Environmental and Risk Assessment of the Timok River Basin

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ABBREVIATIONS

AEWS	Accident Emergency Warning System
As	Arsenic
Art.	Article
BG	Bulgaria
BOD	Biochemical Oxygen Demand
Cd	Cadmium
Co	Cobalt
Cr	Chromium
Cu	Copper
Dir.	Directive
DRBD	Danube River Basin Directorate
DW	Directorate for Water
EAFA	Executive Agency for Fishery and Aquaculture
EC	European Community
EEC	European Economic Community
ERDF	European Regional Development Fund
EU	European Union
GIS	Geographic Information System
ICPDR	International Commission for the Protection of the Danube River
INTERREG	Interregional cooperation programme (in the European Union)
MAFWM	Ministry for Agriculture, Forestry and Water Management
Mn	Manganese
MoEW	Ministry of Environment and Water
N	Nitrogen
$N\text{-}NH_4$	Ammonium Nitrogen
$N\text{-}NO_2$	Nitrite Nitrogen
$N\text{-}NO_3$	Nitrate Nitrogen
NH_4	Ammonia
Ni	Nickel
NO_2	Nitrite
NO_3	Nitrate
Pb	Lead
PE	Population Equivalent (in wastewater treatment)
PO_4	Phosphates
RDP	Rural Development Programme
RTB Bor	Rudarsko-Topioničarski Basen Bor (Copper Mining and Smelting Complex Bor)
TSS	Total Suspended Solids
UN	United Nations
WB	Water Body
WFD	EU Water Framework Directive
WWTP	Waste Water Treatment Plant
Zn	Zinc

1. INTRODUCTION

The objective of this document is to present information on the natural and socio-economic situation within the Timok River Basin, offer an Environmental Status evaluation and Risk Assessment for the area and provide recommendations on the river basin management options at short, mid- and long-term. Another expected outcome is to establish a basis for dialogue between the two countries for the development of an appropriate legal regime and cooperation.

This study offers a basis for cooperation between two countries, accounting for all levels of possible collaboration. The expected outcome is the establishment of a basis for dialogue between the two countries for the development of an appropriate legal framework and future cooperation. Based on the collected information, this document provides guidance for future joint efforts between the Bulgarian and Serbian Competent Authorities in order to develop a more effective integrated river basin management.

This document is based on data collected from various sources such as published papers, reports, and unpublished data on aquatic biota in the region. The main sources were the Statistical Office of Serbia, National Statistic Institute – Bulgaria, Danube River Basin Directorate – Bulgaria, national, regional and municipal plans and programmes.

Although a lot of relevant data is available, there are some limitations regarding the information needed for the proper evaluation of the Timok River Basin's environmental status and, consequently, the Risk Assessment for the region. Two main problems have to be underlined: (1) Data are available for municipalities but not for the basin area; (2) Preparation of the Cadastre (Inventory) of Pollutants for Serbia is still an ongoing process.

Taking into account the gaps in data, our idea was to present an overall, general overview of the area's natural, socio-economic and relevant historical characteristics, identify the main pressures, and evaluate the general environmental status highlighting uncertainties. The objective was to suggest an effective platform for collaboration between the institutions from Bulgaria and Serbia. It should be underlined that "expert opinion" was used as the methodological approach, in addition to analyses based on existing data. .

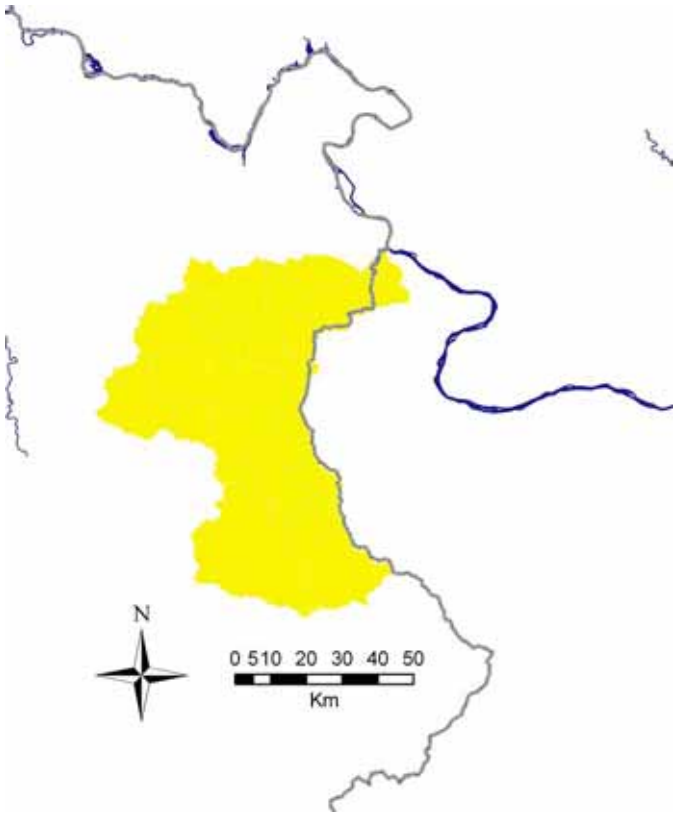
The benefit for both countries regarding this project is evident, taking into account that environmental issues have become one of the most important subjects for new EU member states as well as for those in the process of becoming new member states (Jorgensen, 1998).

2. DESCRIPTION OF THE TIMOK RIVER BASIN

2.1 Geographical situation

The Timok River is a trans-boundary river. The larger part of the river basin area is located in Serbia (4.607 km^2, 98%), while the smaller part is located in Bulgaria (93 km^2, 2%). At its most downstream part the river itself makes 17.5 km along the Serbian-Bulgarian State border (Fig. 1).

Figure 1. The Timok River Basin



Watercourses in Serbia belong to three basins: Black Sea (Danube River), Adriatic Sea and Aegean Sea. The Timok Basin is a part of the Black Sea catchment that covers the largest territory of Serbia.

According to the standard geographical division of Serbia (Markovic 1970), the basin is situated in East Serbia (Fig. 2). The area belongs to ecoregion 7 – East Balkan (according to Paunovic et al. 2007). Ecoregional approach suggested by Illies (1978) was taken as frame for typology proposed in WFD, and have to be considered in detail. The west border of the Timok Basin is the border between ecoregions 7 and 5 (Dinaric West Balkan) (Fig. 3).

Figure 2. Standard geographical division of Serbia (Markovic 1970)

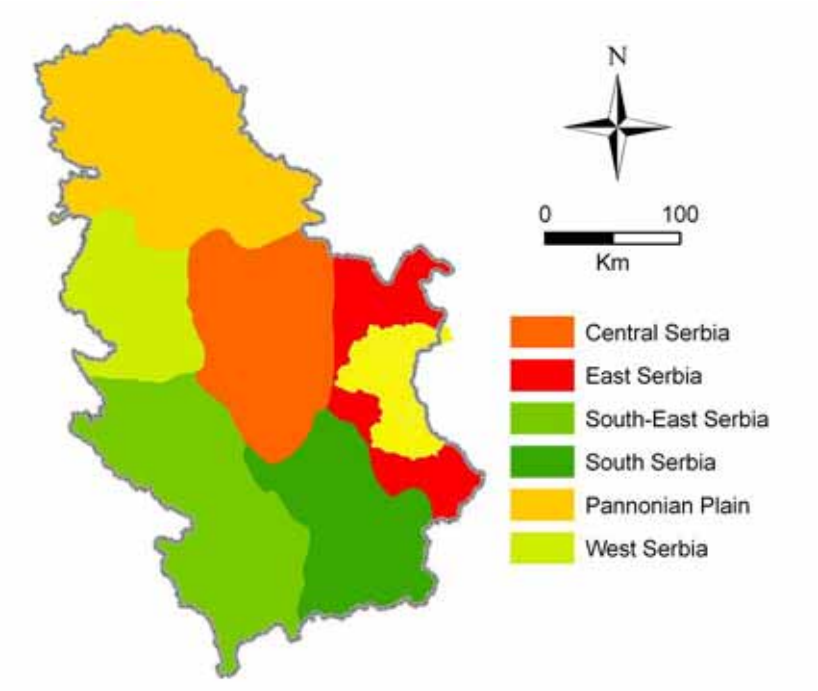
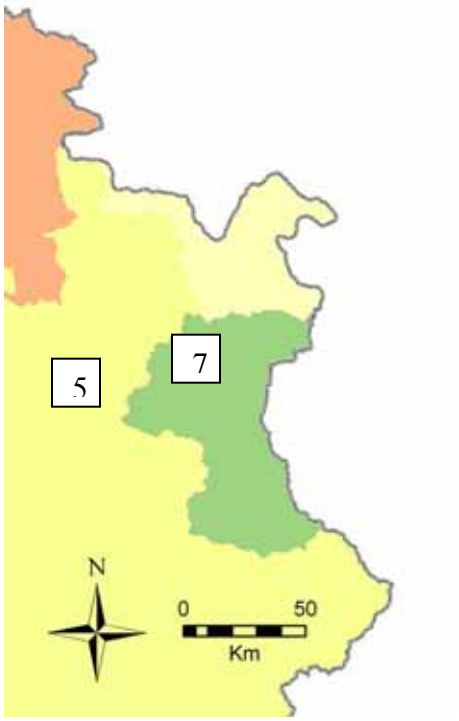
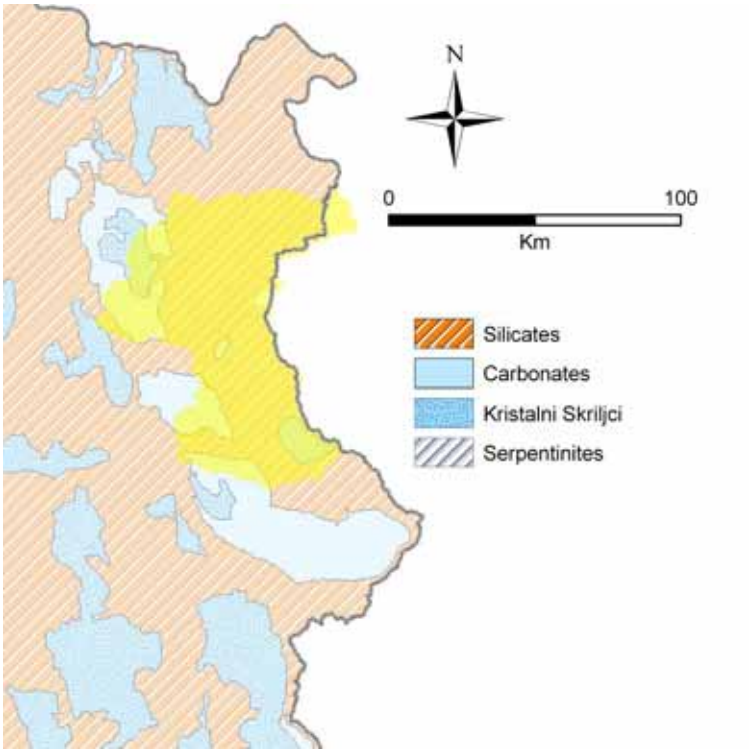


Figure 3. Ecoregion border



Heterogeneous geological substrate is present throughout the basin area. According to a simplified geological description of the territory of Serbia (SCG ICPDR National Report 2004), all main types of geological substrate are present (Fig 4).

Figure 4. Main groups of geological substrate



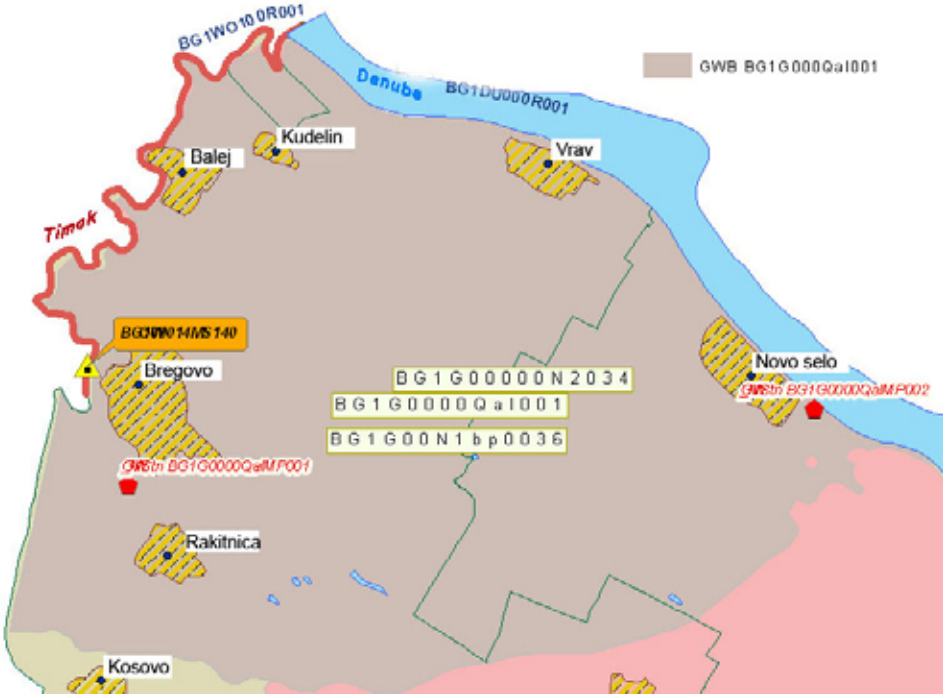
The Timok River is the last tributary of the Danube River in Serbia and its confluence is at the Danube at rkm 845.5. The river (known also as the Veliki Timok) starts at the confluence of the Beli Timok and the Crni Timok which is downstream of the city of Zajecar. Its length is 85 km and the mean slope is about 1%. The most significant tributary at this part is Borska (Bela) River. The river valley is rather narrow, except immediately downstream of the confluence of the Crni and the Beli Timok and in the Negotinska Valley where the riverbed is very unstable with many meanders.

The Crni Timok River rises to the plateaus of the Kucaj Mountains. The catchment's mean slope is about 2.6%. The watercourse is 90 km long and flows in the West-East direction. The Beli Timok River arises at the confluence of the Trgoviski Timok and Svrljiski Timok Rivers near the city of Knjazevac. Its length is 50 km and its mean catchment slope is about 1.84%. The Beli and Crni Timok have a catchment area of less than 4.000 km^2.

In the **Bulgarian part**, the exact geographical boundaries of the river basin are defined according to the catchment of the surface water body BG1WO100R001 (according to the requirements and methodologies of the Water Framework Directive (WFD) 2000/60/EC).

Figure 5. Surface water bodies in the Bulgarian part of the river basin

The Ground Water Bodies associated with the Timok River cover different geographical boundaries. The Quaternary aquifer, which is located close to the surface and has more intensive connection with the surface water bodies, is shown in Figure 6:



2.1.1 Relief

The Timok River Basin is characterized by a heterogeneous relief. The major part of the basin is situated in a so-called mountain-valley region in eastern Serbia. The highest point in the territory of the municipality is Midžor on Stara Planina (2,169 m), which is also the highest peak in the Republic of Serbia. The lower part of the river basin, including the Bulgarian part is plain. The lowest point is the confluence of the Timok River into the Danube River.

2.1.2 Climate

The Region is influenced by temperate as well as continental climate, and a variant mountain climate, characteristic of the temperate-continental climat-zone. The region is exposed to the influence of the North and East Europe region, specifically, a typical continental climate.

The warmest month is July with an average temperature of 21.3^{o}C. and the coldest month is January with an average temperature of -0.8^{o}C. The average annual temperature is 25^{o}C, with an absolute temperature range of 68.1^{o}C. The frequent presence of anticyclonic conditions has been recorded in the region. The average annual rainfall is 590.5 mm/m^{2} with distinct dry and wet seasons. On average, there are 306 sunny days in addition to 30 days with snow coverage.

2.1.3 Soils

The region is exposed to the influence of a diverse climate, geological base, altitude, exposure, and vegetation, consequently different soil types can be found. The shift of different types of soils is observed, from smonitzas, eutric cambisols, district cambisols, luvisols and calcocambisols to luvisols and fluvisols and eugleys.

In general, the high quality soils of the Pannonian basin slowly change to less productive ones as it moves south.

2.1.4 Hydro potential of the region

Based on available information, there is no significant hydro potential in the region. Terrains in the Northwest belong to the catchment area of the river Mlava, and in the South to the catchment area of the river Nisava, while in the North, it belongs to the Djerdap (Iron Gate) area.

The natural disposition of the hydrographical network is conditioned mostly by geological characteristics. The majority of the main river streams are positioned in the north-northwest to the south-southeast direction which coincides with the directions of the major tectonic dislocations in the Timok eruptive zone, such as the Zlot, Bor-Tupiznica and Bucijan fault.

Water streams are characterized by slow flow rates and unsteady water levels. The hydrological regime of the main watercourses within the basin is presented in Tables 1 and 2.

Table 1. Mean annual and monthly flow for selected main watercourses (1946-1991)

River	Site	$Q_{mean\ monthly}$ (m^3/s)												$Q_{mean\ annual}$ (m^3/s)
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Crni Timok	Bogovina	5,36	9,68	15,25	15,71	5,58	4,51	2,07	1,15	1,06	1,78	3,80	5,67	6,22
Crni Timok	Gamzigrad	11,15	19,43	31,51	31,29	16,01	9,01	4,31	2,33	2,28	3,76	7,65	11,34	12,50
Beli Timok	Knjazevac	8,03	13,28	17,76	15,76	13,00	8,05	3,99	2,46	2,40	3,15	4,80	7,21	8,33
Beli Timok	Vratarnica	10,16	17,52	23,41	20,20	15,60	9,89	4,36	2,61	2,63	3,67	5,86	9,56	10,46
Beli Timok	Zajecar	12,16	20,63	28,56	24,50	18,81	10,94	4,90	2,87	3,06	4,27	7,02	10,97	12,39
Svrljiski Timok	Rgoste	4,17	6,17	8,31	6,24	5,03	3,21	1,65	0,94	0,94	1,47	2,12	3,21	3,62
Trgoviski Timok	Gornja Kamenica	3,28	4,94	6,64	6,26	5,49	3,58	1,84	1,11	1,06	1,29	2,01	2,79	3,36

Table 2

River	Site	Basin area (km^2)	Qmean (m^3/s)
Grliska	Grliste	191	1.48
Zlotska	Sumrakovac	269	3.5
Zlotska	Zlot	210	3.29
Borska	Rgotina	340	3.04
Sikolska	Mokranja	114	0.602

Table 3: Basic flow characteristics of the Timok River (according to SCG ICPDR National Report 2004)

River	Profile	Area (km^2)	Q_{min} 95% (m^3/s)	Q_{av} (m^3/s)	q_{min} (l/s km^2)	q_{av} (l/s km^2)
Timok	At the mouth to the Danube River	4,630	1.2	31	0.3	6.7

The table indicates a high ratio between Q_{min}95% and Q_{av},

2.1.5 Hydrological characteristics

Surface and ground water characterization and identification within the Timok River Basin were done within the program “Activities on realization of obligations of the Republic of Serbia in regard to cooperation with International Commission for the Protection of the Danube River”, supported by the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia – Directorate for Waters.

The basic facts regarding the used typology system are presented in the Serbian ICPDR National Report (2004).

Surface water bodies on the Timok River are listed in Table 4. All Water Bodies (WBs) on the Veliki Timok River belong to CS_Typ1.4 (large lowland rivers, siliceous, medium sediments). The delineation was done according to the change of morphology, surface water category and pollution.

Table 4. Delineation of the water bodies on the main course of the Veliki Timok River

Code	Upstream border (rkm)	Downstream border (rkm)	Length (km)	Description
Ser_TIM_1	17.5	0	17.5	From the mouth to Bregovo (BG); common WB with BG.
Ser_TIM_2	40	17.5	22.5	From Bregovo to Tabakovac (CS)
Ser_TIM_3	59	40	19	From Tabakovac to HPP Sokolovica Dam;
Ser_TIM_4	78	59	19	HPP Sokolovica reservoir
Ser_TIM_5	90	78	12	From the Bela (Borska) River mouth to the confluence of the Beli Timok River and Crni Timok River

Delineation of the most downstream WBs requires further coordination with the BG. Namely, in Part A of the Roof Report 2004, there were 5 WBs identified on this river. After the BG proposal, the previously identified number of WBs changed to 6, with additional WB at the common section (***CS_TIM_1***). The length of this WB should be discussed in the future, since the BG side proposed a length of 10 km and the CS opinion is that it should be 17.5 km (SCG ICPDR National Report 2004).

Serbia and Bulgaria signed an Agreement in 1961 on the partial change of the state border line on Timok. The Agreement's objective was rectification of the common section of the Timok River. According to the adopted design, the natural course of the Timok should have been shortened from about 17.5 to 10 km. Nevertheless, it is important to understand that the present length of the common river section is 17.5 km and the designed (but not established) one is 10 km (SCG ICPDR National Report 2004).

CS_TIM_2 WB stretches 40 km from Bregovo (BG) through a wide valley. The channel is sinuous to meandering.

CS_TIM_3 WB stretches 40 km through the gorge to the Hydro Power Plant Sokolovica Dam.

CS_TIM_4 is the HPP Sokolovica Reservoir. It stretches 78 km to the mouth of the Bela (Borska) River.

Due to some work around the river and the polluted sediment originating from the mining and flotation plant in Bor, all 4 WBs were identified as possibly impacted.

The most-upstream WB is ***CS_TIM_5,*** which stretches 90 km from the mouth of the Bela River to the city of Zajecar. River course modification and flood protection works are planned for this WB in the Serbian Water Master Plan.

The water types for streams with catchments area larger than 100 km^2 within the Timok catchments area are presented in Annex 1.

The water bodies and heavily modified water bodies (HMWB) are presented in Annex 2.

Four major aquifers hosting 24 bodies of groundwater have been identified in the Carpatho-Balkanides of Eastern Serbia, including:

- Karstic aquifers: 16 bodies of groundwater
- Intergranular porosity aquifers: 7 bodies of groundwater (3 within intergranular porosity aquifers in alluvial Quaternary sediments and 4 bodies of groundwater in Tertiary sediments of the basins);
- Fissure porosity aquifers: 1 body of groundwater.

There are numerous mutually isolated massifs in this Carpatho-Balkanide area, whose geological structure is dominated by carbonate rocks (exceptions are the massifs of the Homolje Mountains, Deli Jovan and Stara Planina). The Eastern Serbian karst features a different karstic surface relief than the spacious holokarst of the Dinarides. This is primarily reflected in the "scarcity" of macromorphologicial formations (such as fields) and significant vegetation coverage.

Limestones, frequently of sandy or dolomite varieties, dominate the lithologic structure. The overall thickness of the carbonate rock is occasionally greater than 1,000 m when viewed from the highest mountaintops (e.g. the Suva Planina).

Karstic aquifers underlying other formations have the greatest surface area in the Neogene gorges of Svrljig, Bela Palanka, the Southern part of Zagubica, Soko Banja, Pirot, the western part of Zviska and Babusnica.

/The aquifers are, for the most part, recharged by atmospheric precipitation and surface waterways. Based on water balance analyses of several karstic aquifers, it is estimated that the average infiltration of atmospheric precipitation amounts to 30-50%. Surface waterways generally lose all of their water through numerous swallow holes when flowing into limestone terrains further downstream.

About 144 karstic springs have been identified in the Carpatho-Balkanide area, whose extreme minimum yield is greater than 5 l/s. The overall dynamic reserves of the Carpatho-Balkanide karstic aquifers are estimated to be 18 m^3/s, while the available yield (the difference between the dynamic reserves of the strata and the summary minimum yield of the spring) is greater than 12 m^3/s.

Sixteen bodies of groundwater have been identified within the karstic aquifers of Eastern Serbia.

The alluviums of the Danube (downstream of the Iron Gate Hydroelectric Power Plant), the Timok (including the alluviums of the Crni Timok downstream of Bogovina and the Beli Timok downstream of Knjazevac) and of the Nisava (downstream of Niska Banja), have been identified in Eastern Serbia.

The thickness of these alluviums ranges from about 5 m to a maximum of about 10 m, with the exception of the singular aquifer of the alluvium terrace (the Danube), where it is sometimes more than 20m. The lithologic structure features interchanging sands, gravels and clays.

The main water-bearing sandy and gravelly horizon is continuous and follows the river channels. The groundwater is generally unconfined. In places there is a low hydrostatic pressure due to an overlying clay stratum (sub artesian water level). The groundwater regime in the alluvial strata is usually dependent on the surface water regime, with which there is an active hydraulic link.

Infiltration from watercourses, infiltration of atmospheric precipitation, and subsurface flow from underlying and lateral aquifers generally recharge these aquifers. The aquifers drain directly into watercourses during low flow periods, through weak and rare springs, in the evapotranspiration process and via shallow dug wells used for individual water supply.

The *Nisava alluvium,* in the general area of Brzi Brod, hosts one of the water sources, the Mediana Water Source, which services the city of Nis. It has been studied to the greatest extent. Mediana is the largest water source in the country where artificial recharge is implemented. It is located on the left bank of the Nisava, slightly upstream of city limits. The thickness of the alluvial strata in this area is 6-10 m. The overlying semi-pervious strata are comprised of humus, clay and sandy clay, 1-4 m thick. The main water bearing horizon is made up of gravels and sands whose thickness is 2-8 m.

With the exception of Nis and Kladovo where the thinness of the sediments and a frequently increased clay-type component consequently limits groundwater reserves, the bodies of groundwater within these aquifers constitute prospective sources only for individual water supply.

Three water bodies have been identified within the alluvial aquifers of Eastern Serbia.

Four major Tertiary basins have been identified in Eastern Serbia: Negotinsko-Kladovski Kljuc, the Zajecar Basin, the Soko Banja Basin and the Pirot Gorge.

The Neogene sediments of *Negotinsko-Kladovski Kljuc* generally occur over Cretaceous flysch and are more than 2000 m thick in some places. The singular basin, which hosts thick Tertiary strata made up of sands, gravels, clays and limestones with interlinking facies, runs in the southerly direction, all the way to Zajecar and on to Knjazevac (the Minicevac-Knjazevac Basin). The strata thickness generally diminishes in this direction.

In the *Soko Banja Gorge* the thickness of the Tertiary sediments is centrally more than 500m. In the Pirot Gorge, Neogene sediments generally overlie a karstic aquifer whose average thickness is more than 200 m; its most elevated parts are Quaternary sediments.

The boundaries of the aquifer are generally well delineated in areas where deep drilling has occurred. Negotinsko-Kladovski Kljuc and the Zajecar Basin have been studied in some detail, while the boundaries of water bearing media in the Soko Banja Basin and the Pirot Basin are, for the most part, assumed.

The continuity of an overlying stratum cannot be determined in all of the considered basins. Parts of the water-bearing strata are exposed on the terrain surface, but they can also be found in the deeper reaches of the basin. In other cases, clay type sediments frequently result in a discontinuity of the aquifer.

The aquifers are generally recharged by karstic spring discharge, storage of significant reserves in Neogene sediments, and infiltration of atmospheric precipitation. As a general rule, the groundwater level in Neogene sediments is sub artesian or artesian.

The intergranular porosity aquifer in Tertiary sediments could potentially be the primary source for individual water supply, although this needs to be studied in greater detail and verified in each specific instance. Furthermore, deep aquifers are

potential sources of geothermal energy and clean water with a low mineral content (which can be bottled for commercial use). Four water bodies have been identified within theTertiary aquifers of Eastern Serbia.

The major CB fissure porosity aquifer is related to andesites and igneous sediments in the eruptive area of the Timok.

The overall thickness of the igneous sedimentary complex varies from an average of about 700 m along the outer edges, to about 3000 m in the center of the trench. The fissured aquifer is, for the most part, uncovered and has no impermeable overlying stratum. The water table of the aquifer is close to the terrain surface and is not continuous.

In addition to its geothermal potential (health resorts, heating), the aquifer provides local water supply to numerous communities in this area. One water body has been identified within the fissure porosity aquifers of Eastern Serbia.

2.2 Historical, Organizational, Socio-economic, and Political Background

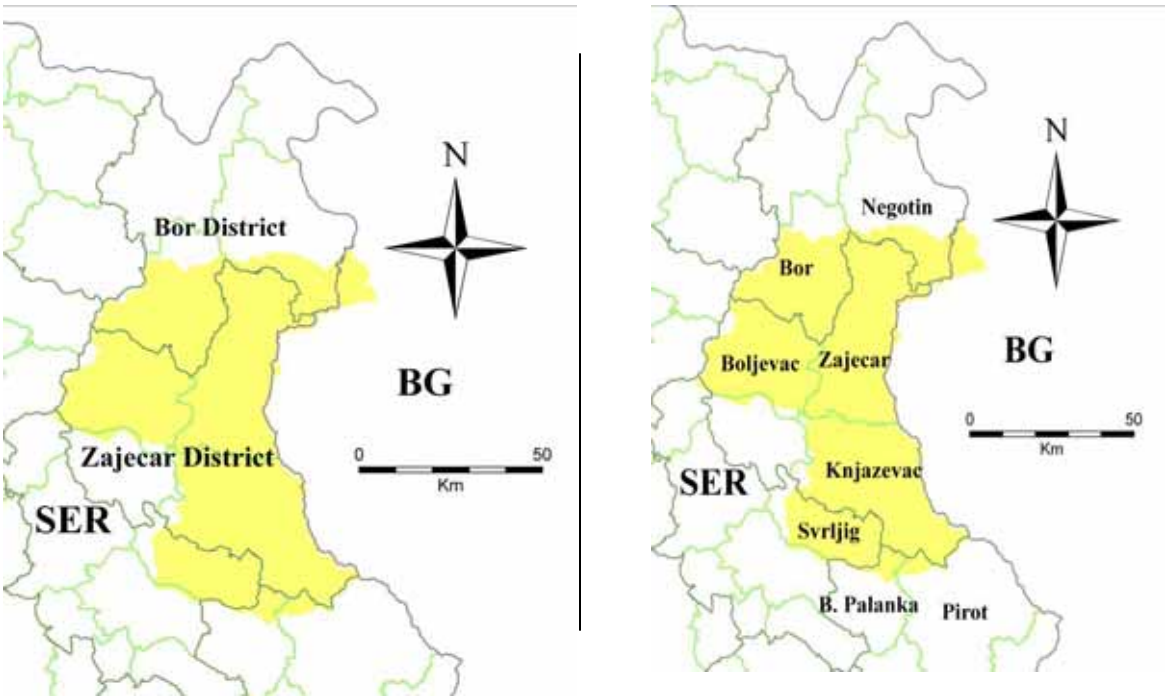
The most intensive, socio-economic development of the region occurred in the 19th and 20th Centuries. In this period the development of agriculture and forestry, as well as the expansion of the urban and industrial areas, have significantly changed the land-use patterns and natural environment. Over the last 50 years both the training of the river bed and development of the mining industry have mainly affected the middle and lower sections of the Timok river.

After major development of the agriculture and other industries during the Communism period, the region currently faces socio-economic difficulties with a declining population in the main economic sectors.

2.2.1 Serbian Area

Between 1918 and 1922, two districts within the Kingdom of Serbs, Croats and Slovenes existed in the area – the Krajina District (seat in Negotin) and the Timok District (seat in Zaječar). In 1922, these two districts were merged into the Timok Region with seat in Zaječar. The Timok Region existed until 1929 after which it was included into the newly formed Morava Banovina with seat in Niš.
Today, the Timok River Basin lies within the territory of two districts – the Bor District and the Zaječar District, with eight municipalities: Zaječar, Bor, Negotin, Knjaževac, Sokobanja, Kladovo, Boljevac and Majdanpek (Fig. 7).

Figure 7. Districts and Municipalities



Up to the end of the 19th century, the area was poorly inhabited and not developed. The quick development of the municipalities started with the discovery of copper ore in 1903, when mining activities started. At the beginning of the 20th century, a French mining association expanded the mining production building worker colonies and thereby strongly influencing the development of the city. For illustration, when the mining started, Bor consisted of 150 houses and 717 citizens. Prior to World War II, Bor had a population of 10 000 citizens, 6 000 of which worked in the mine. The recorded production of copper in that period was 40 000 tonnes of anodes. The 1960s was characterized by very rapid industrial and urban development. New metallurgical and industrial capacities were built, new mines opened, and buildings, railroads, roads and other infrastructure were constructed. In that period the largest settlements in the region became an educational, health and cultural center in East Serbia. The 1990s was marked by the decrease of economic production in the region which lead to slower development and degradation of infrastructure. The overall unfavorable socio-economic situation during this time generated the rapid increase of unemployment and decline in the population.

Lack of financial resources also lead to the unsatisfactory management of environmental protection.

2.2.2 Bulgarian area

According to the Agreement on partial change of the State border line on Timok, signed between Serbia and Bulgaria in 1961, the natural course of Timok should have been shortened from about 17.5 km to 10 km. The Bulgarian part of the Timok

River Basin covers partially the municipalities of Bregovo and Novo selo, within the Vidin district.

The fertile lands, good climate conditions and available water resources in the area led to the development of intensive agricultural in the 20th century, particularly during the Communist regime (1944 – 1989). Large-scale grain crop production and food production industries were the most developed economic sectors. Irrigation was managed by a system of channels and several small reservoirs. In the same period, the exploitation of Bor mines started in the former Yugoslavia and caused long term pollution of the Timok River.

During the last two decades the agricultural production and other intensive land uses declined in the whole Vidin district as well as in many rural areas in Bulgaria. This also caused the closing of some industry production, a decline in the economical status and problems with demographic migration from the area. Many agriculture lands are now abandoned. The irrigation systems built in the past are no longer in operation.

The recent accession of Bulgaria to the European Union (2007) and the stabilization of its economy are also expected to improve the social and economic situation of the border area. The application of the Common Agriculture Policy of EU and the increasing public funds for infrastructure development projects will create preconditions for the recovery of agriculture, transport, tourism and industry.

2.2.3 Shared issues

Serbia and Bulgaria signed an agreement in 1954 regarding their shared border. According to the Agreement, the border would stay unchanged irrespective of possible changes in the riverbed's position. In 1961, the two parties had signed another agreement about a partial change of the frontier between the two countries - taking into account the newly constructed watercourse on the river Timok, according to the project in 1958.
Until now, the designed river course modification (rectification) has not been completed because of differences between the two parties' views. If the frontier defined by the agreement from 1961 had been de facto and de jure, not only misunderstandings emerged, but the mutual need to solve this problem as well.

According to the adopted design, the natural course of Timok should have been shortened from about 17.5 to 10 km. Nevertheless, it is important to understand that the present length of the common river section is 17.5 km and the designed (but not performed) one is 10 km.

3. COMPETENT AUTHORITIES AND ENVIRONMENTAL POLICY OVERVIEW

In this subchapter the most important national authorities competent for Environmental issues, as well as other institutions that could contribute to the effective environmental protection are described.

3.1 Competent Authorities and Institutions in Serbia

An analysis of the legislative and legal framework shows that the general state of the institutional organization of Environmental and water issues in the Republic of Serbia is characterized by an overlapping of areas and competences between governmental authorities. In addition, the arbitrary interpretation of Ministerial law of Serbia sometimes occurs. This approach leads to the necessity of effective coordination between the competent authorities.
The following governmental institutions have the main responsibility for environmental protection in the Republic of Serbia:

- Minister of Environment and Spatial Planning;
- Ministry of Agriculture, Forestry and Water Management
- Ministry of Agriculture, Forestry and Water Management – Directorate for Waters
- Serbian Environmental Protection Agency (SEPA)
- Ministry of Science and Technological Development;
- Ministry of Health.
- Republic Hydrometeorological Institute
- Public Water Companies (Srbija vode and Vode Vojvodine)

Certain responsibility and support is needed from:

- Ministry of Finance
- Ministry of Economy and Regional Development
- Ministry of Energy and Mining
- Ministry of Infrastructure
- Ministry of Public Administration and Local Self-Government
- Tourism

Other organizations also play an important role in environmental protection such as the Fund for Environmental Protection, National Council for Sustainable Development (NCSD**)**, in addition to universities, research institutes and other institutions.

The Republic of Serbia is in a phase of fundamentally reforming their political, social, economic and legal systems including the full harmonization of national regulation with international and EU legislation. One important task is to create an institutional framework for the establishment and maintenance of the Cadastre (Register) of

Pollutants. The Registry should be prepared and maintained in collaboration with Government institutions, local government units, enterprises and entrepreneurs who, in the performance of their activities, use natural resources and endanger or pollute the environment, in addition to scientific and professional organizations, public services, NGO's and other organizations.

3.2 Competent Authorities and Institutions in Bulgaria

The Ministry of Environment and Waters (MoEW) is the competent water authority at the national level and develops the National Water Plan, approves river basin management plans, develops the national policy for bilateral and multilateral cooperation in water management, and gives concessions/permissions on water use in specific cases.

Some decisions at the national level concerning the water sector are also made by the Council of Ministers, which adopts the National Water Plan, national programmes for water management and gives concessions/permissions on water use in specific cases.

Following the principle of water management at the river basin level set by WFD, the country is divided into 4 River Basin Management Districts based on catchment area. Following this hydrographical criteria the river basin management units are named after the main bodies of surface water that the respective inland rivers flow into, for example:

- Danube River Basin Management District (with centre Pleven), which is the competent authority for Timok River Basin.
- Black Sea River Basin Management District (with centre Varna)
- East Aegean River Basin Management District (with centre Plovdiv)
- West Aegean River Basin Management District (with centre Blagoevgrad)

Established in each River Management District, the four River Basin Directorates are regional bodies of the Ministry of Environment and Water and the competent water authorities at the basin level. The Directorates organize the preparation of the water management plans, issue permits according to water legislation, manage information databases on water resources and water quality, control compliance with requirements set in permits and concessions under the water legislation, control the state of water bodies, control the state of water infrastructure systems and utilities, manage exclusive state property with water that is not given to concession, and collect fees for water use and discharges into water bodies.

The link between the River Basin Directorates is provided by the Water Directorate of the MoEW. This administrative unit of the central government authority also carries out the coordination between activities at the national and basin level, supports the Minister of Environment and Water in his/her capacity as a national competent authority including making expert contributions in the preparation of the

Council of Ministers' decisions on issues within the scope of the water legislation (WFD respectively).

Regional Inspectorate of Environment and Waters – Montana is the regional structure of MoEW responsible for the management of the environment (including wastewaters, waste, protected areas, biodiversity, air quality, etc.) and control of the pollutants.

Regional Laboratory – Montana is the regional structure under the Executive Environmental Agency, responsible for the monitoring of biological and chemical water quality parameters.

Executive Agency of Fisheries and Aquacultures is an agency under the Ministry of Agriculture and Foods. The local branch of EAFA in Vidin is responsible for the control of fisheries and the implementation of the Operational Programme Fisheries and Aquaculture.

The Irrigation Agency and the local irrigation system companies are in charge of maintaining the irrigation channels and dykes.

The State Agency of Forestry and its regional/local structures are responsible for the exploitation, management and maintenance of state owned forests.

The Ministry of Regional Development and Public Works formulates state policy concerning regional development and manages Cross-border Cooperation Programmes.

3.3 Legal Framework and Relevant Initiatives

3.3.1 International Policy and Legal Framework

Convention on Cooperation for the Protection and Sustainable use of the Danube River

The Convention on Cooperation for the Protection and Sustainable use of the Danube River signed on 29 June 1994, in Sofia forms the overall legal instrument for cooperation and transboundary water management in the Danube River Basin. The main objective of the convention is the sustainable and equitable use of surface waters and groundwater and includes the conservation and restoration of ecosystems. The Contracting Parties cooperate on fundamental water management issues and take all appropriate legal, administrative and technical measures, to maintain and improve the quality of the Danube River and its environment.

Both Bulgaria and Serbia are full Contracting Parties to the Danube River Protection Convention. The convention was ratified by Bulgaria with a law passed by the 38th National Assembly on 24 March 1999. The Federal Republic of Yugoslavia/Serbia and Montenegro ratified the Convention on Cooperation for the Protection and Sustainable Use of the River Danube (hereinafter referred to as the Danube River

Protection Convention) on 30 January 2003 and became a full member on 19 August 2003. Being both Danube countries, Bulgaria and Serbia are particularly sensitive to water quality protection and the sustainable use of the Danube River. Efficient water management is one of the priorities in the national environmental policy.

At its 3rd Ordinary Meeting on November 27-28, 2000, in Sofia the International Commission for the Protection of the Danube River) (ICPDR) made the following resolutions:

- The ICPDR will provide the platform for the coordination necessary to develop and establish the River Basin Management Plan for the Danube River Basin.
- The Contracting Parties ensure to make all efforts to arrive at a coordinated international River Basin Management Plan for the Danube River Basin in line with the requirements of the WFD.

In the ICPDR all Contracting Parties support the implementation of the WFD in their territories and cooperate in the framework of the ICPDR to achieve a single, basin-wide coordinated Danube River Basin Management Plan.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes

The UNECE Convention of the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention) is intended to strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwater.

Bulgaria ratified the Convention in 2003, while Serbia has yet to ratify it.

The Convention obliges Parties to prevent, control and reduce water pollution from point and non-point sources.

The Convention also includes provisions for monitoring, research and development, consultations, warning and alarm systems, mutual assistance, institutional arrangements, and the exchange and protection of information, as well as public access to information.

EU Water Framework Directive 2000/60/EEC (WFD)

The Water Framework Directive establishes a legal framework to guarantee sufficient quantities of good quality water across Europe. Its key aims are:

- to expand water protection to all waters: inland and coastal surface waters and groundwater
- to achieve "good status" for all waters by 2015
- to base water management on river basins
- to combine emission limit values with environmental quality standards

- to ensure that water prices provide adequate incentives for water users to use water resources efficiently
- to involve citizens more closely
- to streamline legislation.

WFD provides a number of deadlines by which Member States are required to fulfill particular obligations and report their achievement to the European Commission. The key reporting obligations in the Directive are summarized below:

2004	Characterisation of river basin: pressures, impacts and economic analysis (Art. 5)
2006	Establishment of monitoring network (Art. 8)
2008	Presentation of draft river basin management plan (Art. 13)
2009	Finalisation of river basin management plan, including programmes of measures (Art. 13 and 11)
2010	Introduction of pricing policies (Art. 9)
2012	Operationalisation of programmes of measures (Art. 11)
2015	Meet environmental objectives (Art. 4)
2021	First management cycle ends (Art. 4 and 13)
2027	Second management cycle ends, final deadline for meeting objectives (Art. 4 and 13)

EU Flood Directive 2007/60 EEC

In October 2007, the European Commission (EC) adopted a Directive (2007/60/EC) on the assessment and management of flood risks entered into force on 26 November 2007. This Directive requires Member States to evaluate water courses and coast lines that are at risk from flooding, to map the flood extent and and humans at risk in these areas and to take coordinated measures to reduce this flood risk. With this Directive also reinforces the rights of the public to access this information and to have a say in the planning process**.**

EU Seveso II Directive (96/82/EC)

On 9 December 1996, Council Directive 96/82/EC on the control of major-accident hazards - so-called Seveso II Directive - was adopted. Member States had up to two years to bring into force the national laws, regulations and administrative provisions to comply with the Directive. From 3 February 1999, the obligations of the Directive have become mandatory for industry as well as the public authorities of the Member States responsible for the implementation and enforcement of the Directive.

The Seveso II Directive 96/82/EC was extended by the Directive 2003/105/EC of the European Parliament and of the Council of 16 December 2003 on the control of major-accident hazards involving dangerous substances. The most important extensions of the scope of this directive are to cover risks arising from the storage and processing activities in mining, from pyrotechnic and explosive substances and from the storage of ammonium nitrate and ammonium nitrate based fertilizers. Therefore it is of particular interest concerning the Timok River Basin.

EU Mining Waste Directive
The Directive 2006/21/EC on the management of waste from the extractive industries deals with all wastes resulting from the prospecting, extraction, treatment and storage of minerals. It provides for the application of Best Available Technology for mine waste facilities, as well as for the obligation to draw up closure plans including financial security to cover any environmental damage.

3.3.2 Legal framework in Serbia

Although environmental issues have been largely neglected for a very long time both in the former Federal Republic of Yugoslavia and Serbia and Montenegro (Cavoski 2004), a lot of effort has been made since 2001 to adopt effective regulations to protect the environment. These efforts resulted in the adoption of several laws – (1) the Law on the Protection of Environment ("Official Gazette RS", No. 135/04)., (2) Law on Integral Prevention and Control of Pollution ("Official Gazette RS", No. 135/04), (3) the Law on Strategic Environmental Impact Assessment and (4) the Law on Environmental Impact Assessment, (5) the Law on free access to information of public significance RS (Official gazette 120/2004).
Mentioned acts are fundamental environmental acts and can be considered as the first steps in the overall process of approximation of domestic legislation with EU law (Cavoski 2004). These laws are harmonized with the EU Directives on Environmental Impact Assessment (85/337/EEC), Strategic Impact Assessment (2001/43/EC), IPPC (96/61/EC) and Public Participation (2003/35/EC).

The harmonization of Serbian environmental legislation with EU Directives is one of the most important tasks for Serbia on its way to join the European Union. In the last decade, there were many political, economic, social and demographic changes caused by economic and political sanctions.

Economic sanctions had a negative influence on international cooperation. It was made impossible for the Federal Republic of Yugoslavia to implement the ratified international agreements in the area of the environment, even with the conventions protecting the environment from across-the-border pollution and those of global significance.

Concerning the Policy Framework, it is important to mention the following initiatives:

- National Strategy for Waste Management (adopted by Government in 2003)
- Poverty Reduction Strategy (adopted by Government in 2003)
- Water Masterplan of Serbia 2002-2012 (adopted by Government in 2003)
- Study of Sustainable Development of the Water Sector in the Republic of Serbia (adopted by Government in 2003)
- Strategy for Development of Agriculture in Serbia (adopted by Government 2005)
- Energy Sector Development Strategy (adopted by Government 2005)
- National Environmental Strategy, adopted by National Assembly, for a period of 10 years

- Strategy for Development of Forestry (adopted by Government 2006)
- Strategy for Development of Tourism
- Strategy for Sustainable Development in the Republic of Serbia
- National strategy for Economic Development of Serbia 2006-2012
- National Environmental Action Plan
- Strategy for Biodiversity, Action plan and National Report
- Strategy of Introducing Cleaner Production in the Republic of Serbia
- Fishery Strategy for Serbia
- National strategy of sustainable use of natural resources and goods
- Water Master Plan of the Republic of Serbia was prepared in 2002
- The Study of Sustainable Development of the Water Sector in the Republic of Serbia has also been adopted by Government
- The process of accreditation for laboratories started
- Government of Republic Serbia adopted National Waste Management Strategy (2003)
- The Law on Ratification of the Convention on the Conservation of European Wildlife and Natural Habitats was adopted (2007)
- Regulations on Limit Values, Emission Criteria for Establishing Measuring Sites and the Data Evidence do not currently prescribe target values but should after the Law on protection of air is adopted
- In 2003, Serbia started to implement the project “Preparation of the National Strategy for Preservation of Biological Diversity”.

Concerning the priority actions needed the following can be highlighted:

- The new Law on Waters in accordance with EU legislation should be promptly adopted; and consequently:
- New standards, and norms for water quality monitoring (surface and ground) are needed;
- Protection of water is still not based on the river basin management principle.
- There is an inconsistent implementation of the “polluter pays” and “user pays” principles, and full cost recovery for water usage and water treatment.
- The lack of effluent standards is a major problem. Implemented standards are based on ambient water quality, which is ineffective and difficult to monitor and control.
- The existing water quality legislation relevant to drinking water and bathing/recreation water does not comply with European standards.
- There is no early warning system of industrial accidents. Action plans in the event of pollution due to industrial accidents exist; the procurement of relevant equipment is under way. It has to be harmonized with the existing Danube Accident Emergency Warning System (AEWS) developed and established within the framework of the ICPDR
- The Law on Waste Management should be adopted soon?, and
- The existing emission regulations are not harmonized with the EC legislation.

The field of water is regulated by numerous laws and regulations, which include:

- Law on waters (Official Journal of the Republic of Serbia, No. 46/91, 53/93, 67/93, 48/94, 54/96)
- Law on water regime (Off. Jour. of Federal Republic of Yugoslavia, No. 59/98)
- Law on hydro-meteorological affairs of interest for the whole country (Official Journal of the Socialistic Federal Republic of Yugoslavia, No. 18/88, 63/90)
- Regulations on methods and minimum number of wastewater quality testing (Official Journal of the Socialist Republic of Serbia, No. 47/83, 13/84)
- Bylaw on method for determining and maintenance of areas and belts for sanitary protection of drinking water plants (Official Journal of the Socialist Republic of Serbia, No. 33/78)
- Regulations on harmful substances in waters (Official Journal of the Socialist Republic of Serbia,, No. 31/82)
- Regulations on water classification (Official Journal of the Socialist Republic of Serbia,, No. 5/68)
- Regulations on categorization of watercourses (Official Journal of the Socialist Republic of Serbia,, No. 5/68)
- Regulations of the sanitary quality of the drinking water (Off. Jour. of FRY, No.42/98, 44/99)
- Regulations on permitted amounts of hazardous and harmful substances in soil and water for irrigation and methods of their testing (Official Journal of the Republic of Serbia, No. 23/94)
- Bylaw on conditions which must be fulfilled by firms and other legal persons performing certain kind of examination of surface and groundwater, as well as examination of wastewater quality (Official Journal of the Republic of Serbia, No. 41/94, 47/94)
- General plan for protection from floods (Official Journal of the Republic of Serbia,No. 34/03)
- Operative plan for protection from floods (Official Journal of the Republic of Serbia,No. 38/03)

The comments on relevant regulations are presented in Annex 3.

3.3.3 Legal framework in Bulgaria

Integrated Water Management as a ruling Principle of the EU WFD was introduced into Bulgarian legislation through the Water Act 1999 which came into force in January 2000, and its implementing Regulations:

- Regulation on the way and order of industrial waste water discharge in the urban sewage systems (Dir. 76/464/EEC; 91/271/EEC);
- Regulation on the quality of the water intended for human consumption (Dir. 98/83/EEC);
- Regulation on the quality requirements of surface water intended for drinking purposes (75/440/EEC);
- Regulation on the prevention of nitrates polluting the waters as caused by agriculture (Dir. 91/676/EC);
- Regulation on the quality of bathing water (Dir. 76/160/EC);

- Regulation on the quality of fish and shellfish water (Dir. 78/659/EEC and 79/923/EEC);
- Regulation on the quality of coastal sea water (Dir. 79/923/EEC; 76/464/EEC; 91/271/EC and 76/160/EEC);
- Regulation on the emission limit values of dangerous and hazardous substances in the discharged waste water (Dir. 76/464/EEC);
- Regulation on the way and order of the development of the networks and National Water Monitoring System activity;
- Regulation on the research, use and prevention of polluting the groundwaters (Dir. 80/68/EEC and 76/464/EEC);
- Regulation on the protected sanitary areas (Dir. 75/440/EEC; 80/68/EEC; 91/676/EEC);
- Regulation on the wastewater discharge permits issue and individual emission limit values of pollution discharges (Dir. 80/68/EEC; 76/464/EEC and 91/271/EC).

3.3.4 International Cooperation

The ratification and implementation of international conventions and agreements in the field of environmental protection as well as on water management is an important part of international cooperation.

The following regional initiatives, connected to environmental issues are relevant to the Timok River Basin:

- Both Serbia and Bulgaria participate in the Black Sea Economic Cooperation Council - the implementing body is the Commission for Environmental Protection Cooperation in April 2003, International Convention on Protection and Sustainable Use of River Danube - the implementing body is ICPDR the International Commission for the Protection of the Danube River;
- The Republic of Serbia appointed a Secretary to the International Commission for Sava River Basin (ICSRB) and actively participated in the framework agreement on the regulation of the Sava River with the Interim Sava Commission, as well as with the ICSRB, which is located in Zagreb, Croatia;
- Regional cooperation in the transport and energy fields was improved through the SEE Transport Core Network and the Regional Energy Market;
- Initiative Tisa – the Republic of Serbia participates in the INTERREG IIIA/Phare, CBC Programme Hungary - Romania and Neighbourhood Programme Hungary – Serbia regarding the Food and Agriculture Organization pilot project on water quality and agricultural pollution;
- Regional Environmental Reconstruction Programme (REReP) Project 4.3.27 – Cross border cooperation on the clean up of the Drina river and Perucac lake between Serbia and BiH;.
- ECENA (ex BERCEN) network of environmental inspectorates;
- Priority Environmental Investments Programme (PEIP) where priority environmental investment projects are identified and their proposals prepared;

- AIMS Network (Network of Multilateral Environmental Agreements Senior Officials and Legal Experts for South Eastern Europe).

It is of utmost importance to continue with efforts aimed at upgrading environmental legislation in general, as well as strengthening relevant institutions. More concrete projects are needed and more help from abroad if Serbia is to catch up to the other countries in transition.

3.3.5 Bilateral between Serbia and Bulgaria

Water management issues
An agreement between the governments of the FPR of Yugoslavia and the PR of Bulgaria concerning water management issues was signed on 4 April 1958. The agreement is formally still in force, but cooperation was discontinued in 1982. A new bilateral agreement on the management of transboundary water courses is a subject of ongoing discussions between the competent authorities in both countries. The development and concluding of such an agreement in the nearest future is highly recommended (see the pt. 7 Recommendations).

Border issue
Concerning a partial change of the State border-line on the Timok River, an Agreement was signed in 1961. The main objectives were a riverbed regulation and a construction of levees with the intention of protecting Bulgarian riverside from floods. According to the approved design, the natural course of the River Timok should have been shortened from about 17.5 to 10 km. Nevertheless, although the Agreement entered into force, the agreed river works have never been performed and State border-line on Timok is still the same.

Border fishing
An agreement between the governments of the FPR of Yugoslavia and the PR of Bulgaria concerning border fishing was ratified on 22 January 1962. The agreement is formally in force, but it is not being implemented in practice.

4. SOCIO-ECONOMIC TRENDS

4.1 Economic Driving Forces

As previously emphasized, up to the end of the 19th century, the area was poorly inhabited and not developed. The quick development of the region took place from the beginning of the last century up to the 1990s. During the 1990s, a decrease in economic production in the region was recorded which produced a rapid increase of unemployment and declining number of citizens. Insufficient financial resources lead to unsatisfactory management of the environment.

4.1.1 Agriculture

Agricultural land covers a considerable part of the Timok River Basin Area. The exact share of agricultural land within the Timok basin could not be evaluated due to the fact that all data are organized according to municipalities. The border of municipalities does not correspond to the borders of the Timok Basin.

However, it could be estimated, that in Serbia according to the data for municipalities that share the larger territory within the basin area (Bor, Zajecar, Boljevac, Svrljig and Knjazevac), agricultural land covers between 45 and 60 percent of the territory. Grain cultures are frequently cultivated in the lower part of the basin, while within the hilly- mountainous region, cultivation of fruit and vegetables is the main agricultural activity. The Knjazevac region is famous for its grape cultivating activities.

Bregovo municipality is a rural area, which is largely dependant on agriculture as an income and employment generating sector. The propitious climate and fertile soil are favourable for growing grain and forage crops, vineyards, vegetables and breeding cattle. The grain crops, mostly wheat, barley and maize, occupy the majority of the agricultural land. The benefits for agriculture development are identified as opportunities for future economic development and ensuring employment and income to the local population. There are 172 registered farmers in the Bregovo municipality (according to the statistical data from 2005).

Figure 8. Crops coverage (data from Municipal Development Plan – Bregovo, 2005)

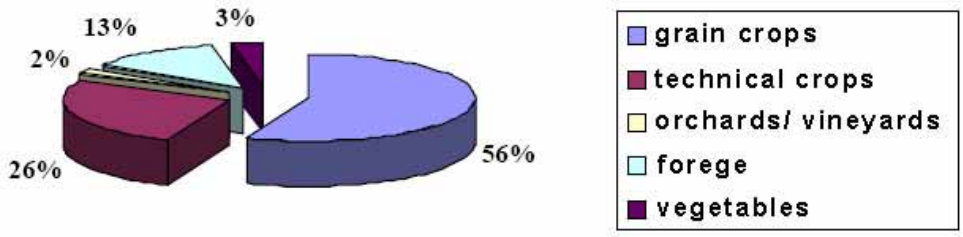
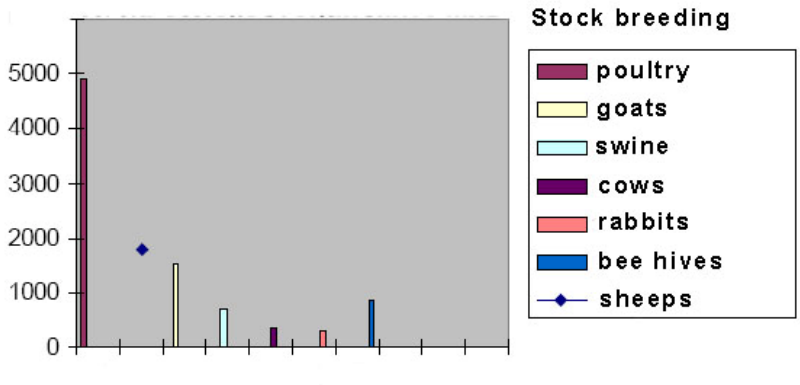


Figure 9. Stock breeding (data from Municipal Development Plan – Bregovo, 2005)



The large area of abandoned lands, a serious problem, is caused by a separation in many small plots, low prices/rents, insufficient financial resources for farming and depopulation of the settlements in the area.

4.1.2 Industry

The region is rich in copper and gold mines, especially in the Bor area. The Bor complex is one of the main factors influencing the economy and the environment in the area. It is 400-600 m above sea level.

The Bor open pit mine is located near the city of Bor. It is approximately 300 m deep and over 1 km at its widest point. Mining activities are not ongoing and the pit is presently used for the storage of waste rock as delivered by an overland conveyor from the Veliki Krivelj mine together with waste slag from the smelter.

Excavation of the Veliki Krivelj open pit mine started in 1979, while production started in 1982. It is estimated that 150 million tones of ore have been excavated, while the annual production is assessed at around 4,8 million tonnes.

The Cerovo mine is located 14 km northwest of Bor. It is situated in a hilly countryside near the initial stretch of the Kriveljska stream. The open pit is located between two streams, the Cerovo and the Valja Mare. These confluence to form the Kriveljska river, approximately 2 km southeast of the mine, towards the village of Mali Krivelj. The Cerovo open pit is presently not operational. Production took place from 1991 to 2002, when 1,17 million tonnes of ore were mined at a grade of 0.35% Cu.

Due to mining works that took place during the last century, the morphology of the area has been changed significantly.

The process of privatization of Bor Group is underway and it is not known when it will be completed. The privatization process has already run for six years (since 2002) in accordance with the Serbian Law on Privatization (Official Gazette of the Republic of Serbia, No. 38/2001, 18/2003, and 45/2005). Before starting the privatization process, the RTB Group consisted of 19 legal entities – one holding company and 18 subsidiaries.

The majority of “non-core business” subsidiaries which are not of special importance from the aspect of environmental protection have already been privatized (hotels, some small factories, sport center, etc.).

The RTBor Group now consists of RTB Bor LTD, RTB Copper Mine Bor, RTB Copper Mine Majdanpek and RTB Bor Smelting Malt and Refinery, as well as subsidiaries. The Reconstruction Program of RTB Group, which is the basis for the process of privatization, comprises the “Environmental Investment Program”, as proposed by a consultant with the Privatization Agency of Serbia.

In the Privatization Program, certain specific obligations will be imposed on the buyer for the RTB Group. Therefore, the completion of the privatization process is likely to improve the environmental component of the RTB Bor business. For example, some prospective buyers have been rejected (which prolonged the privatization process) because they did not provide guarantees they would follow the Environmental Investment Program of RTB Bor.

The industry in the BG part of the Timok River Basin declined in the last 2 decades. It is represented by small/medium scale industries:

- Food production: a few bakeries, dairy and sunflower oil plants based on the availability of local agricultural resources
- Wine production: the local grape type “Gamza” is famous on the national market, the wine is also bottled for export
- Clothing factories: two small factories are in operation, ensuring employment for the local population but providing low levels of income
- Carpentry: small scale factory

4.1.3 Energy

There is no energy production at present. The development of agriculture will create opportunities for the local utilization of biomass as a renewable energy source.

4.1.4 Transport

The geographical location defines defines the development of transport infrastructure.. The border checkpoint at Bregovo ensures transport between Bulgaria and Serbia.

The construction of the Danube Bridge II started May 13, 2007, as part of the European transport corridor 4 (Berlin – Thessaloniki). The bridge, which will connect Vidin (Bulgaria) with Kalafat (Romania), is expected to significantly improve accessibility and the entire economic development of the area. The existing ferryboat between Vidin and Kalafat has limited capacity.

The Timok River is a tributary of the Danube River, which is an important transport channel from ancient times. Nowadays it is known as European transport corridor 7 (Rain – Main – Danube). The future road connection between Corridor 4 and Corridor 10 (which pass through the Republic of Serbia) will increase the importance of the Vidin district as a transport crossroad.

The port of Vidin has passengers, cargo and ferryboat terminals which require renovation. Its importance is also expected to increase with the construction of the Danube Bridge II and the planned improvement of the road infrastructure in the area.

The railway infrastructure is not in good repair. There are projects for renovating the existing railway Vidin – Sofia as well as construction of the railway Vidin – Vrashka Chuka in order to establish a railway connection with Serbia.

4.1.5 Forestry and Hunting

Forests and other wooded land in Serbia occupy 2.429.577 ha or 27.3% of the territory. State and public ownership is at 50.91% and private ownership is at 49.09% of the overall area of forests and other wooded land. About 30% of the Timok Area is covered by forest.

The forestry is managed by “Srbijasume” enterprise. In the Timok basin in particular, it is run by the individual activity, FE ”Forest of Timok“, Boljevac, which comprises seven forest management units. The state and private forests occupy more than 200.000 ha within the area covered by the enterprise “Forest of Timok”. As in the case of agricultural land, the share of forests could not be evaluated.

Hunting in the region is managed by the enterprise "Forest of Timok" Boljevac, which comprises of nine hunting regions.

In the Bulgarian part, the sector is underdeveloped because the forest covers 2% of the territory of the catchment area.

4.1.6 Tourism

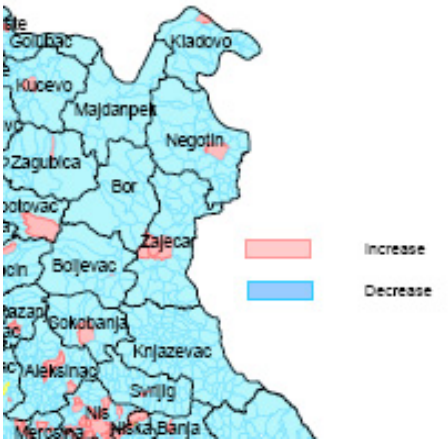
Tourism is is expected to be an important source of income for the region. The potential for tourism in the area is illustrated by the presence of important archeological sites (Felix Romuliana), several spa centers, and monasteries in Serbia. The construction of a ski center at Stara Planina could provide the basis for rapid development of the area from one point of view, but from the other side the building of facilities could pose an environmental risk.

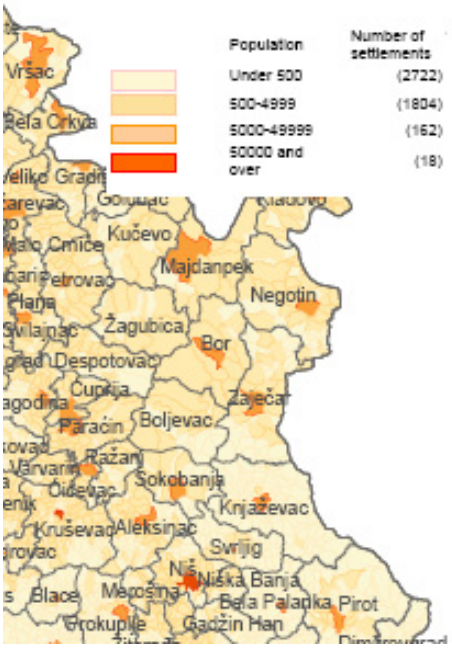
Tourism is underdeveloped in North-Eastern Bulgaria. However, proximity to the Danube River, the development of transport infrastructure and adjacent historical monuments provide conditions for the development of this sector in the local economy.

4.2 Social Driving Forces

4.2.1 Population, Employment, Migration and Poverty

The ***Serbian part*** of the river basin is inhabited by approximately 200.000 people. A significant depopulation was recorded for the period 1991-2001, ranging between 8 and 10% of the total number of citizens (Municipalities of Serbia 2008).



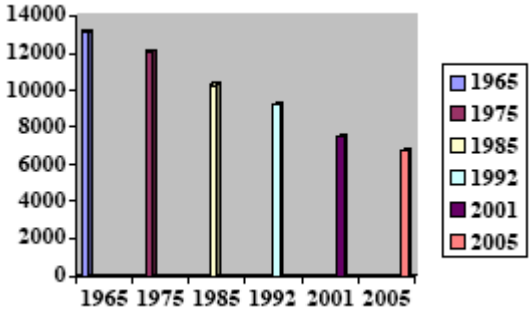


The demographic status of the **Bulgarian part** is adverse, consistent with the overall Vidin district. The population is decreasing and aging because of the decreased birth rate and migration. The trend of depopulation is visible from the table and graph below:

Settlement / Year	1999	2000	2001	2002	2003	2004	2005
Bregovo	8346	8189	7364	7181	7122	6869	6725
Novo selo	4508	4359	4084	3916	3972	3845	3733
Vidin	81669	80701	77167	75651	73856	72577	71222
Total for District of Vidin	138794	136212	128050	125158	122609	120192	117809

Source: National Statistic Institute, Annual statistic records 2000 - 2006

Trend of depopulation in Bregovo municipality



The unemployment rate for the whole territory of Vidin district is 17 %.

4.3 Financial Initiatives

4.3.1 Bilateral and international programmes

- **Cross-border Cooperation Programme Bulgaria – Serbia, 2007 – 2013** was approved by the European Commission on March 25, 2008. The programme includes specific measures for the development of infrastructure concerning environmental issues such as small-scale infrastructure for pollution prevention, waste management, floods and erosion prevention.

- **South East Europe Operational Programme** aims at improving the territorial, economic and social integration process and contributes to cohesion, stability and competitiveness through the development of transnational partnerships and joint action on matters of strategic importance. The Priority Axis 2 of the programme is “Protection and improvement of the environment”.

- **INTERREG IVC** is part of the European Territorial Cooperation Objective. It is a EU programme that helps regions of Europe work together to share their knowledge and experience. Launched in 2007, the programme will run until 2013. Two main priorities are targeted: “Innovation and Knowledge economy” and “Environment and Risk prevention”.

4.3.2 Financial initiatives in Serbia

Instrument for Pre-Accession Assistance (IPA) is the Community's financial instrument for the pre-accession process for the period 2007-2013. Assistance is provided on the basis of the European Partnerships of the potential candidate countries and the Accession Partnerships of the candidate countries. The Multi-annual Indicative Planning Document for the implementation of IPA in Serbia has among its objectives to promote economically, socially and environmentally sustainable rural development and investments in environmental infrastructures.

4.3.3 Financial initiatives in Bulgaria

As a new EU member state, Bulgaria is able to benefit from the Structural funds and Cohesion fund of the Community which provide financial resources in support of economic development and environmental protection. The European Union objectives, as they are identified in the Community Strategic Guidelines for Cohesion for the 2007 to 2013 period, are addressed by the National Strategic Reference Framework of the Republic of Bulgaria.

This financial framework is divided at the national level into several Operative programmes by sector and Cross-border cooperation programmes:

- **Operative Programme Environment and Waters** has 4 priority axes:
  1. Improvement and development of water and wastewater infrastructure in settlements with over 2000 population equivalents (PE) and in settlements below 2000 PE within urban agglomeration areas.
  2. Improvement and development of waste treatment infrastructure.
  3. Preservation and restoration of biodiversity .
  4. Technical assistance.

- **Operative Programme Regional Development** - sets out a coherent regional development strategy for 2007-2013 supported by a multi-annual investment commitment in the key areas of infrastructural development of urban centres, territorial connectivity, sustainable tourism growth and support to regional and local partnerships.

- **Rural Development Programme (RDS) 2007 – 2013**
  The objectives of the RDP will be addressed by 30 measures within the following four priority axes:
  - Improving the competitiveness of the agricultural and forestry sector.
  - Improving the environment and the countryside through agro-environmental payments, afforestation of non-agricultural land, restoring forestry potential and introducing preventative actions.
  - Quality of life in rural areas and diversification of the rural economy, including diversification into non-agricultural activities, village renewal and development and encouragement of tourism activities.
  - Leader - Implementation of local development strategies, inter-territorial and trans-national cooperation.

5. MANAGEMENT OF NATURAL RESOURCES AND STATE OF ENVIRONMENT

5.1 Water Resources

5.1.1 Water Balance, Availability and Uses

In 1959, a dam was constructed on the tributaries of the Brestovacka River. The reservoir Bor Lake was then formed with a total area of 30 ha.

The lack of drinking water in the region of Zajecar was the main reason for constructing the dam and forming the reservoir on the Grliska River.

Mining activity in the past few years has strongly influenced the natural river courses in the Bor Region. In particular, Borska Reka, which was originally flowing northwest to southeast next to the Bor settlement, has been deviated by a pipeline built north of the Bor open pit and is now flowing into the Kriveljska River deviation before the underground collector placed under the Veliki Krivelj tailing ponds.

South to the tailing pond “RTH”, the natural river basin does not receive river water but only water discharges that flow into the Kriveljska River near to the Slatina settlement. In addition, the Kriveljska river course has been modified from the original course both as a result of the Veliki Krivelj open pit where it now borders the pit and the Veliki Krivelj tailing ponds, where it is deviated into an underground collector running under the eastern tailing pond. The Kriveljska River flows into the Timok River.

The Bor water supply is connected to the basin of the Zlotska River, and since 2000, from the wells in the region of Crni Timok.

With regards to the fact that data are not organized according to Basin Areas, the use of groundwater is presented for East Serbia, wherein the Timok Basin is situated. The information on groundwater use represents the outline from SCG ICPDR National Report (2004).

East Serbia is primarily characterized by a large number of karstic springs (about 144 have been identified and their lowest yield is greater than 5 l/s). More than 70 of these have also been identified as significant for water supply (with the lower limit of minimum yield during an average hydrological year of 10 l/s). 16 springs have a registered minimum yield greater than 100 l/s. However, the utilization of this natural potential is relatively low.
Several successful karstic aquifer regulation projects have been completed in recent years where water is abstracted from semi-closed karstic structures (in the wider zones of springs which had already been tapped) for the cities of Bor, Nis, Knjazevac and Cuprija. There is also the potential for increasing the capacity of a number of other water sources in this area. In the case of water sources for Bor and

Knjazevac, it is now possible to an average of about 200 l/s during the hydrologic minima occurring in the Summer and Fall (i.e. the natural minimum yield has been doubled).
There is no hydrometric data for the quantitative status of the lower section of the Timok River which prevents the responsible institutions from calculating the water balance.
The drinking water supply for the town of Bregovo and most of the settlements along the Timok River is supplied by wells using the groundwaters in the river basin. There are no drinking water treatment facilities at present.

Broad irrigation systems were constructed from 1950 to 1970 with the intensification of agriculture. At present, most of the irrigation channels are abandoned and the water of the Timok River is not used for irrigation.

5.1.2 Surface and Ground Water Quality

Monitoring activities in the vicinity of the Bor Complex in the Timok, Bor, Kriveliska and Bela rivers have been carried out in recent years. Several exceedences of Serbian legal limits for heavy metals (mainly copper and nickel) and suspended solids were recorded in the Bor, Kriveliska and Bela rivers (copper concentrations up to 16 mg/l against a limit of 0.1 mg/l). This situation has mainly arisen from the leaching of waste and overburdening heaps located in the Bor area and by RBB and TIR liquid effluents discharge.

Serbian regulation points out the legal framework for protection of surface water by means of four classifications according to water pollution level and use water classification (Official Gazette of Social Republic of Serbia, No. 5/68).

The quality monitoring of regular water is performed by the Republic Hydrometereological Service of Serbia at four sites.

Hydrobiological quality
In Bulgaria the monitoring of the hydrobiological status of the Timok River waters started in 1999. There is one monitoring point from the National monitoring system designated for the river, located near the town of Bregovo. Additional samplings are done at Baley, a village near to the inflow of the Danube River. The data from the hydrobiological monitoring describe significant deterioration of the water ecosystem. The Biotic index, based on macrozoobenthos, varies between 1 and 2 (before 2007), which corresponds to bad / poor ecological status of the waters according to the WFD 2000/60/EC.

Sampling point	**years**								
	2007 (2)	2007 (1)	2006	2005	2004	2003	2002	2001	2000
Timok at Bregovo	3	2	2	1-2	1-2	2	1	1	1
Timok at Baley					1	2	1	1	1
Danube at Vrav, km 840					2-3	2	3		
Danube at Vidin, km 787					3	3	3	3	2

As can be seen from the table, there is a trend of improvement in the Biotic index of the Timok River in recent years, which probably means a reduction in pollution.

Concerning the level and distribution of pressures within the basin area, as well as taking into consideration the typology and number of water bodies within the catchment area, the number of monitoring stations is not enough.

According to the results of monitoring (Republic Hydrometereological Service, 2004, 2005 and 2006) the water quality at the monitoring stations is mostly within classes II and III, with some parameters indicating IV class. The results indicate not satisfactory water quality.

Chemical quality

The chemical monitoring of the Timok River shows significant pollution by heavy metals. The limit values for Copper (Cu) is 0.5 mg/dm^3. In this respect the regular monitoring indicates large variations of the Copper (Cu) contents in the waters from 0.008 mg/dm^3 to 5.22 mg/dm^3 (measured in November 2004). The average value for the year 2004 is 0.6 mg/dm^3.

The dissolved oxygen, measured at Bregovo meets the Bulgarian national standards for water quality class III. The average annual value is 8.8 mg/dm^3, calculated from the monthly samplings while the threshold for the III category is 2.0 mg/dm^3.

The nutrient content in the water is relatively low. The average annual value of BOD_5 for the year 2004 is 2.5 mg/dm^3 with a threshold of 25 mg/dm^3 for the III category.

The content of nitrate nitrogen ($N\text{-}NO_3$) is 1.3 mg/dm^3, which is far below the threshold of 20 mg/dm^3. The nitrite nitrogen ($N\text{-}NO_2$) is 0.02 mg/dm^3, also below the limit value of 0.06 mg/dm^3. The ammonia ($N\text{-}NH_4$) is 0.2 mg/dm^3 while the threshold for III category is 5.0 mg/dm^3.

Phosphates (PO_4) are 0.19 mg/dm^3 which meets the standard of 2.0 mg/dm^3.

The average value for Total Suspended Solids is around the limit values –100 mg/l however the values vary significantly in relation with the flow discharge. High discharges cause temporary increases of the TSS and secondary pollution from the bottom sediments and river banks.

Sediments

Assessments of bottom sediments are occasionally initiated by expert teams from the Bulgarian Executive Environmental Agency. One of the sampling points was at the point of inflow of the Timok River. There are no certain limit values for the heavy metals in sediments according to national legislation in both Serbia and Bulgaria. If the results are compared, however, to the limit values set by ICPDR and the national legislation of some EU member states, exceedences of most measured parameters can be found.

Results from the assessment in year 2000:

№	Sampling locaton	Parameters								
		Cd mg/kg	Pb mg/kg	Cu mg/kg	Zn mg/kg	Mn mg/kg	Co mg/kg	Ni mg/kg	Cr mg/kg	As mg/kg
		Indicative limit values for comparison - mg/kg								
		0.50	*20*	*20*	*500*	*500*		*20*	*20*	*20*
1	Danube at Timok inflow	0.449	**60.000**	**1006.000**	98.400	217.000	10.000	**35.400**	6.700	**90.200**
2	Danube after Timok inflow at BG bank	**1.490**	**109.000**	**2330.000**	340.000	380.000	20.000	**31.800**	20.000	**99.800**
3	Danube at Novo selo, BG bank	**0.746**	**41.000**	**46.000**	105.000	466.000	8.500	**51.500**	10.000	9.700
4	Danube at Vidin	**0.646**	23.000	**166.000**	62.000	204.000	4.000	**27.300**	20.000	13.600

Compared to the other rivers in northwestern Bulgaria, the Timok River is the most polluted. Because of its poor ecological status, the Timok River is designated as a water body at risk of not meeting its ecological objectives according to the WFD. Operative monitoring of the water quality with a sampling frequency of 1 month started in 2008.

Groundwater quality

With regard to Eastern Serbia, the assessment reveals there should be no significant impacts provided water is abstracted in licensed quantities, in a controlled manner, and the water quality is monitored on an ongoing basis.

5.1.3 Waste Water

The situation regarding wastewater in the region is complex due to the several larger settlements, a number of villages and waste water discharge points from the three mines and the metallurgical complex combined with sanitary waste water from the town of Bor along with several villages. This whole complex significantly impacts the aquatic ecosystems.

Activities related to wastewater management in the **Serbian part of the river basin** are under the jurisdiction of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia/Republic Directorate for Water (licenses and permits), Ministry of Public Administration and the local self-government (operation and maintenance of waste water treatment plants and waste water infrastructure) and Ministry of Science and Environment Protection.

The most important laws that refer to the waste water domain in Serbia are the Law on Waters (1991), Law on Environment Protection, Law on Communal Works, and Law on Public Utility Companies.

According to the Law on Public Utility Companies, such companies perform: "treatment and disposal of storm-water and wastewater“ which means "collection

and disposal of sewage, storm-water, and surface water from public areas by means of sewers, drainage channels, or otherwise, treatment and release from the network, channels, drains, and other water disposal structures, sanitation of septic tanks, and collection of used waters from consumers' connections onto the street network and removal via sewers, treatment, and release from the network ".

The concern of every public utility is to collect and evacuate sewage and storm-water from its urban territory.

Borska Rreka and Kriveljska Reka are the final destinations of effluents from the Jama and Veliki Krivelj drilling activities and wastewaters from the flotation processes undertaken in the Veliki Krivelj waters from the smelting/refining complex as well as untreated municipal wastewater. This results in extremely polluted and degraded surface water with respect to pH, suspended solids, copper and iron.

Contamination of the Borska River is clearly visible between Bor and Slatina. The riverbanks have deposits of tailings from previous incidents at the Bor tailings pond. The Borska water is still acidic and contains elevated levels of suspended solids and copper concentrations as far as 10 km from the metallurgical complex. The Kriveljska stream south of the Veliki Krivelj mine and tailings ponds is acidic and contains high levels of suspended solids, iron, copper and zinc.

With regard to wastewater effluents generated at Bor, the main sources of wastewaters include effluents from the underground mines (blue waters), drainage waters collected at the bottom of open pits (Bor, Veliki Krivelj and Cerovo), wastewaters from the smelting complex comprising of sulphuric acid plant WW, spent electrolyte solutions and blowdowns as well as runoff from the overburdened disposal sites..

Monitoring undertaken on the generated effluents in 2005 detected the presence of heavy metals (Cu, As, Zn, Fe and Ni) in concentrations above Serbian limits and highly acidic pH.

In the **Bulgarian part**, the sewage systems are constructed only partially and only in larger settlements (Bregovo and Novo Selo) in the Bulgarian part of the Timok River Basin. A major portion of the urban wastewater flows into septic tanks without proper maintenance, which pollutes the surface and groundwater. There are no wastewater treatment facilities at present.

The Municipality of Bregovo has developed a project for the development of wastewater collection, rainwater collection and a WWTP. The technical design and construction works have not been financed yet. The Municipality of Novo Selo also has a concept project for a WWTP.

The entire river basin falls into a Nitrate Vulnerable Zone according to the Nitrates Directive (91/676/EC). As a part of the Danube River Basin, it is also designated as a Sensitive Area according to the European Urban Waste Water Treatment Directive.

5.2 Biological Resources

5.2.1 Flora and Fauna Diversity

The region is overall heterogeneous in natural characteristics. The diverse climate, relief diversity, altitude range, as well as the influence of neighboring regions, contributes to the considerable biological diversity within some parts of the Timok Basin area. The area of Stara Planina could be recognized as the most important region regarding biological diversity within the Timok Basin.,. The area was described as one of the biodiversity centers for plants (Stevanovic et al. 1995) and insects (Radovic et al. 1995), as well as for aquatic fauna (Simic 1993, Simic & Simic 1999, Paunovic et al. 2005a, 2005b).

The plain landscape and the intensive land use practices have led to majorchanges in natural habitats in the lower part of the Timok River basin. The last remnants of native forest vegetation are preserved in narrow strips and patches along the river. Being a border zone, the river banks are subject to limited human access and fewer pressures compared to the adjacent territories. Therefore the lower river section is considered as important for the protection of biodiversity and a natural “green corridor”, valuable for migratory species.

5.2.2 Protected Areas

There are several protected sites from the Natura 2000 network in the Bulgarian part of the Timok River Basin and downstream along the Danube River which are dependant on the ecological status, water management and environmental risks associated with the Timok River. The entire Timok river section shared between Serbia and Bulgaria, is designated as a protected site of Community interest.

The protected Site of Community Interest **Timok BG0000525** is designated to protect riparian habitats listed in the annexes of the Habitat Directive 92/43/EEC including: 91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*, 2340 - Pannonic inland dunes, 3270 - Rivers with muddy banks with *Chenopodion rubri p.p.* and *Bidention p.p.* vegetation and 6430 - Hydrophilous tall herb fringe communities of plains and of the mountain to alpine levels. The protected site covers 494.97 ha and includes a major part of the river section shared between Bulgaria and Serbia.

Mt. Stara Planina-Vidlic is designated as an Important Bird Area. The IBA Programme of BirdLife International addresses wetlands or water-dependent areas. The programme aims to identify, monitor and protect a global network of IBAs for the conservation of the world's birds and other biodiversity.

5.2.3 Current Threats

The following threats were identified during the process of Natura 2000 elaboration:

- Decline and fragmentation of natural habitats because of logging, agriculture and other intensive land use practices.
- Possible morphological alterations of the river bed and impacts on the biodiversity if the extraction of sand and gravel is further developed.
- Long-term impacts on the fish fauna from the pollution of the river.

5.3 Land Resources

5.3.1 Land Uses

The major part of the land is used for agriculture, while the urban areas and infrastructure cover about 10%.

5.3.2 Land Degradation

Over 4000 ha of the most fertile agricultural land on the banks of Borska and Veliki Timok Rivers in Serbia and Bulgaria are extremely contaminated with heavy metals and other toxic substances because of the mining industry. This incliudes 450 ha along the Bulgarian section of Timok River, which are affected by the transboundary

pollution. There are old plans for re-cultivation of the contaminated soils but the funding for their implementation is not certain.

5.3.3 Soil Erosion

Soil erosion is mainly a problem in the Serbian part of the basin area. The erosion of varying intensities is recorded in all parts of the region. The most widespread type is surface erosion or runoff erosion (Project ReREP 2003).

In BG part the soil erosion is a problem mainly connected with bank of the Danube River in the village of Vrav. There is no significant erosion along the BG bank of the Timok River.

5.4 Forest Resources

5.4.1 Forest Stands and Logging

The forest resources are very limited in the Bulgarian part of the river basin. The forest coverage is 2% of the total area. Forest management and logging is governed by the enterprise Forestry of Berkovitza.

5.5 Mineral Resources

5.5.1 Endowment and Use

The Bulgarian part of the Timok river basin, as well as the whole Vidin district, is not rich in mineral resources. There are small scale finds of black and antacid coal in the northern slopes of the Balkan mountains near to the border but extraction is not profitable.

The extraction of sand and gravel from the river beds for construction purposes is interesting for investors but in many cases it has a negative impact on the river morphology.

5.5.2 Mine Waste Water and Tailings Deposits

For many years there has been a problem with heavy metals polluting soil in the northwest areas of Bulgaria along the Timok River by RTB “Bor” in the Republic of Serbia. Wastewaters generated from the mine include copper wastewater from copper processing as well as wastewater generated from the metallurgy-chemical process of copper electrolysis in addition to the sulphuric acid producing factories. Consequently, large areas in Serbia and Bulgaria are contaminated.

5.6 Waste

The Serbian national regulation on waste management, evaluation of the quality and quantity of waste in the region, together with plans for waste management are presented in the National Waste Management Strategy (2003).

In Bulgaria the Waste Management Act was adopted in 2003 and the National Waste Management Programme (2003 – 2007) started. It continued with the Annual Action Plan in 2008.

Although the quantities of household waste, industrial non-hazardous waste and other waste types are difficult to evaluate, it should be underlined that the main concern is the waste generated as a consequence of the functioning of the Bor Mining Group. The main wastes generated from the mining activities include:

- Waste generated at the Jama underground mine;
- Waste from the old Bor open pit;
- Waste from flotation unit.

The following waste materials are derived from the exploitation process of copper ore in the subsurface pit Jama:

- Scrap iron resulting from the replacement of worn out machines and installations. Scrap iron is stored in the plant yard and sold as secondary raw material.
- Waste grease and lubricating oils, resulting from mining machinery maintenance. Reportedly, waste oil is temporarily stored in drums and reused on site for rotating machinery lubricating purposes.
- Waste materials generated from the Bor flotation plant.
- Waste steel materials consisting of waste steel rods, balls and linings resulting from ore grinding operations and maintenance. Waste steel rods and balls are removed daily and stored in a bunker near the rod mill, while waste steel linings are stored in the production plant yard. Waste steel rods, balls and linings are also sold as secondary raw material.
- Scrap iron resulting from the replacement of worn-out machines and installations. Scrap iron is stored in the plant yard and sold as secondary raw material.
- Waste rubber belts resulting from replacement and maintenance operations. There is no special storage location for waste rubber belts so they are mixed with other waste materials and stored in various locations at the site.
- Waste grease and lubricating oils, resulting from mining machinery maintenance. Reportedly, waste oil is temporarily stored in drums and reused on site for rotating machinery lubricating purposes.
- Flotation tailings resulting from the flotation concentrating process of copper mineral. Flotation tailing is pumped over to the tailing pond located in Bor, the so called RTH.

The sites generate a variety of waste that is stored at different locations throughout the site itself. No formal waste management procedures are in place at the site and the waste generated is generally temporarily stored on site waiting to be reused, sold or dumped on site.. No reliable figures with regard to type and detailed estimates of waste are available and it is therefore not possible to provide an estimated cost for disposal.

Based on the available information and interviews conducted at the site, waste has historically been abandoned/dumped on site and the same procedure is currently in place with the exception of secondary raw materials which can be sold or reused at the site (metal scraps, redundant equipment, spent batteries, used oils). There is a lack of awareness of waste management issues such as waste minimization, safe storage and handling of waste, waste labeling and segregate collection.

Main wastes generated at Bor include waste and tailings from mining activities, slags from blast furnace and insulating materials as well as from the smelting process and other waste including waste tyres, scrap metals, lubricating oils and spent accumulators. Waste generated at Bor is currently mainly deposited on open dumps. Major open dumps are recognized to be present at the Bor site, close to the tailing pond RTH and in the old Bor open pit. An open dump for municipal waste is also located on the premises.

5.6.1 Municipal Wastes

Solid waste management is still a problem in many municipalities in Bulgaria and Serbia, including in the catchment of the Timok River.

5.6.2 Industrial Wastes

Small scale organic wastes are produced by food processing and wineries. The waste is not utilized but there is potential for its utilization as an energy source.

5.6.3 Radioactive Wastes and Hazardous Chemicals

There are no sources of radioactive waste or hazardous chemicals in the region.

6. ENVIRONMENT AND SECURITY

6.1 Natural Disasters

6.1.1 Floods

The river bed of the Veliki Timok was trained in 1950 – 1970 and dykes were built to prevent flood events.

6.1.2 Droughts

In the Timok basin, climate change over the past few decades and its expected future impacts are associated with droughts. The drought risk is particularly impactful to agriculture, especially in the Bulgarian part of the Timok River Basin where the irrigation systems are not in use due to water pollution and economical crisis in the agriculture sector the last 20 years.
The similar situation regarding the irrigation activities was recorded in Serbia., and the agriculture could be seriously affected by climate changes.

6.2 Accidental Pollution

6.2.1 Potential Accident Risk Spots

The main sources of pollution are untreated wastewaters, agriculture and the Bor Complex. Major emission sources in the area consist of stacks from the TIR smelting complex which have high emissions of sulphur dioxide (annual average concentrations in 2004 were up to 16,000 mg/Nm3 against a limit of 2,000 mg/Nm3) and particulates (annual average concentrations in 2004 were up to 1,200 mg/Nm3 against a limit of 20 mg/Nm3). Additional sources of emissions to air include: sulphur dioxide and particulate from power plants, particulate from mining activities both underground and from crushing/milling processes, wind blown particulate from tailing ponds and spoil heaps.

Key identified sources of soil and water contamination at Bor include:

- Wet/dry deposits of air pollutants from the smelter and dust from tailing ponds, open dumps and waste heaps;
- Historical and current waste dumping, contaminated storm water infiltration into the ground and leakage from the underground pipeline connecting Cerovo open pit to Bor;
- Historical and current discharge of contaminated effluents into surface watercourses and the consequent sediments contamination.

The entire section of the Timok River that follows the Serbian-Bulgarian border is considered at high risk of accidental pollution of a ttransboundary origin. As a major

tributary, the Timok River also contributes significantly to the water pollution of the Danube River in the section after the inflow.

Aside from its environmental impacts, the pollution also causes human health risks. An example of such a risk is the bioaccumulation of heavy metals in the Danube fish species which are used for food. A study of fish samples done in the year 2000 raised an alarm for this risk.

6.2.2 Management of Transboundary Environmental Impacts

The existing coordination between the countries is mostly at central governmental level, without visible implications at the river basin level or local level.

The establishment of mechanisms for transboundary cooperation for Integrated Water Resource Management in the Timok River Basin and coordinated actions for prevention of trans-boundary environmental risks are highly recommended. According to the EU WFD, this is a subject of bilateral agreement between the Competent Water Authorities in the two neighboring countries.

Besides the competent authorities the transboundary cooperation mechanisms should involve all major stakeholders.

7. DEVELOPMENT ALTERNATIVES FOR THE TIMOK RIVER BASIN

7.1 Current Policies and Programmes

The vision and objectives for the future development of the area are of the Timok River Basin in Bulgaria are reflected in the planning documents at municipal level (*Municipal Development Plan of Bregovo Municipality 2007 - 2013* and *Municipal Development Plan of Novo Selo municipality 2007 – 2013*,) and district level (*Strategy for Development of Vidin District*). According to these strategic documents the priority is given to:

- Economic growth based on the development of agriculture, food and drinks processing industry. This includes measures for supporting the farming, restoring the cultivated lands, vineyard development, improving the farming equipment, machinery and innovations in the processing industries, etc. The environmental quality of the waters and soils is crucial for the agriculture development as the pollution could compromise the production and the related incomes and social status of the local population.
- Development of infrastructure, including the roads, environmental and social infrastructure. Large expectations are addressed through the availability of public funds, mainly from the ERDF and the State budget in the period 2008-2013. From the environmental perspective, the most important are the sewage and wastewater treatment facilities to mitigate the impact of nutrient pollution to the surface and groundwater.
- Improvement in the quality of life and reducing migration in the municipalities through improved urban environment and recreation opportunities. This also includes the development of the region as a tourist destination.
- Improved environmental conditions by reducing the impact of pollution, restoring polluted and degraded lands as well as preventing natural disasters. Concrete measures for the restoration of lands, affected by the transboundary pollution along the Timok River and Danube River are also recommended.
- Cross border cooperation with the Republic of Serbia and the Republic of Romania, particularly in the fields of the transboundary management of natural resources and environmental risks.

At the national level the following policy documents are relevant to the environmental issues and setting the environmental objectives for the Bulgarian part of Timok River Basin:

- National Strategy for the Development and Management of the Water Sector
- National Regional Development Strategy of the Republic of Bulgaria for the Period 2005-2015

- National Biodiversity Action Plan.

Regarding the Serbian part of the Timok Basin, it should be mentioned that the regional environmental action plan for the Bor region was adopted in 2004, being the first plan of this level in Serbia. The regional plan included Majdanpek, Kladovo and Negotin municipalities.

In the case of Serbia, the following strategic documents are important for environmental issues and sustainable development, which is also relevant to the Timok Basin:

- Serbian Poverty Reduction Strategy Paper (PRSP)
- Serbian Environmental Strategy (NES)
- Local Sustainable Development Strategy (LSDS)
- Health Care Strategy – Better Health for All in the Third Millennium (HS)
- Serbian Energy Sector Development Strategy (SESDS)
- Serbian Agriculture Development Strategy (SADS)
- Water Management Principal Document for the republic of Serbia (WMPD)
- Serbian Forestry Policy (SFP)
- Serbian SME and Entrepreneurship Development Strategy (SMES).
- National Waste Management Strategy (NWMS).

7.2 Development scenarios

Three development scenarios are briefly explored in this document based on the available information and most likely developments of the socio-economic factors, affecting the environmental conditions in the river basin.

1. **Zero scenario (current situation):** Significant pollution from the mining waste waters in the lower river section and insufficient transboundary management of environmental risks impact the aquatic ecosystem and human health causing limitations in the social and economic developments of the Timok River Basin. Both in the Serbian and Bulgarian parts, some economic activities which are dependant on the environmental conditions (agriculture, tourism and recreation, fishing), are declining.
2. **Sustainable development scenario:** The transboundary cooperation for the management of water resources and the political and financial support for the development of environmental infrastructure are improved. Reduction of the industrial pollution and investments in remediation of the polluted terrains result in water quality improvements. Rehabilitation of the aquatic ecosystem will need time because of the accumulated pollutants. Preconditions for the

future development of sustainable land use practices of the river basin (in accordance with the objectives of the regional and municipal development plans) are created.

3. **Intermediate scenario:** Reducing the pollution from the mining industry along with intensifying the land use for agriculture. This scenario is possible as agricultural development in the area is expected in the near future. In this case the increasing nutrient loads, possible water abstraction for irrigation and further morphological alterations may become the major threats for the ecological status of surface waters and the quality of ground waters.

8. CONCLUSIONS AND RECOMMENDATIONS

Preparation for the present report included analysis of the information on not only the area's ecological status, socio-economic characteristics, policies and strategies, but also interviews with representatives from the decision making institutions.

8.1 Conclusions

8.1.1 Characteristics of the Timok River Basin

- The region of the Timok River Basin is diverse in overall natural characteristics;
- Due to the relief, geological and climate characteristics, as well as due to the position of the basin, considerable biological diversity is recorded;
- The Stara Planina region is of special interest regarding the biodiversity – the area was found to one of the centers of biological diversity of the Balkan Peninsula for plants, insects and aquatic biota;
- The region is socio-economically underdeveloped;
- Due to the unfavorable socio-economic situation, negative population trends have been recorded since 1991 along with a rapid increase of unemployment and decline of the population; and
- Lack of finance also lead to the unsatisfactory management of the environment.

8.1.2 Environmental Acts

- The adaptation of the Environmental Policy in Serbia according to the EU Laws and recommendations has started. A lot of tasks have already been done;
- The Republic of Serbia's Environmental Acts are precise and the pollution levels identified therein are similar to those in other Middle European countries;
- Adoption of some important acts is still pending in Serbia, e.g. new Law on Waters.
- The Environmental legislation of Bulgaria has been completely harmonized with the EU policies and legislation over the last 10 years.

8.1.3 Pressures and State of the Environment

- The main environmental hot spot in the region is the RTB Bor Group;
- Aside from the RTB Bor Group, the untreated urban wastewater and influence of agriculture constitute pressures to the environment;

- The contamination of sediment with heavy metals (copper and arsenic) has been recorded in the Timok River.

8.1.4 Prospects

- Privatization of the RTB Group is underway and it is not known when it will be completed. The Reconstruction Program of the RTB Group, which is the basis for the process of privatization, constitutes the “Environmental Investment Program”, as proposed by a consultant with the Privatization Agency of Serbia.
- Since the protection of water quality is the most neglected segment of the water sector, and in light of the up-to-date global trends, the highest investment volume in the future would be related to sewage collection, disposal, and treatment. Revitalization of the existing and construction of new sewage collection, disposal, and treatment systems is one of the priorities for Serbia.
- The scenarios for sustainable socio-economic development in the border area are dependant on the improvement of the environmental conditions and reduction in the impacts of pollution. This is particularly important for the development of agriculture, fisheries and tourism.

8.2 Recommendations

Based on data collected and conclusions, the following recommendations are highlighted:

1. Cooperation between Serbia and Bulgaria should be improved, taking into consideration the collaboration of the competent authorities, as well as cooperation at the level of research, awareness raisin at all levels and public participation regarding environmental issues and the new EU water policy;.
2. The on-going discussions between Bulgaria and Serbia about the Timok river should result in preparation and conclusion of a bilateral agreement on the management of transboundary water courses.
3. The involvement of the different levels of decision making and the various interested parties should be ensured by the establishment of a stakeholder forum (Timok River Forum).
4. Programs of collaboration should take into the account data gaps, and research to fill these gaps should be supported;
5. Collaboration within the framework of activities aimed at environmental issues on the Timok River Basin area is an excellent opportunity for creating a model for cooperation in other regions. As the area is heterogeneous in natural characteristics and different types and intensities of pressures and impacts are recorded, it offers the possibility of analyzing different aspects of environmental issues. Possible collaboration at the different levels (governmental, municipal, research, etc.) could also be extrapolated to wider territory. As additional steps are taken, other border regions should be involved.

6. One of the first steps in this collaboration should be the definition of appropriate indicators for the environmental status for the region. Although a wide range of indicators is offered, it should be underlined that proper selection should be done based on the specificities of each region. One of the ideas discussed in this document is the set of possible environmental indicators. The discussion should be based on characteristics of the area and evaluation of available data.
7. UNECE Water Convention provides a solid framework for effective transboundary cooperation between Serbia and Bulgaria. More efforts should be done by Serbia to ensure soon ratification of the Convention.
8. Further cooperation in multinational programs within the Danube River Basin is expected, especially within activities of the ICPDR.
9. The framework of cooperation could also be within the process of the WFD implementation.
   - WFD, as the basic act regarding water management in EU, provides an opportunity to view cooperation on different issues – from the designing of monitoring and status evaluation up to the defining of measures for water protection. To make those measures operational majority of actions will be required/carried out at local level
   - Due to the fact that no adequate data is available regarding an evaluation of its status, it is necessary to develop a framework for realizing the project's aim in collecting the necessary information on the priority substances and Biological Quality Elements that are obligatory for the evaluation of status according to WFD.
   - Cooperation on the development of the River Basin Management Plan for the transboundary river basins is an excellent opportunity for collaboration between Bulgaria and Serbia. The priority actions have been outlined in the previous recommendations (No. 6 and 7), and should be carried our within the framework of the bilateral commission on water management issues between Serbia and Bulgaria (chapter 2.2.5);
10. Transboundary management of environmental and technological risks and natural disasters is one of the priorities in future cooperation.
11. Public participation should be ensured in all future programs.
12. Reduction of pollution from the RTB Group is a priority. The effort of the Serbian Government to fulfill the process of privatization according to the Reconstruction Program which follows the "Environmental Investments Program" should be supported.
13. Reduction of pollution from other sources (industrial or urban discharges) is a priority. The design and construction of sewage networks and urban wastewater treatment plants are necessary in both countries.
14. Reduction in pollution from agriculture is an important topic for further collaboration between the countries. In this respect the introduction of good agriculture practices in both countries is necessary. Projects for biomass

utilization as a renewable energy source are relevant in the Bulgarian region, taking into account the expectations for the future development of agriculture and potential increase of organic waste (plants waste, manure, waste from food, wine and vegetal oils processing).

15. Sustainable use and management of the groundwater is an important task.
16. Joint efforts for the restoration of polluted and degraded lands are needed. The Municipal Development Plans of Bregovo and Novo Selo municipalities indicate the need for restoring polluted lands adjacent to the Timok Riverbed. The same situation applies to the degraded land around mining areas in Serbia. The re-cultivation of the devastated forest is highly recommended in order to reduce environmental and health risks associated with future secondary pollution. .
17. Priority actions identified in recommendations 5 and 6 will prepare a framework for realizing a project aimed at collecting relevant data for designing an appropriate monitoring network in the region, developing WFD methodology and contributing to the preparation of the River Basin Management Plan. Moving in this direction, our proposal is to develop a detailed project action plan.

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Annex 1. Running water types for rivers with catchments area larger than 100 km2 - Serbia

River	Type	Upstream border (Rkm)	Downstream border (Rkm)	NOTE	Ecoregion
Sikolska	RS_P2_V1_SIL	23.4	0	confluence of the Sovinac	ER_7
"	RS_P2_V2_SIL	37.8	23.4	Upstream the confluence of the Sovinac stream. Type change due to the elevation class change.	ER_7
Glogovička	RS_P1_V1_SIL	8.5	0		ER_7
"	RS_P1_V2_SIL	19.8	8.5	Type change due to the elevation class change.	ER_7
Borska	RS_P2_V1_SIL	16.3	0		ER_7
"	RS_P2_V2_SIL	24.3	16.3	Type change due to the elevation class change.	ER_7
Kriveljska	RS_P2_V2_SIL	21.4	0	The whole stream	ER_7
Crni Timok	RS_P3_V1_SIL	60.5	0	До ушћа Ваљa Саке.	ER_7
"	RS_P3_V2_CAR	79.6	60.5	Type change due to the elevation class and geology change.	ER_7
Brestovačka	RS_P2_V2_SIL	22.5	0		ER_7
"	RS_P2_V3_SIL	28.8	22.5	Type change due to the elevation class change.	ER_7
Zlotska	RS_P2_V2_SIL	15.4	0	The whole stream	ER_7
Arnauta	RS_P2_V2_SIL	19.3	0	The whole stream	ER_7
Radovanska	RS_P1_V2_CAR	14.4	0		ER_7
"	RS_P1_V3_SIL	19.9	14.4	Type change due to the elevation class and geology change.	ER_7
Beli Timok	RS_P3_V1_SIL	47.4	0	The whole stream	ER_7
Grliška	RS_P2_V1_SIL	9.5	0	The whole stream	ER_7
Koritska	RS_P1_V2_SIL	20.1	0	The whole stream	ER_7
Valevačka	RS_P1_V2_SIL	7	0	The whole stream	ER_7
Svrljiški Timok	RS_P2_V2_SIL	12	0		ER_7
"	RS_P2_V2_CAR	23.8	12	Type change due to the geology change	ER_7
"	RS_P2_V2_SIL	49.1	23.8	Type change due to the geology change	ER_7
"	RS_P2_V3_SIL	58.8	49.1	Type change due to the elevation class change	ER_7
Trgoviški Timok	RS_P2_V2_SIL	32.5	0	The whole stream	ER_7
Aldinačka	RS_P2_V2_SIL	13.6	0	The whole stream	ER_7

Annex 2. Water bodies and heavily modified water bodies (HMWB) delineated within the Serbian part of the Timok River basin

			Location										Groups of pressures		
Label	River	Type	Upstream border (Rkm)	Downstream border (Rkm)	Length of the water body	The change of the category	Change of ecoregion	Type change	The confluence of significant tributary	HMWB	AWB	Pollution (urban waste waters, indusry, agriculture, mining, ...)	The change og hydrological regime (water intake, regulations, the confluence...)	HYMO
RS_SIKOL_1	Sikolska	RS_P2_V1_SIL	23.4	0	23.4									
RS_SIKOL_2		RS_P2_V2_SIL	37.8	23.4	14.4			X						
RS_GLOG_1	Glogovićka	RS_P1_V1_SIL	8.5	0	8.5									
RS_GLOG_2		RS_P1_V2_SIL	19.8	8.5	11.3			X						
RS_BOR_1	Borska	RS_P2_V1_SIL	16.3	0	16.3									
RS_BOR_2		RS_P2_V2_SIL	24.3	16.3	8			X						
RS_KRIV_1	Kriveljska	RS_P2_V2_SIL	10.1	0	10.1									
RS_KRIV_2		RS_P2_V2_SIL	12	10.1	1.9	X				X			X	X
RS_KRIV_3		RS_P2_V2_SIL	21.4	12	9.4									
RS_CTIM_1	Crni Timok	RS_P3_V1_SIL	9.5	0	9.5					X				X (flood protection)
RS_CTIM_2		RS_P3_V1_SIL	40.2	9.5	30.7								X	
RS_CTIM_3		RS_P3_V1_SIL	60.5	40.2	20.3									
RS_CTIM_4		RS_P3_V2_CAR	79.6	60.5	19.1			X						
RS_BREST_1	Brestovačka	RS_P2_V2_SIL	22.5	0	22.5									
RS_BREST_2		RS_P2_V3_SIL	24.5	22.5	2	X		X		X			X	X
RS_BREST_3		RS_P2_V3_SIL	28.8	24.5	4.3									
RS_ZLOT	Zlotska	RS_P2_V2_SIL	15.4	0	15.4									
RS_ARN	Arnauta	RS_P2_V2_SIL	19.3	0	19.3									
RS_RAD_1	Radovanska	RS_P1_V2_CAR	14.4	0	14.4									
RS_RAD_2		RS_P1_V3_SIL	19.9	14.4	5.5			X						
RS_BTIM_1	Beli Timok	RS_P3_V1_SIL	14.6	0	14.6									
RS_BTIM_2		RS_P3_V1_SIL	22.9	14.6	8.3									
RS_BTIM_3		RS_P3_V1_SIL	47.4	22.9	24.5									
RS_GRL_1	Grliška	RS_P2_V1_SIL	4.9	0	4.9									
RS_GRL_2		RS_P2_V1_SIL	9.5	4.9	4.6	X		X		X			X	X
RS_KORIT	Koritska	RS_P1_V2_SIL	20.1	0	20.1									
RS_VAL	Valevačka	RS_P1_V2_SIL	7	0	7									
RS_STIM_1	Svrljiški Timok	RS_P2_V2_SIL	12	0	12									
RS_STIM_2		RS_P2_V2_CAR	23.8	12.0	11.8			X						
RS_STIM_3		RS_P2_V2_SIL	49.1	23.8	25.3			X						
RS_STIM_4		RS_P2_V3_SIL	58.8	49.1	9.7			X						
RS_TTIM	Trgoviški Timok	RS_P2_V2_SIL	32.5	0	32.5									
RS_ALD	Aldinačka	RS_P2_V2_SIL	32.5	0	13.6									

River	WB name/ HMWB Code	Main uses	Significant alterations	Expert judgment
Timok	RS_TIM_1/ RS_T19			Polluted sediment; HMWB CANDIDATE
	RS_TIM_2/ RS_T20			Polluted sediment; HMWB CANDIDATE
	RS_TIM_3/ RS_T21			Polluted sediment; HMWB CANDIDATE
	RS_TIM_4/ RS_T22	Hydropower	Large dam	HPP Sokolovica reservoir; Polluted sediment
	RS_TIM_5/ RS_T23	Flood protection structures planned	Channelisation/ Bank reinforcement planned	HMWB PLANNED

Label	Use			Significant physical changes			Reason for delineation				
	Water supply	Flood protectioon	Urbanization	Dams	Каналисање, просецање кривина	Bank regulation	Fish migration barrier	Category change	Flow reduction	Lateral connectivity	Expert opinion
RS_KRIV_2	X			X			X	X	X		Reservoir Krivelj
RS_CTIM_1		X	X		X	X				X	Regulations in Zajecar
RS_BREST_2	X			X			X	X	X		Bor Lake
RS_GRL_2	X			X			X	X	X		Reservoir Grliste

Annex 3. Serbian legislation

Law on Environment Protection

The new Serbian Law on Environment Protection was adopted in December 2004. Its content was harmonized with the relevant EU legislation. It comprises of:

- Protection of soil, water resources, air, forest, biosphere and biodiversity, plants and animals.
- Mandatory environmental monitoring: the programmes need to be adopted and performed every second year (including air monitoring).
- Responsibility of the Serbian Government to establish the criteria for environmental measurements and annually report the results to the Serbian Parliament.
- The mandatory 1% tax on all new investments in objects that could possibly be sources of environmental pollution to be used for environmental protection and promotion.
- The Ministry of Science and Environmental Protection will, jointly with the ministries in charge of specific areas, prepare action plans.
- Economic instruments such as user charges, environmental pollution charges, refund or exemption mechanisms or reduced charges for environmental pollution, and charges for the local government.

Unfortunately, children's safety and protection are not specifically mentioned.

Environmental Impact Assessment and Strategic Environmental Assessment

The Law on Environmental Impact Assessment (EIA) was adopted by the National assembly of the Republic of Serbia on 21 December 2004. ("Official Journal of the Republic of Serbia", No. 135/2004, p. 14-18). The Law contains five chapters with 47 articles. The Law regulates the impact assessment procedure for projects that may have significant impact on the environment reflecting the contents of the Environmental Impact Assessment (EIA) Study. The participation of competent authorities and concerned organizations included public participation, transboundary exchanges of information for projects that may have significant impact on the environment of another state, supervision, as well as other issues of relevance to impact assessment. The provisions of this Law do not apply to projects designated for national defense. Impact assessments should be elaborated upon for the activities in the fields of industry, mining, energy production, transport, tourism, agriculture, forestry, water and waste management utility services, as well as for all the projects that are planned within the protected areas.

The Law on Strategic Environmental Assessment (Official Journal of the Republic of Serbia", No. 135/2004, p. 18-23) is divided into four chapters and contains 27 articles. This Law regulates the conditions, the methods and procedures for the impact assessment practice. The objects of strategic assessment are plans, programmes, and areas subjected to spatial and urban planning (land use, agriculture, forestry, fishing, hunting, energy, industry, transport, waste management, water management, telecommunication, tourism, protection of natural habitats and wild flora and fauna).

Integrated Pollution Prevention and Control

The Law on Integrated Pollution Prevention and Control (IPPC) (Official Journal of the Republic of Serbia, No. 135/2004, p. 23-28) regulates “the conditions and procedure of granting of integrated permits for installations and activities that may have adverse effects on human health, environment or material resources, types of activities and installations, supervision and other issues that are of relevance for environmental pollution prevention and control”.

The Law on free access to information of public significance

The Law on free access to information of public significance regulates the right to obtain information of public significance from public authorities, in order to 'protect the interests of the public'. 'Information of public significance' is defined as any piece of information in hands of the public authorities, and a product of the work of public authorities or connected with that work, which the public has a justifiable reason to know about.

The Law on Waters (Official Journal of the Republic of Serbia, No. 46/91, 53/93, 67/93, 48/94, 54/96) is the basic document. It regulates key areas such as water protection, protection from harmful impact of waters use and management as goods of public interest, conditions and method of water management activities, organization and financing of water management activities, supervision over implementation of the Law. The Law deals with land water and underground waters including drinking water, thermal and mineral water. The Law also deals with trans-boundary watercourses.

The law states that water should be used “in a manner by which natural characteristics of water is not endangered, by which human life and human health are not impacted, by which plant and animal life are not imperiled as well as natural goods and immovable cultural goods”.

The Law contains rules concerning water areas, water regime (water management strategy, water management plans, water management conditions, water management permits, etc), water management activities (protection from the harmful impact of water), limitation of rights, special measures as well as the role of Public water management enterprises. A portion of the Law also comprises of the financing of water management activities and administrative supervision, as well as penal provisions. The new Law on Waters has been adjusted to the European Legislation and its adoption is expected.