in households in rural and suburban areas
Project 2.6.	Program for establishment a collection and deposit collection system municipal waste by the amount of waste generated in order to stimulated waste prevention and reuse

SPECIFIC OBJECTIVE 3:	ESTABLISHMENT AN INTEGRATED MANAGEMENT SYSTEM FOR SPECIFIC WASTE STREAMS
Area:	WASTE MANAGEMENT
No.	PROJECTS:
Project 3.1.	Program for establishment and expanding separate collection networks glass, plastic and metal, paper and cardboard, which will include the least 50% of the population in both LSGs
Project 3.2.	Program for the establishment of facilities for the treatment of hazardous medical and pharmaceutical waste
Project 3.3	Program for establishment a networks for separate collection of bulk and construction waste



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

SPECIFIC OBJECTIVE 4:	CLOSURE AND RECLAMATION OF UNSANITARY LANDFILLS AND DUMPS
Area:	WASTE MANAGEMENT
No.	PROJECTS:
Project 4.1.	Creating a register of illegal and unsanitary landfills and dumps
Project 4.2.	Preparation of project technical design for cleaning of illegal and unsanitary landfills and dumps
Project 4.3.	Cleaning of illegal and unsanitary landfills and dumps
Project 4.4.	Land reclamation

SPECIFIC OBJECTIVE 5:	CAPACITY BUILDING AND RAISING PUBLIC AWARENESS ON MUNICIPAL WASTE MANAGEMENT
Area:	WASTE MANAGEMENT
No.	PROJECTS:
Project 5.1.	Public awareness raising program related to utility collection waste on local level – local TV, radio, newspapers, social networks
Project 5.2.	Information campaigns for households and businesses on the separation of waste, the functioning of the collection system for bins / bags, recycling yards (working hours, waste fractions that are brought, etc.), recovery systems, hazardous waste management, etc.
Project 5.3.	Information - educational campaigns for households on composting at home



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

Project 5.4.	Local administration capacity building program to work on all waste management activities
--------------	---

SPECIFIC OBJECTIVE 6:	PROVISION OF SUFFICIENT QUANTITIES OF WATER OF APPROPRIATE QUALITY FOR DIFFERENT CATEGORIES OF USERS, PRIMARILY FOR THE SUPPLY OF WATER TO THE POPULATION, WHILE NOT ENDANGERING THE ENVIRONMENT
Area:	WATER PROTECTION
No.	PROJECTS:
Project 6.1.	Program for improvement the public water supply system - increase the coverage of households connected to public water supply systems, while ensuring a stable supply of water of the required quality
Project 6.2.	Source protection program and conservation of water resources used for water supply of settlements, or intended for future use (preparation of studies on sanitary protection zones of springs; changes in spatial plans, general urban plans and detailed regulation plans in accordance with the requirements of the study, etc.).



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

SPECIFIC OBJECTIVE 7:	ACHIEVE AND MAINTAIN GOOD STATUS AND GOOD ECOLOGICAL POTENTIAL OF SURFACE WATER BODIES AND GROUNDWATER
Area:	WATER PROTECTION
No.	PROJECTS:
Project 7.1.	Program for the development of communal infrastructure in the field of wastewater with increasing the coverage of households connected to the sewage system network
Project 7.2.	Program for reducing the emission of pollutants into water bodies: <ul style="list-style-type: none"> • from concentrated sources of pollution for municipal wastewater, industrial wastewater and landfills for municipal and industrial waste • from scattered sources of pollution from agricultural and forest land, roads and from settlements with less than 1.000 inhabitants
Project 7.3.	Preparation of technical documentation for the construction of wastewater treatment plants
Project 7.4.	Construction of wastewater treatment plants



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

SPECIFIC OBJECTIVE 8:	PROTECTION OF EXISTING FORESTS AND INCREASE OF FOREST AREAS
Area:	BIODIVERSITY AND NATURE PROTECTION
No.	PROJECTS:
Project 8.1.	Development of the Action plan for the afforestation in which afforestation is below the average in the cross border region
Project 8.2.	Increasing forest areas by afforestation with indigenous species (afforestation of shallow and erodible arable land of VI grade and low-yielding pastures of VI and VII grade)
Project 8.3.	Increasing the area under forest by raising forest belts on public areas in protection zones (along major roads, above the hydro-accumulation) Increasing the area under forest by raising suburban forests by exploiting and reclamation the free space on the perimeter urban and industrial zones.
Project 8.4.	Design and establish a system of early warning and rapid response to the emergence of forest fires, based on the use of modern media (mobile phones, e-mail, social media), as well as traditional communication channels.
Project 8.5.	Incorporating integrated forest fire risk management in local and regional planning, as well as the integration of forest fire risk management into forest management plans (together with organizations responsible for forest management)



“JOINT INITIATIVES FOR NATURE PROTECTION THROUGH IMPROVEMENT OF THE QUALITY OF AIR, SOIL AND WATER IN THE CROSS-BORDER REGION”

SPECIFIC OBJECTIVE 9:	REDUCTION OF NEGATIVE IMPACTS ON BIODIVERSITY
Area:	BIODIVERSITY AND NATURE PROTECTION
No.	PROJECTS:
Project 9.1.	Improvement of institutional and administrative capacity for conservation biodiversity and geodiversity and reporting on biodiversity and nature protection
Project 9.2.	Development and establishment of procedures for evaluation of all new strategic and planning documents at the level of local self-governments adopted by the municipal assembly and public utility companies in terms of compliance with the objectives of preserving and improving biodiversity and nature protection

SPECIFIC OBJECTIVE 10:	STRENGTHEN THE CAPACITY OF ALL PARTICIPANTS IN INDUSTRIAL POLLUTION RISK MANAGEMENT PROCESSES AT THE LOCAL LEVEL
Area:	INDUSTRIAL POLLUTION RISK MANAGEMENT
No.	PROJECTS:
Project 10.1.	Program for strengthening the capacity of local administration to control the issued integrated permits for operators