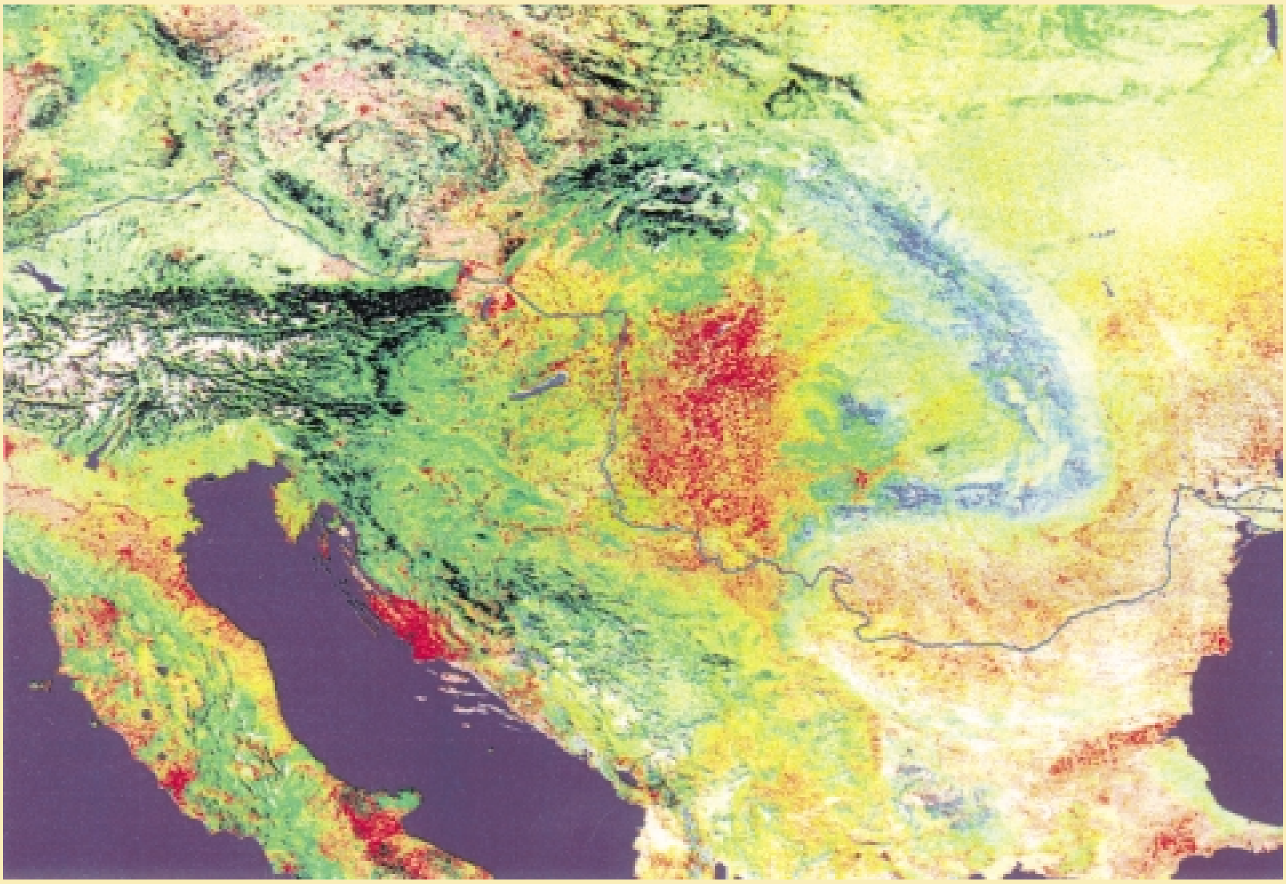
DANUBE POLLUTION REDUCTION PROGRAMME

TRANSBOUNDARY ANALYSIS

ANNEXES

JUNE 1999



Programme Coordination Unit
UNDP/GEF Assistance

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Annex 1.1 - A

Direct Transboundary Relationships by Country and River

Annex 1.1 – A Direct Transboundary Relationships by Country and River

Direct Transboundary Relationship	Major Transboundary Rivers	Direct Transboundary Relationship	Major Transboundary Rivers
Germany to Austria	Danube	Yugoslavia to Bosnia and Hercegovina	/Sava/Drina
	/Inn	Yugoslavia to Romania	Danube
	/Inn/Salzach	Yugoslavia to Croatia	Danube
Austria to Germany	/Inn	Yugoslavia to Bulgaria	Danube
	/Inn/Salzach		Timok
Austria to Slovak Republic	Danube	Bulgaria to Yugoslavia	/Velika Morava watershed (Nisava, Jerma, Visocica, Gaberskareka)
	/March [Morava]		*
Austria to Hungary	*	Bulgaria to Romania	Danube
Austria to Slovenia	/Drava		/Lom
	/Drava/Mura		/Ogasta
Czech Republic to Austria	/Morava/Dyje		/Iskar
Czech Republic to Slovak Republic	/Morava		/Vit
Slovak Republic to Czech Republic	/Morava		/Ossam
Slovak Republic to Austria	Danube		/Yantra
	/Morava		/Russenski Lom
Slovak Republic to Hungary	Danube	Romania to Hungary	/Tisza/Somes
	/Vah		/Tisza/Crasna
	/Hron		/Tisza/Barcau
	/Ipal		/Tisza/Crisul Repede
	/Uzh		/Tisza/Crisul Negro
	/Tisza		/Tisza/Crisul Alb
	/Tisza/Bodrog		/Tisza/Mures
	/Tisza/Mornad		*
	/Tisza/Sajo	Romania to Yugoslavia	Danube watershed (Timis, Nera, Karas, Brzava, Moravica, Rojga)
	/Tisza/Hernad		/Tisza watershed (Zlatica, Bega Old, Bega Canal)
Hungary to Slovak Republic	*		/Bega Veche
Hungary to Croatia	Danube		/Birzava
	/Drava		/Caras
	/Drava/Mura		/Mera
Hungary to Yugoslavia	Danube, Tisza, Bajski Canal, Plazovic, Keres	Romania to Bulgaria	Danube
Slovenia to Hungary	/Drava/Mura		/Jiu
Slovenia to Croatia	/Drava		/Olt
	/Drava/Mura		/Arges
	/Sava		/Vedea
	/Kolpa	Romania to Moldova	/Prut
Croatia to Hungary	/Drava	Romania to Ukraine	/Danube
	/Drava/Mura	Moldova to Romania	/Prut
Croatia to Bosnia and Hercegovina	/Sava	Moldova to Ukraine	/Prut
	/Sava/Una		/Cahul
Croatia to Yugoslavia	Danube		/Jalpug
	/Drava	Ukraine to Slovak Republic	/Uzh
	/Sava, Bosut, Studva		/Latorytsa
Bosnia and Hercegovina to Croatia	/Sava		*
	/Sava/Una	Ukraine to Hungary	/Tisza
	/Sava/Bosna		*
	/Sava/Vrbas	Ukraine to Romania	Danube
Bosnia and Hercegovina to Yugoslavia	/Sava/Drina, Tara, Piva, Cehorina, Lim, Rzdv		/Siret
			/Prut
		Ukraine to Moldova	/Prut

Note: Asterisk (*) denotes minor tributaries or side flows

Annex 1.1 - B

Direct Transboundary Relationships by River and Monitoring Station

Annex 1.1 – B Direct Transboundary Relationships by River and Monitoring Station*

Major Transboundary Rivers	Country Relationships	Cross-Border Stations
Danube (main stream)	Germany to Austria	D02, Jochenstein, (km 2204)
		A01, Jochenstein, (km 2204)
		Felsen Hutt, Austria (km 2209)?
	Austria to Slovak R.	A04, Wolfstahl, (km 1873)
	Slovak R. to Hungary	SK01, Bratislava (km 1869)
		SK02, Medvedov/Medve (km 1806)
		SK03, Komarno/Komarom (km 1768)
		H01, Medve/Medvedov (km 1806)
		H02, Komarom/Komarno (km 1768)
		H03, Szob (km 1708)
		H04, Dunafoldvar (km 1560)
	Hungary to Croatia	H05, Hercegszanto (km 1435)
		HR01, Batina (km 1424)
	Hungary to Yugoslavia	H05, Hercegszanto (km 1435)
		YU, Bezdan (km 1425)
		HR01, Batina (km 1424)
	Croatia and Yugoslavia	HR02, Borovo (km 1337)
		YU, Bogojevo (km 1387) - downstream of Drava
		Apatin (km 1401) - upstream of Drava
		Baika Palanka - end of state border
	Croatia to Yugoslavia	YU, Bosut River, Batrovci, (km3.3)
		YU, Studra River, Morovic (km 3.0)
	Yugoslavia to Romania	RO01, Bazias (km 1071)
		YU, Banatska Palanka
		YU, Radujevac (km 851)
		RO, Gruja
	Yugoslavia to Bulgaria	RO02, Pristol/Novo Selo Har.(km 834)
		BG01, Novo Selo Harbour/Pr. (km834)
	Yugoslavia and Romania	RO02, Pristol/Novo Selo Har.(km 834)
		BG01, Novo Selo Harbour/Pr. (km834)
		YU, Gradiste (km 1059.2)
		YU, Tekija (km956.6)
		YU, Kladovo (km 938)
		YU, Brza Palanka (km 883.3)
		YU, Redujevac (km 851.0)
	Bulgaria and Romania	BG02, us Iskar-Bajkal (km 641)
		BG03, Downstream Svishtov (km 554)
		BG04, us, Russe (km 496)
		RO03, us. Arges (km432)
		RO04, Chiciu/Silistra (km 375)
		BG05, Silistra/Chiciu (km 375)
	Romania to Bulgaria	RO02, Pristol/Novo Selo Har.(km 834)
		BG01, Novo Selo Harbour/Pr. (km834)
	Ukraine and Romania	UA01, Reni-Kilia/Chilia arm (km 132)
		RO05, Reni-Chilia/Kilia arm (km 132)
		UA02, Vilkovo-Kilia/Chilia arm (18)
		RO06, Vilkovo-Kilia/Chilia arm (18)
		Reni (km 163 & 136) ?
		Ismail, Ukraine (km 115 & 99)??
	Danube to Black Sea	UA02, Vilkovo-Kilia/Chilia arm (18)
		RO06, Vilkovo-Kilia/Chilia arm (18)
		RO07, Sulina - Sulina arm (km 0)
		RO08, Sf. Gheorghe/Ghorghe are (0)

Major Transboundary Rivers	Country Relationships	Cross-Border Stations
/Inn	Germany to Austria	
	Austria to Germany	D03Kirchdorf, (km 195)
/Inn/Salzach	Austria to Germany	D04, Laufen (km 47)
	Germany to Austria	
/Morava	Czech R. to Slovak R.	CZ01, Lanzhot (km 79)
(March)	Austria to Slovak R.	Devin, Austria (km 1.0)
	Slovak R. to Austria	
/Morava/Dyje	Czech R. to Austria	CZ02, Breclav (km 21)
		Breclav-Ladna, Czech R. (km 32.3) ?
/Vah	Slovak R. to Hungary	SK04, Komarno, (km 1)
/Hron	Slovak R. to Hungary	
/Ipel	Slovak R. and Hungary	H, Ipolytarnoc (km 179)
/Drava	Austria to Slovenia	Dravograd, Slovenia (km __)
	Slovenia to Croatia	SI01, Ormuz, (km 300)
		HR03, Varazdin (km 288)
	Hungary to Croatia	H07, Dravaszabolcs (km 68)
	Croatia to Hungary	HR05, D. Miholjac (km 78)
	Croatia to Yugoslavia	HR05, D. Miholjac (km 78)
/Drava/Mura	Austria to Slovenia	
	Slovenia to Croatia	Petanjci, Slovenia (km __) ?
	Croatia to Hungary	H, Ortilos (km 225)
	Slovenia to Hungary	H, Letenye (km 35.2)
	Hungary and Croatia	H, Dravaszabolcs (km 68)
/Kolpa	Slovenia to Croatia	Metlika / Radovici (km __) ?
/Uzh	Ukraine to Slovak R.	Uzhgorod, Ukraine (km 33) ?
	Slovak R. to Hungary	Radovici, Slovakia ? (km __) ?
/Tisza	Ukraine to Slovak R.	Khust, Ukraine (km 854) ??
	Ukraine to Hungary	H, Tiszabecs (km 757)
	Slovak R. to Hungary	
	Hungary to Yugoslavia	H09, Tiszasziget (km 163)
		YU, Martonos (km 152)
/Tisza/Bodrog	Slovak R. to Hungary	H, Felsoberecki (km 46)
/Tisza/Hornad	Slovak R. to Hungary	
/Tisza/Sajo	Slovak R. to Hungary	H08, Sajopuspoki (km124)
/Tisza/Hornad	Slovak R. to Hungary	H, Tornyosnemeti (km 102)
/Tisza/Somes	Romania to Hungary	H, Csenger (km 45.4)
/Tisza/Crasna	Romania to Hungary	H, Merk (km 42.2)
/Tisza/Barcau	Romania to Hungary	H, Pocsaj (71.5)
/Tisza/Crisul Repede	Romania to Hungary	H, Korosszakal (km 58.6)
/Tisza/Crisul Negro	Romania to Hungary	H, Sarkad (km 15.9)
/Tisza/Crisul Alb	Romania to Hungary	H, Gyulavari (km 9.3)
/Tisza/Mures	Romania to Hungary	H, Nagylak (km 50.6)
/Tisza/Bega	Romania to Yugoslavia	YU, Zlatica, Crna Bara (km 33.0)
		YU, Bega Old, Hetin (km 36.0)
		YU, Bega Can., Srpski Itebej (km 29)
		YU, Timis, Jasa Tomic (km 116.0)
		YU, Brazava, Markovicevo (km 18.0)
		YU, Karas, Dobricevo (km 14.0)
		YU, Nera, Kusic (km 21.0)
		YU, Moravica, Vatin (km 15.0)
/Sava	Slovenia to Croatia	SI02, Jesenice (km 729)
		HR06, Jesenice (km 729)
	Croatia to Bosnia and Herc.	HR07, us. Una Jasenovac (km 525)
		BIH01, Jasenovac (km500)
	BIH and Croatia to FRY	YU, Jamena (km 201)
	BIH to Yugoslavia	YU, Srenska Mitrovica (km 138)

Major Transboundary Rivers	Country Relationships	Cross-Border Stations
	Bosnia and Herc. and Croatia	HR08, ds. Zupania (km 254)
	Croatia to Yugoslavia	(see above)
/Sava/Una	Croatia to Bosnia and Herc.	
	Bosnia and Herc. to Croatia	BIH02, Kozarska Dubica (km 16)
/Sava/Bosna	Bosnia and Herc. to Croatia	BIH04, Modrica (km 24)
/Sava/Vrbas	Bosnia and Herc. to Croatia	BIH03, Razboj (km 12)
/Sava/Drina watershed	Bosnia & Herc. to Yugoslavia	Bajina Basta (km 160)
	Yugoslavia to Bosnia & Herc.	Piva River, Scepan Polje
		Tara River, Duratevica Tara (km 56)
		Lim River, Priboj (km 47.2)
		Cehotina River, Gradac, (km 55.5)
/Timis	Romania to Yugoslavia	(see above)
/Velika Morava watershed	Bulgaria to Yugoslavia	Nisava, Dimitrouvgrad (km 142)
		Jerna, Petacnica (km 21.5)
/Timok	Yugoslavia to Bulgaria	YU, Brusnik (km 20.0)
/Jiu	Romania to Bulgaria	
/Iskar	Bulgaria to Romania	BG06, Orechovitza, (km 28)
/Vu	Bulgaria to Romania	
/Olt	Romania to Bulgaria	
/Osam	Bulgaria to Romania	
/Yantra	Bulgaria to Romania	BG07, Karantzi (km 12)
/Rus. Lom	Bulgaria to Romania	
/Arges	Romania to Bulgaria	RO09, Conf. Danube (km 0)
/Siret	Ukraine to Romania	
	Romania to Ukraine	RO10, Conf. Danube Sendreni (km 0)
/Prut	Ukraine to Romania	Chernivtsi, Ukraine (km 722)
		MD01, Lipcani (km 658)
	Ukraine to Moldova	Chernivtsi, Ukraine (km 722)
		MD01, Lipcani (km 658)
	Romania and Moldova	MD02, Leuseni (km292)
		Braniste, Moldova (km 546)
		Ungheni (km 376)
		Leova, Moldova (km 216)
		Cahul, Moldova (km 78)
	Romania to Ukraine	MD03, Conf. Danube-Giurgiulesti (0)
		RO11, Conf. Danube-Giurg. (km 0)
	Moldova to Ukraine	MD03, Conf. Danub.-Giurg. (km 0)
		RO11, Conf. Danube-Giurg. (km 0)
/Cahul	Moldova to Ukraine	
/Jalpug	Moldova to Ukraine	

** Note: Stations beginning with letter/number combinations are TNMN stations. The letters denote the following countries.*

D = Germany
A = Austria
CZ = Czech Republic
SK = Slovak Republic
SI = Slovenia
HR = Croatia
BIH = Bosnia and Hercegovina
FRY = Federal Republic of Yugoslavia
BG = Bulgaria
H = Hungary
RO = Romania
MD = Moldova
UA = Ukraine

Annex 1.1 - C

Territories and River Catchment Areas of the DRB Countries

Annex 1.1 – C Territories and River Catchment Areas of the DRB Countries

Country		Territory	Catchment Areas of the Danube River System by main Rivers											Total Area of the Danube River Basin	
		1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	1000 km2	%
Bosnia &	Rivers		Una	Vrbas	Bosna	Drina	Sava								
		51.182	8.554	5.806	14.641	5.215	3.100							37.316	73%
Bulgaria	Rivers		Danube	Ogosta	Iskar	Vit /	Yantra	Rous. Lom	Others						
		111.000	2.480	3.117	8.366	4.390	6.860	2.869	17.884					46.953	42%
Croatia	Rivers		Danube	Drava	Sava										
		56.542	2.416	6.888	25.100									34.404	61%
Czech Republic	Rivers		Morava	Vlara											
		78.866	20.681	0.464										21.145	27%
Hungary	Rivers		Danube	Tisa											
		93.030	50.547	42.483										93.030	100%
Moldova	Rivers		Prut	Yalpugh	Cahul										
		33.840	8.240	3.180	0.605									12.025	36%
Romania	Rivers		Som./Tisa	Crisuri	Mures	Bega/etc	Jiu-Cerna	Olt	Arges-V.	Ialomita-B.	Siret	Prut-B.	Others		
		237.500	22.300	14.860	29.390	14.440	11.440	24.010	17.980	15.654	30.406	18.210	38.730	237.420	100%
Slovakia	Rivers		Morava	Danube	Vah-Nitra	Hron	Ipel	Bodrog-T.	Slana	Bodva	Hornad				
		49.014	2.257	1.138	16.005	5.465	3.647	7.329	3.191	0.893	4.427			44.352	90%
Slovenia	Rivers		Drava	Mura	Sava	Kolpa									
		20.253	2.806	1.625	12.120	0.958								17.509	86%
Ukraine	Rivers		Danube	Tisa	Prut	Siret	Latoritsa	Uzh							
		603.700	7.850	7.900	9.630	2.070	2.890	2.010						32.350	5%
Yugoslavia	Rivers		Danube	Tisa	Tamis	Sava	V.Morava	Mlava	Pek	Timok					
		102.173	3.169	8.994	1.107	31.046	37.269	1.886	1.233	4.215				88.919	87%
Germany	Rivers														
		356.778												56.240	16%
Austria	Rivers		Danube	Inn/Salz.	Traun	Enns	Moldau	March	Leitha	Rabnitz/R.	Mur	Drau			
		83.850	12.353	15.911	4.274	6.075	7.359	3.670	2.145	6.649	10.313	11.815		80.564	96%
Total	Area	1877.728												802.227	43%
Total including small areas located in Italy, Switzerland, Albania and Poland														817.000	

Annex 1.3 - A

Summary of Information from the Report on Wetlands and Floodplain Areas in the Danube River Basin

Summary of Information on Wetlands and Floodplain Areas in the Danube River Basin

Bosnia-Herzegovina

The main section on wetlands states that "Bosnia and Herzegovina don't have big and important wetlands in [the] Black Sea Catchment Area, and pollution on existing [areas] is negligible." (Section 3.4.5, Part B.)

Table 3.4.4, Part B shows data on the main areas of flooding both now and following construction of flood protection. Six rivers are highlighted as being of top priority because of their richness and the sensitivity of their ecosystems: Una, Sana, Trebi Drina, Neretva, Pliva.

The 'Space Arrangement Plan', set up in 1980, plans to place between 16-24% of the land area of Bosnia-Herzegovina under some form of protection by 2025. Water resources are to be given a high priority within this plan.

Bulgaria

The report states that: "According to the Ramsar Convention (Bulgaria is a member since 1976) it is necessary a great attention to be paid to the wetlands which will generate reestablishment of the quality of the water in the Danube River." (Section 2.2, Part A).

"Among the wetlands are the Srebarna swamp and the marshes, situated on the Belene Island (Persin), and some small swamps on the flooded islands of Kitka, Tsibritsa, Vardim, Garvan and Popina" (section 4.4.5, Part B).

There are 61 Danube Islands in Bulgaria, with a total territory of 10,624 hectares. Floodplain forests, floodplain lowlands, and riverside lakes and marshes form the rest of the wetland complex which "play a leading role in the conservation of the biological diversity, also in providing the self-purification of the water and securing the long-time usage of the water and biological resources" (section 2.2, Part A). The Belene islands are described as being of "European-wide importance".

Map C 6-5 shows the location of the major wetlands in Bulgaria and map C 6-4 illustrates the location of the major floodplain areas. Table 2.2, Part A lists important Bird Areas in the Danube basin.

At present the following projects are in progress:

- Preparation of Management Plan for Srebarna Ramsar Site
- Hydrochemical monitoring of Srebarna water
- Small Scale Wetland Restoration Project in the Danube River Basin

Croatia

The report gives the following summary on wetlands in Croatia: "The catchment areas of Drava, Sava [and] Danube are extremely biologically rich...Many eco-systems are still 'untouched', especially in the national parks and reserves. Some eco-systems are endangered by the human impact, but the whole area is still an ecological resource. The efficient organisation of environmental protection of all three catchment areas will be a good basis for promotion [of] biodiversity and sustainability of many eco-systems living there."

(Section 2.2, Part A.)

The main flood plains are located at Zutica, Lonsjsko Polje, Mokro Polje, Zelenika and Kupcina with a total capacity of 1805 million m3. A map of potentially flooded areas is included in section 4.4.4, Part B. Two key wetlands are identified in the report:

- Lonjsko polje Nature Park in the Sava River basin
- Kopacki rit Nature Park in the Drava and Danube River basins.

Czech Republic

The report identifies wetland on the Morava River as being one of the richest ecosystems in Europe, supporting rare and endangered species. It states that "in the last fifty years these wetlands were unpleasantly influenced, several of them changed their character and some wet meadows and forests have disappeared." (Section 4.4.5, Part B.) The ecology of the Morava River basin and its main threats are summarised in the report and current landscape management programmes are briefly mentioned. The Morava floodplain is described as a bio-corridor of European importance, which continues along the Becva and Odra River floodplains to Poland, with biocorridors of transregional importance being situated along the Dyje, Jihlava and Svratka Rivers.

The Lower Dyje Wetlands are highlighted as being the most important wetlands of the Morava River basin. They are located within a proposed Trilateral National Park, Morava-Dyje, which covers territory in Austria, the Czech Republic and Slovakia. A map of the main wetlands, floodplains and protected areas in the Morava River basin is shown in Fig. B.5, Part B.

A new system of flood control is under preparation.

Hungary

Section 4.5.2, Part B gives the following overview of wetlands in Hungary:

"Aquatic/wetland ecosystems used to be and are still endangered. At the same time it has to be mentioned that Hungary was very rich in perennially and temporarily inundated areas, until the beginning of large-scale river-regulation works and land-reclamation activities... In spite of very extended human impact on aquatic/wetland sites huge areas survived and there exists a great number of former wetland areas which are not yet beyond irreversible status, which can be still reconstructed. Hungary has quite a reputation in very effective revitalization-renaturalisation of former wetlands."

In addition, the report stresses the importance of wetlands, summarises the main problems and gives specific examples. It also states that the condition of most wetlands is far from optimal.

Ramsar sites are listed in table 4.7, Part B and the following key wetlands are described in brief:

- Ferto-Hansag NP
- Gemenc LPA
- Kis-Balton LPA
- Hortobagy NP.

Relevant maps include: fig. 4.12: Location of wetlands; fig. 4.10: Floodplains and main levees; fig. 4.11 Site protection; fig 2.2.1 National Ecological Network and ESAs.

An inventory of existing wetlands and also potential sites for reconstruction has recently been completed using remote sensing techniques. Further work is to involve categorisation of these areas and the production of an atlas, as well as promotional material for NGOs to encourage public participation. It is planned to continue to increase the area of protected sites. Specific projects expanded upon include the Danube-Drava rehabilitation project.

Moldova

The Moldovan report includes the following statements on wetlands: "As a link between land and water, wetlands play a vital role in water quality management programmes... Wetlands provide a wide array of functions including shoreline stabilisation, non-point sources run-off filtration, and erosion control, which directly benefit adjacent and downstream waters. In addition, wetlands provide important biological habitat, including nursery areas for aquatic life and wildlife, and other benefits such as groundwater recharge and recreation. Wetlands comprise a wide variety of aquatic vegetated systems, including sloughs, swamps, pot-holes, wet meadows, bogs, fens, vernal pools, marshes and similar areas." (Sec. 3.2.3, Engineering.)

"Wetland areas in the Moldovan part of the Danube river basin were dessicated in the mid of 70^{th}. At the same time, some areas (mainly protected ones) remained in the southern and central part of the Prut river basin and in the downstream of Yalpugh. It should be mentioned, that due to financial difficulties farmers can not use significant part of desiccated wetland areas and rehabilitation processes have place. No special studies were held in the frame of wetland restoration..." (Section 3.4.5, Water Quality Report.)

Figure 3.4.4.1 shows data regarding the flooding of localities in Moldova.

Despite the destruction of most of the wetlands in the Moldovan part of the Danube River basin, the report identifies, and describes the status of, four small sites in the Prut river valley suitable for wetland restoration. High priority is given to this restoration project and brief details are given of possible restoration measures. The sites are:

- Confluence of Camenca and Prut rivers, near the villages of Leusheni and Calmatui
- Prut Fens near village of Gotesti.
- Manta lake and Beleu lake near villages of Manta, Valeni, Brinza.
- Lower Yalpugh river near the villages of Aluat and Vinogradnoe.

The report suggests that a conservation program for natural reserves and wetlands will be established in the future.

Romania

Romania is “home to the 650,000 hectare Danube Delta...the largest wetland in Europe...The delta area in Romania belongs to the 591,200 ha Danube Delta Biosphere Reserve. The core of the reserve (312,400 ha) has been established as a “World Nature Heritage” in 1991” and also a Ramsar. The report gives a description of the delta (section 2 and 2.2, Part A) and states that it supports “unique ecosystems, home to several rare bird species, being an important resting point for populations of migrating birds, rich in fish, with extensive reedbeds, forest, grassland and unusual flora and forest vegetation." The filtering capacity of both wetlands in general and the Danube Delta specifically is described as the “main factors for improving the quality of the river and partially of its sedimentary load ... However, the Delta’s values as a biological buffer and wetland ecosystem has declined over the last 40 years” and the report gives a number of reasons for this.

Section 2.2, p16, Part A describes the typical flora and fauna of wetland areas in Romania. The overall state of national water resources in Romania is described as “fairly satisfactory” but where there are local pollution problems, “the cleaning-up process proves to be slow and very costly.” (Section 2, Part A).

Annex 1, p99, Part A lists the main nature reserves in Romania.

Slovakia

The report identifies, and briefly describes, seven wetlands of international importance (Ramsars):

- Sur Nature Reserve
- Paris Swamps Nature Reserve
- Cicov Oxbow Lake Nature Reserve
- Senne Ponds Nature Reserve
- Morava River floodplain Protected Landscape Area
- Danube River floodplain area
- Latorica

It also lists five proposed Ramsars: Orava River and tributaries; Poiplie along the Ipel River; Rudava River Alluvium; wetlands in the Turiec area and also in the Orava River basin. A map showing the location of wetlands in Slovakia is under preparation.

The area of land prone to flooding and area protected from flooding is shown in table 4.9. Examples of areas where flooding occurs include non-canalised stretches of the Kysuca, Rajcianka, Torysa rivers and also parts of the Morava, Latorica and Uh rivers. Inundation areas are shown on a map available from the Water Research Institute.

Details of a specific wetland restoration project in the Lower Morava River are included.

Slovenia

Wetlands and other humid biotopes cover 26,000 ha or 1.3% of Slovenia. Their current status is summarised as follows: "Like elsewhere, the wetlands are among the most endangered ecosystems in Slovenia. Twenty-two of them are already protected as important sites for endangered or rare species of wild flora and fauna. The share of inland wetlands and ponds is significant in the main river systems, where the main threat is the construction of hydrological and engineering structures that are detrimental to their ecological and environmental integrity. Today the overall wetlands surface is decreasing, in particular in the coastal area, because they are filled in, or drained and used for construction" (Section 4.4.5, Part B.)

Wetlands are described as "the most affected ecosystems in Slovenia". Table 3.6 shows the area of wetlands in national parks in Slovenia. At present, Secoveljske marine salt-works is the only designated Ramsar, but reports are currently being prepared for two proposed Ramsars: Lake Cerknisko Jezero and Ljubljana swampland. The key wetlands identified in the report are:

- Secoveljske marine salt-works
- Lake Cerknisko Jezero; Planinsko polje; Ljubljana swampland
- Drava and Mura Rivers
- Golnik (near Trzic, Gorenjska)
- Prigorica (near Ribnica)
- Zelenica (Spring of Sava River)

With the exception of Secoveljske, these sites are priorities in the National Action Plan and details, including proposed restoration, are given in table 4.4.5-1, Part B. It is planned to protect the entire course of the Mura, Ljubljana Moor, Kolpa and parts of the Drava and Ormoz Lake. Project outlines are given for enhancing biodiversity in the Kucnica river and the ecologically sustainable exploitation of the Mura wetlands. Other important wetlands include: Crni log (Ledava River), Krakovski gozd and Jovski wetlands (Sotla River).

Table 4.4.4-1 and fig.4.4.4-1.show the extensive areas of flooding in Slovenia.

A panel of wetland experts has recently been set up. A detailed inventory of wetlands and their status is in preparation and a national wetlands strategy is to be developed, as well as a structure for designating important sites. A review of wetlands drawn up in 1992 for the European Commission is included in Annex 4.4.5.2.

Ukraine

The report identifies the area covered by wetlands within regions of the Ukraine:

Ivano-Frankivsk - 198 ha
Zakarpattia - 82.9 ha including 0.8 ha swamps.
Odessa - 176 ha.

A list of wetlands, their area, and location is shown in table 6.2, Part B. The most important wetlands of the Danube River basin are located in the Odessa region:

- Danube Delta (part Ramsar)
- Prydunaisky Lakes wetlands

It is planned to protect the whole of the Danube Delta under the GEF Biodiversity Project.

Table 4.2, Part B shows the area of flooded lands under different water levels in the Danube River and table 4.3 shows data on flood events in the Tisza River basin.

Yugoslavia

Section 4.4.5, Part B gives the following overview of wetlands in Yugoslavia:

“There are several of large wetlands sited behind the embankments along the Danube (e.g. Monostorski Rit, Sige-Kazuk Area, the zone near Apatin town, area upstream of City of Belgrade, a long stretch under the influence of backwater of Iron Gate I, as well as the stretch under the influence of backwater of Iron Gate II ... There are also several wetlands along the Sava River (Obedska Bara protected by Ramsar Convention, etc.) as well as along the Tisa River (e.g. near Senta town, near Be~ej town.) which could be rehabilitated...there are several wetlands (e.g. Ludos lake near City of Subotica and Carska bara near of City of Zrenjanin, both protected under Ramsar Convention as the bird reserves) within the Danube watershed in FRY. Every of these wetlands is a unique part of Nature to be saved for the future generations.”

Supplement A-1, Part A lists sites in the Yugoslavian part of the Danube river basin protected by international conventions:

- 3 Ramsars: Ludosko Jezero, Obedska Bara and Carska Bara.

The report suggests that another 40 marshy areas should be protected as Ramsars between 1998-99 and proposes two new sites: Koviljsko-Petrovaradinski Rit and Gornje Podunavlje.

- Durmitor National Park World Natural Heritage sites (plus 5 nominated Heritage sites)
- Tara River Canyon Biosphere Reserve (plus 8 nominated Biosphere Reserves).

Supplement A-4 maps protected (actual and proposed) natural areas in the Danube River Basin and supplements A-2 and 3 show protected areas by size.

The main flood plains lie along the Danube, Sava, Tisza and Grand Morava rivers, with a total potentially flooded area in Yugoslavia of approximately 16,000 km^2 (see section 4.4.4, Part B).

Figure 4.4 shows potentially flooded areas for 100 year flood events only. Analysis and mapping of floodplains for shorter return periods is proposed as part of a larger study on floodplains and their contribution in pollution retention and removal (section 6, Part C).

A second proposed project involves rehabilitation of wetlands along the Danube, Tisa and Sava rivers (see section 7, Part C).

Annex 1.4 - A

Present and Projected Population in the Countries of the DRB

Annex 1.4 – A Present and Projected Population in the Countries of the DRB

	Population Characteristics	Unit	Bosnia & Herzegovina	Bulgaria	Croatia	Czech Republic	Hungary	Moldova	Romania	Slovakia	Slovenia	Ukraine	Yugoslavia	Germany	Austria	All Countries
A	Present Population of the Country (1996/97)	Million	3.8	8.3	4.8	10.3	10.2	4.3	22.6	5.4	2.0	50.9	10.4	82.1	8.1	223.2
	- Urban Population	(%)	80%	68%	70%	60%	63%	46%	55%	57%	53%	68%	52%			63%
	- Rural Population	(%)	20%	32%	30%	40%	37%	54%	45%	43%	47%	32%	48%			37%
	- Population Density	Pop/km2	74	82	85	131	109	128	95	110	98	84	102	230	96	119
B	Present Population in the DRB (1996/97)	Million	2.9	3.9	3.2	2.8	10.2	1.1	21.2	5.2	1.7	3.1	9.0	9.1	7.7	81.2
	- Urban Population (%)	(%)	80%	70%	55%	60%	63%	27%	55%	50%	54%	45%	52%			58%
	- Rural Population (%)	(%)	20%	30%	45%	40%	37%	73%	45%	50%	46%	55%	48%			43%
	- Population Density (Population / Km2)	Pop/km2	79	84	94	131	109	91	89	116	99	95	101	162	96	101
C	Projected Population of the Country (2020)	Million	5.2	8.3	4.5	9.5	9.5	4.1	22.8	5.5	2.2	52.4	10.8	82.9	8.3	225.9
	- Urban Population	(%)	65%	68%				51%	55%			69%	66%			
	- Rural Population	(%)	35%	32%				49%	45%			31%	34%			
	- Population Density	Pop/km2	102	82	79	121	102	121	96	111	108	87	106	232	99	121
D	Projected Population in the DRB (2020)	Million	3.7	3.9	3.0	2.6	9.5	1.0	21.4	5.2	1.9	3.2	8.8	9.2	8.0	81.3
	- Urban Population	(%)	65%	70%				34%	55%			46%	67%			
	- Rural Population	(%)	35%	30%				66%	45%			54%	33%			
	- Population Density	Pop/km2	99	84	88	121	102	83	90	118	111	98	99	164	99	101
	Remarks:	Slovakia: projection figures are only available for year 2010 Bulgaria: No projections available; it is schematically assumed that the population will remain at the present level														

Annex 1.5 - A

Main Economic Indicators for the DRB Countries

Annex 1.5 – A Main Economic Indicators for the DRB Countries

Country	Gross Domestic Product 1997	GDP by Main Sectors			GDP/Capita (*)		Annual Inflation Rates			Exchange Rates: National Currencies to US$					Minimum Wage
		1996			1996	1997	1995	1996	1997	Name of National Currency	1995	1996	1997	1998	
		Agri-culture	Industry Mining	Services Others										January/ May	1996/1997
	Billion USD (*)	%	%	%	USD/ Capita	USD/ Capita	%	%	%	(NC)	NC/USD	NC/USD	NC/USD	NC/USD	USD/ Month
BiH (****)	4.1	--	--	--	776	1087	-12.0	3.0	3.0	KM	--	--	1.8	--	40-85
Bulgaria	9.9	11.7	28.3	60.0	1114	1227	62.0	123.0	1082.6	BGL	67.1	177.9	1717.7	--	77
Croatia	18.8	10.3	20.3	69.4	4243	4267	2.0	3.5	3.6	HRK	6.0	5.4	6.4	6.5	200
Czech Republic	48.9	5.0	33.8	61.2	5063	5050	9.1	8.8	8.5	CZK	26.5	27.0	31.7	--	76
Hungary	44.5	3.0	30.3	66.7	4308	4462	28.2	23.6	18.3	HUF	125.7	152.6	186.8	205.2	91
Moldova (****)	1.9	30.0	25.0	45.0	455	504	29.9	23.5	11.8	MDL	4.5	4.6	4.6	--	4
Romania	34.6	34.2	19.1	46.7	1569	1549	32.2	38.8	154.8	LEI	2600.0	3800.0	7200.0	8478.0	--
Slovakia	19.5	5.3	27.0	67.7	3531	3624	9.9	5.8	6.1	SK	29.7	30.7	33.7	34.4	87
Slovenia	17.4	5.2	36.1	58.7	9254	9101	13.4	9.9	8.3	SIT	118.5	135.4	159.7	--	--
Ukraine (****)	49.7	17.8	44.8	37.4	880	976	377.0	80.0	16.0	HRN	1.5	1.8	1.9	2.1	27
Yugoslavia	15.5	19.9	37.8	42.3	1477	1462	74.1	93.1	18.5	YUD	4.7	5.1	5.9	10.6	36
Germany	2034.1	1.1	31.9	67.0	28790	25606	1.8	1.5	1.8	DM	1.4	1.5	1.7	1.8	--
Austria	195.7	2.1	27.6	70.3	27950	24691	2.2	1.9	1.3	ATS	10.1	10.6	12.2	12.4	--

Remarks

(*) GDP and GDP/capita expressed in USD at official exchange rates between USD and national currencies

(**) Source: EIU Country Reports, (The Economist Intelligence Unit Limited, 1997/1998)

(***) Source: EBRD

(****) GDP/capita 1996 for Moldova and Ukraine own estimates; GDP for BiH 1997: GDP/ capita multiplied by number of domestic population;

Annex 1.5 - B

Domestic Water Demand in the Danube River Basin

Annex 1.5. – B Domestic Water Demand in the Danube River Basin

Country	Water Demand Characteristics of Present Population Connected to Central Water Supply Systems							Water Demand Characteristics of Projected Population Connected to Central Water Supply Systems						
	Year	Present Population in the DRB	Total Demand per Year	Water Demand per Capita	Portion of Population Connect. to Cent. Syst.	Range of Losses	Per Capita Consump-tion	Year	Projected Population in the DRB	Total Demand per Year	Water Demand per Capita	Portion of Population Connect. to Cent. Syst	Range of Losses	Per Capita Consump-tion
		Million	Mln m3/a	l/c/d	%	%	l/c/d		Million	Mln m3/a	l/c/d	%	%	l/c/d
Bosnia & Herzeg. (2)	1997	2.9	153	250	57%	40%	150		3.7	404	305	98%	20%	
Bulgaria (1)	1996	3.9	622	439	98%	43%	190	2010	3.9	369	260	99%		
Croatia (3)	1997	3.2	184	254	62%	35%	170	2015	3.0	184				
Czech Republic (1)	1995	2.8	201	248	80%	26%	98	2015	2.6	230	282	86%		150
Hungary	1996	10.2	546	147	96%	27%	107	2020	9.5	744	217	99%		
Moldova	1995	1.1	21	177	29%	20%	143	2020	1.0	59	241	67%	10%	217
Romania (1)	1996	22.6	2062	409	61%	22%	244	2020	22.8	2928			20%	
Slovakia	1997	5.2	361	245	78%	23%	177	2010	5.2	340	226	79%		178
Slovenia	1995	1.7	100	196	81%	28%	141	2020	1.9	101	158	90%	20%	126
Ukraine	1997	3.1	136	172	70%	17%	144	2020	3.2	140	172	70%		
Yugoslavia (4)	1991	9.0	372	255	45%	30%	179	2020	8.8	598	293	64%	18%	240
Germany (1)	1997	9.1	750	230	98%		146	2020	9.2	667	200	99%		135
Austria (1)	1997	7.7	586	242	86%		145	2020	8.0	604	237	86%		145
Total		**82.6**	**6093**						**82.8**	**7368**				

Remarks:

(1) "Specific water demand": including water losses and other population related demand (such as administrative, commercial, touristic demand, etc)

(2) Water demand figures for Bosnia & Herzegovina are "normative figures" (disregarding actual war damages)

(3) No projection figures available: it is schematically assumed that the domestic water demand will approximately remain constant

(4) Data for urban population connected to large CWSS;

Annex 1.5 - C

Domestic Waste Water Generation in the Danube River Basin

Annex 1.5 – C Domestic Waste Water Generation in the Danube River Basin

Country	Present Waste Water Generation in the Danube River Basin of Population Connected to Central Sewerage Systems							Projected Waste Water Generation in the Danube River Basin of Population Connected to Central Sewerage Systems						
	Year	Present Population in the DRB	Total Waste Water Generation	Waste Water Generation per Capita	Percentage of Population Connected to Central Sewerage Systems			Year	Projected Population in the DRB	Total Waste Water Generation	Waste Water Generation per Capita	Percentage of Population Connected to Central Sewerage Systems		
					Total	Urban	Rural					Total	Urban	Rural
		Million	Mln m3/a	l/c/d	%	%	%		Million	Mln m3/a	l/c/d	%	%	%
Bosnia - Herceg. (1)	1997	2.9	70	125	52%				3.7	316	234			
Bulgaria	1996	3.9	149	161	65%	91%	5%	2010	3.9	332				
Croatia (2) (3)	1996	3.2	87	178	41%			2015	3.0	81				
Czech Republic (2)	1995	2.8	57	80	71%			2015	2.6	96	128	80%		
Hungary	1996	10.2	231	139	45%	67%	6%	2020	9.5	639	205	90%		
Moldova	1996	1.1	9	152	14%	48%	1%	2020	1.0	46	260	49%	95%	25%
Romania	1996	22.6	665	197	41%			2020	22.8	960				
Slovakia (2)	1997	5.2	189	202	50%			2010	5.2	187	142	69%		
Slovenia	1995	1.7	32	108	46%			2020	1.9	57	108	75%		
Ukraine (3)	1997	3.1	90	157	51%	75%	3%	2020	3.2	93				
Yugoslavia	1997	9.0	152	140	33%	63%		2020	8.8	306	192	50%	74%	
Germany	1997	9.1	460	155	89%			2020	9.2	447	146	95%		
Austria	1997	7.7	306	145	75%			2020	8.0	358	145	85%		
Total		**82.6**	**2496**						**82.8**	**3917**				

Remarks:

(1) Waste water figures for Bosnia & Hercegovina are "normative figures" (disregarding war damages)

(2) Waste water projection for Croatia and Czech Republic for year 2015, for Slovakia for year 2010;

(3) Projection of waste water generation proportionally to development of population

Annex 1.5 - D

Abstraction of Raw Water from the Danube River System

Annex 1.5 – D Abstraction of Raw Water from the Danube River System

Country	Present Raw Water Abstraction from the Danube River System								Projected Raw Water Abstraction from the Danube River System						
	Year	Total Without Cooling Water	Public Water Supply Systems	Industry, Mining	Agri-culture, Irrigation	Other Purposes	Cooling Water		Year	Total Without Cooling Water	Public Water Supply Systems	Industry, Mining	Agri-culture, Irrigation	Other Purposes	Cooling Water
		Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a			Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a	Mln m3/a
BiH (1)	1997	57	7	49	--	--	--		2020	678	165	473	40	0	--
Bulgaria (3)	1996	234	--	211	17	6	176			--	--	--	--	--	--
Croatia (3)	1994	104	16	79	9	0	242			--	--	--	--	--	--
Czech Republic	1995	162	54	97	11	0	67		2015	270	54	189	28	0	--
Hungary (3)	1996	1148	41	171	935	0	4417			1217	49	205	963	0	--
Moldova	1996	114	17	7	79	11	0		2020	285	59	21	155	50	--
Romania (2) (3)	1996	7388	1237	4647	1504	--	2600			--	--	--	--	--	--
Slovakia	1997	879	49	747	83	0	0		2010	1481	113	1352	16	0	--
Slovenia (3)	1995	14	8	1	4	0	51			--	--	--	--	--	--
Ukraine (2) (3)		--	--	--	--	--	--			--	--	--	--	--	--
Yugoslavia (4)	1997	1152	271	457	424	--	5300		2020	4821	435	2362	2024	--	--
Germany	1997	164	34	130	0	0	1512		2020	172	42	130	0	0	--
Austria	1997	1300	0	1300	0	0	1300		2020	1300	0	1300	0	0	--
Total (Mln m3)		**12714**	**1734**	**7896**	**3067**	**17**	**15665**			**10226**	**917**	**6032**	**3227**	**50**	**--**
Total (%)		**100%**	**14%**	**62%**	**24%**	**0%**	**123%**			**100%**	**9%**	**59%**	**32%**	**0%**	

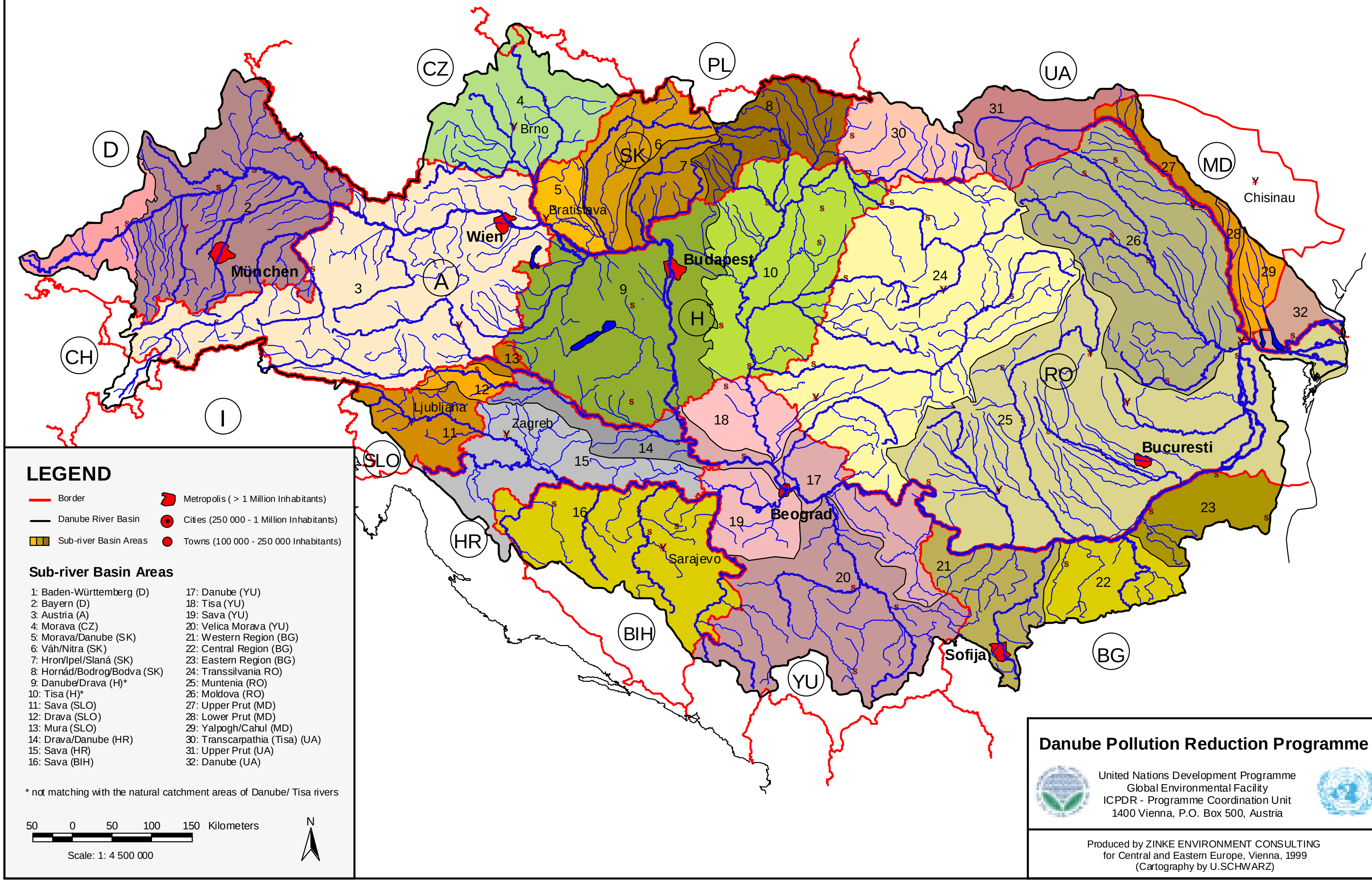
Remarks:
(1) Industrial water abstraction presently about 10% of pre-war volume;
(2) Schematic assumption: 60% of municipal water demand and 75% of industrial water demand abstracted from surface waters;
(3) No projection figures available
(4) Schematically assumed that 75% of water for irregation is abstracted from surface water;

Annex 2.3 - A

Danube Sub-river Basin Areas

Map 3: Sub-river Basin Areas

Based on National Planning Workshop Reports 1998



Annex 3.1 - A

Data from Selected Cross-Border Water Quality Monitoring Stations as Presented in the National Review Reports

Annex 3.1 – A Data from Selected Cross-Border Water Quality Monitoring Stations as Presented in the National Review Reports

Table 1. Brief Summary of Data for the Germany / Austria Transboundary Area on the Danube River at Jochenstein Station (L 2130)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	365	365	366	--	592 - 4193 m = 1390	696-4580 m = 1630	656 -3690 m = 1280	--
Water discharge at time of water quality sample (m3/s)	26	25	26	--	633 - 2380	761 - 4060	679 - 2620	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered, mg/l)	26	25	26	26	.03 - .21	.05 - .23	.03 - .20	.02 - .14
NO3-N (filtered, mg/l)	26	25	26	26	1.2 - 3.9	1.3 - 3.9	1.1 - 3.5	1.1 - 3.8
Total P (mg/l)	26	25	26	26	.050 - .120	.060 - .510	.060 - .210	.040 - .150
BOD	26	25	26	26	1.3 - 3.7	1.2 - 5.0	1.3 - 4.2	1.1 - 6.0
COD	26	25	26	26	<15 - <15	<15 - 24	<15 - <15	<15 - 17
Heavy metals	26	25	26	26	various	various	various	various

Note: [--] = not presented in national review report; m = mean

Table 2 **Brief Summary of Data for the Austria / Germany Transboundary Area on the Inn River at Kirchdorf Station (L 2150)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	365	365	366	365	97.3 - 794 m = 292	102-1110 m = 330	66.5 -820 m = 260	107 - 1100 m = 311
Water discharge at time of water quality sample (m3/s)	26	24	26	25	134 - 619	111 - 840	73.8 - 595	152 - 849
Suspended sediment (mg/l)	60	365	305	--	nc	nc	nc	nc
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered, mg/l)	26	24	26	25	.06 - .50	.06 - .32	.03 - .38	.04 - .26
NO3-N (filtered, mg/l)	24	24	26	24	<.20 - .8	.1 - .9	.4 - 1.0	.3 - .9
Total P (mg/l)	25	24	26	25	.049 - .353	.053 - .286	.030 - .468	.028 - .920
BOD	26	24	26	25	1.2 - 4.5	1.5 - 5.7	<1.0 - 4.7	<1.0 - 6.1
COD	--	--	--	--	--	--	--	--
Heavy metals	26	24	26	25	various	various	various	various

Notes: [--] = not presented in national review report; m = mean; nc = meaning not yet clear

Table 3. **Brief Summary of Data for the Austria / Germany Transboundary Area on the Salzach River at Laufen Station (L 2160)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	365	366	365	--	107 - 2120 m = 271	60.6 - 1420 m = 220	--
Water discharge at time of water quality sample (m3/s)	26	26	26	27	87.4 - 549	13 - 899	69.4 - 511	84.6 - 547
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered, mg/l)	26	26	26	27	.01 - .18	<.02 - .17	<.02 - .27	<.02 - .08
NO3-N (filtered, mg/l)	26	26	26	27	.4 - 1.1	.5 - 1.1	.4 - 1.1	.4 - 1.0
Total P (mg/l)	25	20	19	26	.015 - .167	.024 - .120	.026 - .129	.033 - .121
BOD	26	26	26	27	1.4 - 4.8	1.2 - 6.5	<1.0 - 4.6	1.3 - 5.0
COD	--	--	--	--	--	--	--	--
Heavy metals	26	26	26	27	various	various	various	various

Note: [--] = not presented in national review report; m = mean

Table 4. Brief Summary of Data for the Germany / Austria Transboundary Area on the Danube River at Felsen Hutt Station (km 2209)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	12	12	12	12	690 - 2050 m = 1340	860 - 3950 m = 1783	644 - 1666 m = 1194	719 - 1817 m = 1197
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered?, mg/l)	12	12	12	12	.05 - .45	.02 - .25	.06 - .27	.06 - .12
NO3-N (filtered?, mg/l)	12	12	12	12	1.33 - 2.53	1.2 - 3.7	1.5 - 3.2	1.08 - 3.21
NO2-N (filtered?, mg/l)	12	12	12	12	.01 - .02	.01 - .04	.01 - .02	.01 - .03
Total P (mg/l)	12	12	12	12	.064 - .115	.057 - .368	.046 - .099	.057 - .355
BOD	12	12	12	12	1.0 - 6.8	1.3 - 4.1	2.1 - 6.5	.8 - 4.3
COD	--	--	--	--	--	--	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; m = mean

Table 5. **Brief Summary of Data for the Austria / Slovakia Transboundary Area on the Danube River at Wolfstahl Station (km 1873)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	12	12	11	12	940 - 4430 m = 2047	1137 - 5239 m = 2467	926 - 3065 m = 1889	1041 - 2670 m = 1757
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered?, mg/l)	12	12	11	12	.05 - .55	.02 - .32	.062 - .45	.06 - .37
NO3-N (filtered?, mg/l)	12	12	11	12	1.50 - 3.40	1.5 - 3.6	1.6 - 3.4	1.31 - 3.12
NO2-N (filtered?, mg/l)	12	12	11	12	.01 - .08	.02 - .05	.01 - .04	.01 - .06
Total P (mg/l)	12	12	11	12	.070 - .200	.044 - .287	.057 - .128	.047 - .174
BOD	12	12	11	12	1.5 - 4.6	1.4 - 4.5	1.1 - 7.3	1.5 - 4.3
COD	12	12	11	12	6.2 - 14	7 - 21	--	6 - 28
Heavy metals	12	12	11	12	Various	Various	Various	Various

Note: [--] = not presented in national review report; m = mean

Table 6. Brief Summary of Data for the Austria / Slovakia Transboundary Area on the March River at Devin Station (km 1.0)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	--	12	11	12	83	35 - 186 m = 106	60 - 654 m =145.6	57 - 266 m = 106
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4-N (filtered?, mg/l)	--	12	11	12	.58	.05 - 1.03	.11 - 1.32	.12 - 2.11
NO3-N (filtered?, mg/l)	--	12	11	12	3.51	1.2 - 6.1	2.8 - 16.0	2.12 - 8.79
NO2-N (filtered?, mg/l)	--	12	11	12	.05	.02 - .09	.02 - .07	.02 - .09
Total P (mg/l)	--	12	11	12	.512	.208 - .670	.172 - .497	.276 - .408
BOD	--	12	11	12	4.7	2.1 - 7.2	2.5 - 8.7	2.1 - 6.5
COD	--	12	--	12	25.6	18 - 51	--	17 - 29
Heavy metals	--	12	11	12	Various	Various	Various	Various

Note: [--] = not presented in national review report; m = mean

Table 7. Brief Summary of Data for the Moldova / Romania Transboundary Area on the Prut River at Braniste Station (km 546)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	--	--	--	--	--	--	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (filtered, mg/l)	--	--	--	--	--	m = .17	m = .17	m = .25
NO3 (filtered, mg/l)	--	--	--	--	--	m = 2.38	m = 1.38	m = 2.20
NO2 (filtered, mg/l)	--	--	--	--	--	m = .013	m = .018	m = .030
Total P (filtered, mg/l)	--	--	--	--	--	m = .122	m = .065	m = .074
BOD	--	--	5	--	--	m = 2.19	m = 2.71	m = 1.94
COD	--	--	5	--	--	--	m = 17.2	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; m = mean

Table 8. **Brief Summary of Data for the Moldova / Romania Transboundary Area on the Prut River at Leova Station (km 216)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	--	--	--	--	--	--	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (filtered, mg/l)	--	--	--	--	--	m = 1.73	m = .87	m = .88
NO3 (filtered, mg/l)	--	--	--	--	--	m = 2.45	m = 1.3	m = 1.3
NO2 (filtered, mg/l)	--	--	--	--	--	m = .045	m = .11	m = .11
Total P (filtered, mg/l)	--	--	--	--	--	m = .218	m = .150	m = .092
BOD	--	--	10	--	--	--	m = 3.44	m = 3.43
COD	--	--	10	--	--	--	m = 20.4	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; m = mean

Table 9. Brief Summary of Data for the Moldova / Romania Transboundary Area on the Prut River at Cahul Station (km 78)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	--	--	--	--	--	--	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (filtered, mg/l)	--	--	--	--	m = .45	m = 1.03	m = .69	m = .71
NO3 (filtered, mg/l)	--	--	--	--	m = 1.36	m = 3.95	m = 1.79	--
NO2 (filtered, mg/l)	--	--	--	--	m = .240	--	m = .040	m = .036
Total P (filtered, mg/l)	--	--	--	--	m = .45	m = .194	m = .132	--
BOD	--	--	10	--	m = 3.67	--	m = 3.20	m = 3.16
COD	--	--	10	--	--	--	m = 23.4	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; m = mean

Table 10. Brief Summary of Data for the Moldova / Romania Transboundary Area on the Prut River at Ungheni Station (km 376)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	365	366	--	--	25.6 - 179	37.4 - 628	--
Water discharge at time of water quality sample (m3/s)	--	--	11	--	--	--	39.2 - 163*	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (filtered, mg/l)	--	--	--	--	--	m = .35	m = .48	m = .33
NO3 (filtered, mg/l)	--	--	--	--	m = 1.58	m = 2.28	m = 1.87	m = 2.13
NO2 (filtered, mg/l)	--	--	--	--	m = .070	m = .016	m = .015	m = .016
Total P (filtered, mg/l)	--	--	--	--	m = .74	m = .121	m = .029	m = .122
BOD	--	--	11	--	m = 3.55	m = 3.56	m = 2.86	m = 2.43
COD	--	--	11	--	--	--	m = 19	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; m = mean; [*] = refers only to BOD and COD samples

Table 11. Brief Summary of Data for the Ukraine / Romania Transboundary Area on the Danube River at Vikovo Station (km 26)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	8	12	9	--	2000 - 5220 m = 3572	1420 - 4920 m = 2785	2306 - 6700 m = 4159	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Tot. min.-N (filtered?, mg/l)	9	12	9	--	.26 - .89	1.3 - 1.96	1.20 - 2.80	--
Total P (filtered, mg/l)	8	12	9	--	.18 - 1.00	.07 - .58	.10 - .90	--
BOD	9	12	9	--	.50 - 4.50	1.80 - 4.60	1.70 - 4.60	--
COD	--	--	--	--	--	--	--	--
Heavy metals	Var	i	ous	--	Various	Various	Various	--

Note: [--] = not presented in national review report; m = mean

Table 12. Brief Summary of Data for the Ukraine / Romania Transboundary Area on the Danube River at Ismail Station (km 115 or 99?)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	9	12	9	--	2150 - 5630 m = 3807	2160 - 7500 m = 3871	2410 - 75300 m = 4411	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Tot. min.-N (filtered?, mg/l)	9	12	9	--	.13 - 1.75	1.00 - 2.50	.96 - 2.80	--
Total P (filtered, mg/l)	9	12	9	--	.12 - .91	.09 - .30	.07 - .39	--
BOD	9	12	9	--	.25 - 4.51	.60 - 4.80	1.80 - 4.60	--
COD	--	--	--	--	--	--	--	--
Heavy metals	Var	i	ous	--	Various	Various	Various	--

Note: [--] = not presented in national review report; m = mean

Table 13. **Brief Summary of Data for the Ukraine / Romania / Moldova Transboundary Area on the Prut River at Chernivtsi Station (km 722)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	11	11	4	--	21.6 - 127 m = 50.7	26.1 - 187 m = 70.8	16.7 - 70 m = 30.9	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Tot. min.-N (filtered?, mg/l)	12	12	3	--	1.10 - 4.7	.37 - 2.70	2.00 - 5.90	--
Total P (filtered, mg/l)	7	7	3	--	.03 - 1.00	.06 - .16	.07 - .17	--
BOD	12	12	4	--	2.0 - 4.20	2.10 - 4.20	2.50 - 3.70	--
COD	--	--	--	--	--	--	--	--
Heavy metals	Var	i	ous	--	Various	Various	Various	--

Note: [--] = not presented in national review report; m = mean

Table 14. Brief Summary of Data for the Ukraine / Slovakia Transboundary Area on the Tisza River at Khust Station (km 854)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	4	4	2	--	188 - 338 m = 268	95 - 247 m = 181	90 - 110 m = 100	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Tot. min.-N (filtered?, mg/l)	4	4	2	--	2.60 - 3.70	1.20 - 3.90	.36 - 6.00	--
Total P (filtered, mg/l)	4	4	2	--	.01 - .10	.02 - .22	.07 - .11	--
BOD	4	4	2	--	2.00 - 3.20	2.00 - 2.40	2.00 - 2.70	--
COD	--	--	--	--	--	--	--	--
Heavy metals	Var	i	ous	--	Various	Various	Various	--

Note: [--] = not presented in national review report; m = mean

Table 15. Brief Summary of Data for the Ukraine / Slovakia Transboundary Area on the Uzh River at Uzhgorod Station (km 33)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	10	9	4	--	5.6 - 42.2 m = 23.4	3.7 - 80.7 m = 25.8	4.7 - 35.9 m = 15.7	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Tot. min.-N (filtered?, mg/l)	10	9	4	--	1.50 - 4.20	1.16 - 2.30	.92 - 4.00	--
Total P (filtered, mg/l)	3	7	2	--	.02 - .20	.00 - .13	.08 - .09	--
BOD	10	10	4	--	2.00 - 5.70	.00 - 2.80	2.10 - 2.88	--
COD	--	--	--	--	--	--	--	--
Heavy metals	Var	i	ous	--	Various	Various	Various	--

Note: [--] = not presented in national review report; m = mean

Table 16. Brief Summary of Data for the Slovenia / Croatia Transboundary Area on the Mura River at Petanjci Station (km ___)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	4	4	--	--	~100 - 175	~90 - 150	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	4	4	--	--	.16 - .35	.17 - .56	--	--
NO3 (filtered, mg/l)	4	4	--	--	8.5 - 11.	6.8 - 15.1	--	--
NO2 (unfiltered, mg/l)	4	4	--	--	.02 - .18	.07 - .51	--	--
Total PO4 (filtered, mg/l) 4	4	--	--		.09 - .18	.16 - .66	--	--
BOD	4	4	--	--	1.8 - 4.3	1.9 - 3.2	--	--
COD (K2Cr2O7)	4	4	--	--	10.7 - 15.6	7.7 - 18.7	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; [~] - estimated from graph

Table 17. **Brief Summary of Data for the Slovenia / Croatia Transboundary Area on the Sava River at Catez / Jesenice Stations (km ___)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	6	6	--	--	~130 - 200	~130 - 450	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	--	--	.07 - .29	.2 - .33	--	--
NO3 (filtered, mg/l)	6	6	--	--	5.4 - 8.1	6.1 - 8.9	--	--
NO2 (unfiltered, mg/l)	6	6	--	--	.01 - .14	.02 - .08	--	--
Total PO4 (filtered, mg/l) 6	6	--	--		.11 - .62	.1 - .62	--	--
BOD	6	6	--	--	1.3 - 2.3	.7 - 3.	--	--
COD (K2Cr2O7)	6	6	--	--	4.5 - 18.6	7.8 - 22.5	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; [~] - estimated from graph

Table 18. Brief Summary of Data for the Austria / Slovenia Transboundary Area on the Drava River at Dravograd Station (km ___)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	6	6	--	--	~170 - 350	~130 - 350	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	--	--	.08 - .35	.16 - .26	--	--
NO3 (filtered, mg/l)	6	6	--	--	3.4 - 5.5	3.4 - 6.3	--	--
NO2 (unfiltered, mg/l)	6	6	--	--	.02 - .09	.02 - .05	--	--
Total PO4 (filtered, mg/l)	6	6	--	--	.01 - .15	.05 - .13	--	--
BOD	6	6	--	--	.1 - 2.1	.8 - 2.6	--	--
COD (K2Cr2O7)	6	6	--	--	5. - 14.8	4.2 - 15.6	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; [~] - estimated from graph

Table 19. Brief Summary of Data for the Slovenia / Croatia Transboundary Area on the Drava River at Ormuz Station (km ___)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	4	6	--	--	~200 - 350	~175 - 350	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	--	--	.11 - .33	.13 - .22	--	--
NO3 (filtered, mg/l)	6	6	--	--	3.7 - 7.2	4.1 - 7.7	--	--
NO2 (unfiltered, mg/l)	6	6	--	--	.02 - .07	.03 - .03	--	--
Total PO4 (filtered, mg/l) 6	6	--	--		.05 - .17	.04 - .12	--	--
BOD	6	6	--	--	1.1 - 3.7	1.4 - 2.6	--	--
COD (K2Cr2O7)	6	6	--	--	3.4 - 8.7	4. - 13.1	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; [~] - estimated from graph

Source: National Review Report for Slovenia

Table 20. **Brief Summary of Data for the Slovenia / Croatia Transboundary Area on the Kolpa River at Metlika and Radovici Stations (km ___)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)	--	--	--	--	--	--	--	--
Water discharge at time of water quality sample (m3/s)	6	6	--	--	~15 - 50	~20 - 70	--	--
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	--	--	.07 - .3	.16 - .37	--	--
NO3 (filtered, mg/l)	6	6	--	--	1.8 - 3.8	2.7 - 4.4	--	--
NO2 (unfiltered, mg/l)	6	6	--	--	.01 - .03	.01 - .01	--	--
Total PO4 (filtered, mg/l) 6	6	--	--		.03 - .15	.04 - .23	--	--
BOD	6	6	--	--	1. - 2.9	1.4 - 3.2	--	--
COD (K2Cr2O7)	6	6	--	--	3.9 - 8.2	5.5 - 14.5	--	--
Heavy metals	--	--	--	--	--	--	--	--

Note: [--] = not presented in national review report; [~] - estimated from graph

Table 21. **Brief Summary of Data for the Czech / Slovak Transboundary Area on the Morava River at Lanzhot Station (km 79)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s) (at Straznice, km 133)	--	365	366	365	--	2.4 - 306	6.6 - 364	16.5 - 901
Water discharge at time of water quality sample (m3/s)	12	12	12	12	5.4 - 124	10.9 - 114	19.2 - 147	23 - 265
Suspended sediment (mg/l)	12	12	12	12	12 - 95	7 - 84	4 - 619	5 - 126
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
Total inorganic N (unfiltered, mg/l)	12	12	12	12	1.4 -5.6	1.4 - 5.5	2.9 - 7.2	2.6 - 6.4
Total P (unfiltered, mg/l)	12	12	12	12	.13 - 1.25	.10 - .34	.16 - .53	.17 - .43
COD (K2Cr2O7)	12	12	12	12	16.3 - 44.6	11.4 - 28.2	17.2 - 48.9	16.2 - 36.5
Hg (microgram/l)	12	12	12	12	<.1 - .6	<.1 - .2	<.1 - 1.4	<.1 - .2

Note: [--] = not presented in national review report;

Table 22. Brief Summary of Data for the Czech / Austria Transboundary Area on the Dyje River at Breclav-Ladna Station (km 32.3)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s) (at Straznice, km 133)	--	365	366	365	--	8.9 - 125	11.9 - 311	14.2 - 326
Water discharge at time of water quality sample (m3/s)	--	--	11	11	--	--	17.3 - 192	19.2 - 158
Suspended sediment (mg/l)	--	--	--	--	--	--	--	--
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N Total inorganic N (unfiltered, mg/l)	--	--	11	11	--	--	2.9 - 8.1	3.6 - 8.3
Total P (unfiltered, mg/l)	--	--	11	11	--	--	.18 - .47	.18 - .70
COD (K2Cr2O7)	--	--	11	11	--	--	26.5 - 43.7	26.8 - 37.9
Hg (microgram/l)	--	--	11	11	--	--	<.1 - .42	<.1 - .19

Note: [--] = not presented in national review report;

Table 23. Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Kolpa Metlika Station (km 181.5 from Sava, 10.05 from border)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	6	6	6	--	10.8 - 46.4	18.7 - 59.6	20.5 - 85.0	--
Suspended sediment (mg/l)	6	6	6	6	2.4 - 7.1	1.3 - 5.4	4.0 - 63.1	2.7 - 10.6
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	6	6	0.07 - 0.3	0.16 -0.37	0.08 - 0.62	0.11 - 0.33--
NO3 (filtered, mg/l)	6	6	6	6	1.8 - 3.8	2.7 - 4.4	2.5 - 4.3	2.0 - 5.0
NO2 (unfiltered, mg/l)	6	6	6	6	.01 - .03	.01 - .01	01 - .02	.01 - .02
Total PO4 (filtered, mg/l) 6	6	6	6	6	.03 - .15	.04 - .23	0.02 - 0.3	0.01 - 0.07
BOD	6	6	6	6	1. - 2.9	1.4 - 3.2	1.1 - 3.4	1.5 - 2.4
COD (K2Cr2O7)	6	6	6	6	3.9 - 8.2	5.5 - 14.5	3.7 - 7.6	3.3 - 9.8
Heavy metals (water, susp.s.)	1	5	7	8				
Heavy metals (sediment)	1	1	1	1				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 24. Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Sotla Rakovec Station (km 8.07 from Sava)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	4	4	4	--	1.25 - 5.5	1.78 - 2.37	2.37 - 9.63	--
Suspended sediment (mg/l)	4	4	4	4	8.8 - 14.7	3.0 - 11.9	2.7 - 176.7	4.3 - 7.2
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	4	4	4	4	0.15 - 1.57	0.77 -2.33	0.29 - 2.13	0.18 - 1.42
NO3 (filtered, mg/l)	4	4	4	4	4.8 - 7.6	5.2 - 8.0	4.8 - 5.3	2.6 - 6.3
NO2 (unfiltered, mg/l)	4	4	4	4	.004 - .2	.06 - .17	04 - .12	.02 - .08
Total PO4 (filtered, mg/l) 6	4	4	4	4	0.1 - 0.39	0.29 - 0.63	0.01 - 0.05	0.07 - 0.3
BOD	4	4	4	4	1.9 - 5.1	3.0 - 10.8	1.0 - 6.5	1.9 - 4.6
COD (K2Cr2O7)	4	4	4	4	4.1 - 18.9	11.6 - 22	6.8 - 26.5	5.5 - 13.3
Heavy metals (water, susp.s.)	--	4	4	4				
Heavy metals (sediment)	--	--	--	--				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 25. **Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Sava Jasenice na Dolenjskem Station Station (km 728.82 from Danube)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	6	6	11	--	110 - 211	109- 284	194 - 370	64 - 1231
Suspended sediment (mg/l)	6	6	11	12	3.9 - 21.3	4.1 - 35.0	1.9 - 34.1	1.8 - 183.6
Total N (mg/l)	--	--	8	--	--	--	1.45 - 3.40	--
Other N								
NH4 (unfiltered, mg/l)	6	6	11	12	0.07 - 0.29	0.2 -0.33	0.19 - 0.33	0.1 - 0.33
NO3 (filtered, mg/l)	6	6	11	12	5.4 - 8.1	6.1 - 8.9	5.9 - 7.8	6.0 - 10.5
NO2 (unfiltered, mg/l)	6	6	11	12	0.01 - 0.14	0.02 - 0.1	0.03 -0.23	0.03 - 0.15
Total PO4 (filtered, mg/l) 6	6	6	11	12	0.11 - 1.0	0.1 - 0.62	0.2 - 0.98	0.1 - 0.47
BOD	6	6	11	12	1.3 - 3.0	1.7 - 3.0	1.4 - 3.6	1.9 - 4.2
COD (K2Cr2O7)	6	6	11	12	4.5 - 18.6	7.8 - 22.5	3.8 - 11.0	5.5 - 34.6
Heavy metals (water, susp.s.)	--	5	12	13				
Heavy metals (sediment)	--	1	1	1				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 26. Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Drava Ormoz Station Station (km 11.5 from state border with Croatia)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	6	6	11	12	--	--	201 - 689	162 - 605
Suspended sediment (mg/l)	6	6	11	12	6.4 - 20.8	5.1 - 12.3	3.8 - 17.3	1.5 - 26.4
Total N (mg/l)	--	--	8	--	--	--	0.52 - 2.15	--
Other N								
NH4 (unfiltered, mg/l)	6	6	11	12	0.11 - 1.36	0.13 -0.22	0.08 - 0.29	0.06 - 0.24
NO3 (filtered, mg/l)	6	6	11	12	3.7 - 7.2	4.1 - 7.7	4.0 - 7.7	3.1 - 9.1
NO2 (unfiltered, mg/l)	6	6	11	12	0.02 - 0.07	0.03 - 0.03	0.03 -0.07	0.02 - 0.08
Total PO4 (filtered, mg/l) 6	6	6	11	12	0.05 - 0.17	0.04 - 0.16	0.01 - 0.14	0.01 - 0.16
BOD	6	6	11	12	1.1 - 3.7	1.4 - 2.6	1.3 - 3.3	1.0 - 9.6
COD (K2Cr2O7)	6	6	11	12	3.4 - 8.7	4.0 - 13.1	3.2 - 10.1	3.2 - 26.5
Heavy metals (water, susp.s.)	1	6	12	14				
Heavy metals (sediment)	1	1	1	1				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 27. **Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Drava Dravograd Station (km 132.07 from state border with Croatia)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	6	6	6	--	108 - 250	110 - 290	90 - 420	--
Suspended sediment (mg/l)	6	6	6	6	5.0 - 55.9	2.1 - 23.2	2.4 - 13.0	1.9 - 9.1
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	6	6	0.08 - 0.35	0.16 -0.26	0.13 - 0.27	0.1 - 0.19
NO3 (filtered, mg/l)	6	6	6	6	3.4 - 5.5	3.4 - 6.3	3.4 - 7.5	3.2 - 5.3
NO2 (unfiltered, mg/l)	6	6	6	6	0.02 - 0.09	0.02 - 0.05	0.02 - 0.03	0.02 - 0.03
Total PO4 (filtered, mg/l) 6	6	6	6	6	0.01 - 0.15	0.04 - 0.13	0.05 - 0.52	0.02 - 0.06
BOD	6	6	6	6	1. - 2.1	0.8 - 2.6	0.7 - 3.3	0.8 - 2.2
COD (K2Cr2O7)	6	6	6	6	5.0 - 14.8	4.2 - 15.6	2.8 - 12.5	2.0 - 7.6
Heavy metals (water, susp.s.)	1	6	7	8				
Heavy metals (sediment)	1	1	1	1				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 28. **Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Mura Cersak Station (km 128.7 from Drava, 88.05 from state border)**

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	6	6	6	--	99 - 205	84 - 138	71.3 - 222	--
Suspended sediment (mg/l)	6	6	6	6	5.8 - 50.6	3.8 - 14.9	4.0 - 17.3	4.9 - 29.5
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	6	6	6	6	0.23 - 0.65	0.35 -0.55	0.41 - 3.21	0.29 - 0.94
NO3 (filtered, mg/l)	6	6	6	6	5.6 - 10.1	5.4 - 13.4	5.2 - 8.8	4.5 - 7.9
NO2 (unfiltered, mg/l)	6	6	6	6	0.01 - 0.16	0.06 - 1.21	0.04 - 0.13	0.07 - 0.13
Total PO4 (filtered, mg/l) 6	6	6	6	6	0.01 - 0.29	0.09 - 0.37	0.04 - 0.10	0.07 - 0.10
BOD	6	6	6	6	1.8 - 3.9	1.7 - 4.7	1.9 - 3.4	1.9 - 4.7
COD (K2Cr2O7)	6	6	6	6	10.3 - 14.8	9.7 - 18.6	5.9 - 11.0	6.5 - 27.7
Heavy metals (water, susp.s.)	1	6	7	7				
Heavy metals (sediment)	1	1	2	1				

Note: [--] = not presented in national review report;

Source: Submitted by the National Experts from Slovenia, following the Transboundary Workshop

Table 29. Brief Summary of Data for Slovenia / Croatia Transboundary Area on the Mura Petanjci Station (km 8.07 from Sava)

Parameter	No. of dates with data / year				Range of values in the data / year			
	'94	'95	'96	'97	'94	'95	'96	'97
Water discharge (m3/s)								
Water discharge at time of water quality sample (m3/s)	4	4	4	--	84.5 - 118	89 - 129	71.3 - 192	--
Suspended sediment (mg/l)	4	4	4	4	8.8 - 17.0	4.8 - 23.8	5.7 - 23.9	5.6 - 38.2
Total N (mg/l)	--	--	--	--	--	--	--	--
Other N								
NH4 (unfiltered, mg/l)	4	4	4	4	0.16 - 0.35	0.17 -0.56	0.16 - 0.69	0.23 - 0.67
NO3 (filtered, mg/l)	4	4	4	4	7.6 - 11.0	6.8 - 15.1	6.4 - 13.6	5.6 - 13.8
NO2 (unfiltered, mg/l)	4	4	4	4	0.02 - 0.18	0.07 - 0.51	0.05 - 0.11	0.06 - 0.18
Total PO4 (filtered, mg/l) 6	4	4	4	4	0.08 - 0.18	0.16 - 0.66	0.07 - 0.11	0.07 - 0.13
BOD	4	4	4	4	1.8 - 4.3	1.9 - 3.2	2.3 - 3.0	2.4 - 4.6
COD (K2Cr2O7)	4	4	4	4	10.7 - 15.6	7.7 - 18.7	5.6 - 14.4	8.5 - 29.9
Heavy metals (water, susp.s.)	--	3	4	4				
Heavy metals (sediment)	--	--	--	--				

Note: [--] = not presented in national review report;

Annex 3.1 - B

Consistency Check for 1996 Selected Water Quality and Discharge Data which Appear in the TNMN 1996 Yearbook and the National Reviews

Annex 3.1 – B Consistency Check for 1996 Selected Water Quality and Discharge Data which Appear in the TNMN 1996 Yearbook and the National Reviews

Danube River, Reni Station, RO05, L0430		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	4,200.0-xxxxx	3,800-11,710
Suspended solids	9-132 l, 14-100 m, 11-88 r	all ok
Ammonium-N (NH4+)	.14-1.47 l, .15-.41 m, .15-.43 r	.14-.47 l, .15-.41 m, .15-.39 r
Nitrite-N (NO2)	.010-.043 l, .020-.070 m, .029-.080 r,	.005-.08 l, .02-.07 m, .029-.08 r
Nitrate-N (NO3)	1.16-2.05 l, 1.01-2.27 m, 1.03-2.27 r	12-205 l, 1.01-2.07 m, 1.76-2.27 r
Organic-N	N/A in report	N/A in report
Ortho-P	.650-.080 l, .040-.090 m, .040-.090 r	N/A in report
Total P	.07-.13 l, .08-.12 m, .09-.14 r	.065-.12 l, .08-.12 m, .09-.12 r
BOD5	1.4-3.9 l, 1.9-3.8 m, 2.0-3.7 r	1.4-3.9 l, 1.9-3.8 m, 2-3.7 r
COD[Cr]	8.9-16.0 l, 8.8-20.0 m, 9.7-15.0 r	N/A in report
COD[Mn]	3.1-10.3 l, 2.8-10.3 m, 2.8-10.3 r	N/A in report

Note: l = left sampling point, m = middle sampling point, r = right sampling point
Between Draft III and Draft VII, 37 corrections were made to the TNMN Max-Min Values in the table.

Morava River, Lanzhot Station, CZ01, L2100, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	19.8 - 143.0	19.24 - 146.64
Suspended solids	4 - 619	ok
Ammonium-N (NH4+)	0.3 - 2.80	.03 - 2.8
Nitrite-N (NO2)	.020 - .170	N/A in report
Nitrate-N (NO3)	2.8 - 6.8	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.039 - .300	ok
Total P	.16 - .53	ok
BOD5	3.3 - 9.8	N/A in report
COD[Cr]	17.2 - 48.9	ok
COD[Mn]	3.4 - 16.6	N/A in report

Between Draft III and Draft VII, 4 corrections were made to the TNMN Max-Min Values in the table.

Danube River, Jochenstein Station, D02, L2130, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	656.1 - 3498	679 - 2620
Suspended solids	2 - 217	N/A in report
Ammonium-N (NH4+)	.03 - .2	ok
Nitrite-N (NO2)	.010 - .030	N/A in report
Nitrate-N (NO3)	1.1 - 3.5	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.003 - 080	.005 -.080
Total P	.06 - .21	ok
BOD5	1.3 - 4.2	ok
COD[Cr]	7.5 - 7.5	<15 [Cr or Mn ?]
COD[Mn]	1.9 - 7.3	

Between Draft III and Draft VII, no corrections were made to the TNMN Max-Min Values in the table.

Danube River, Wolfstahl Station, A04, L2170		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	926.0 - 3,065.0	ok
Suspended solids	5 - 102	N/A in report
Ammonium-N (NH4+)	.06 - .45	ok
Nitrite-N (NO2)	.012 - .040	ok
Nitrate-N (NO3)	1.6 - 3.4	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.003 - .060	ok
Total P	.06 - .13	ok
BOD5	1.1 - 7.3	ok
COD[Cr]	11 - 17	N/A in report
COD[Mn]	N/A in report	N/A in report

Between Draft III and Draft VII, no corrections were made to the TNMN Max-Min Values in the table.

Danube River, Hercegszanto Station, H04, L1540, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	1,340 - 2,186.7.	1,300 - 4,220
Suspended solids	11 - 36	N/A in report
Ammonium-N (NH4+)	.04 - .39	.02 - .39
Nitrite-N (NO2)	.003 - .040	.003 - .055
Nitrate-N (NO3)	1.13 - 4.0	1.13 - 4.0
Organic-N	.05 - .42	.01 - .42
Ortho-P	.005 - .051	0 - .105
Total P	.06 - .20	ok
BOD5	1.6 - 9.5	1.0 - 9.5
COD[Cr]	12.0 - 25.0	10 (?) [COD C]
COD[Mn]	3.0 - 6.4	2.7 - 6.4 (?) [COD P]

Between Draft III and Draft VII, 21 corrections were made to the TNMN Max-Min Values in the table.

/Morave/Dyje River, Breclav Station, Cz02, L2120, l		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	15.5 - 155.0	17 - 192
Suspended solids	2 - 83	N/A in report
Ammonium-N (NH4+)	.05 - 1.47	.039 - 4.015
Nitrite-N (NO2)	.04 - .077	N/A in report
Nitrate-N (NO3)	2.27 - 8.0	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.039 - .632	.630 - 1.160
Total P	.14 - .71	.18 - .47
BOD5	2.3 - 12.5	N/A in report
COD[Cr]	29.2 - 45.8	26.5 - 43.7
COD[Mn]	6.4 - 11.4	N/A in report

Between Draft III and Draft VII, 7 corrections were made to the TNMN Max-Min Values in the table.

Danube River, Bratislava Station Station, SK01, L1840, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	948.0 - 3,792	859.3 - 5,595.0
Suspended solids	5 - 79	.3 - 797
Ammonium-N (NH4+)	.08 - .73	.16 - .66
Nitrite-N (NO2)	.009 - .046	0.15 - .050
Nitrate-N (NO3)	1.76 - 4.88	1.72 - 5.96
Organic-N	.01 - .74	N/A in report
Ortho-P	.027 - .140	N/A in report
Total P	.04 - .41	.08 - .38
BOD5	.7 - 5.4	1.0 - 6.5
COD[Cr]	6.9 - 23.0	3.0 - 30.8 ? [COD5]
COD[Mn]	2.4 - 5.9	N/A in report

Between Draft III and Draft VII, 3 corrections were made to the TNMN Max-Min Values in the table.

/Inn/Salzach River, Laufen Station, D04, L2160, l		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	60.6 - 1,002.8	69.4 - 511
Suspended solids	1 - 150	N/A in report
Ammonium-N (NH4+)	.01 - .27	<.02 - .27
Nitrite-N (NO2)	N.A in report	N/A in report
Nitrate-N (NO3)	.39 - 1.1	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.009 - .058	ok
Total P	.03 - .13	ok
BOD5	.5 - 4.6	<1.0 - 4.6
COD[Cr]	N/A in report	N/A in report
COD[Mn]	1.4 - 7.8	N/A in report

Between Draft III and Draft VII, no corrections were made to the TNMN Max-Min Values in the table.

Danube River, Bazias Station, RO01, L0020, lm		
Parameter	TNMN Max-Min. Values [for l and m only - r N/A in report]	National Review Max-Min. Values (if different) - lmr
Flow	3,400 - 9,307	3,228 - 9274
Suspended solids	12-52 l, 12-43 m	ok l, 12-43 m
Ammonium-N (NH4+)	.08-.33 l, .06-.28 m	.12-.33 l, ok m
Nitrite-N (NO2)	.02-.07 l, .02-.07 m	ok l, .015-.07 m
Nitrate-N (NO3)	.9-2.6 l, .9-2.54 m	ok l, ok m
Organic-N	N/A in report	N/A in report
Ortho-P	.02-.08 l, .02-1.08 m	N/A in report
Total P	.04-.12 l, .04-.15 m	.04-.11 l, ok m
BOD5	1.8-3.8 l, 1.5-3.5 m	1.8-3.8 l, 1.5-3.5 m
COD[Cr]	10.8-14.7 l, 9.9-13.7 m	N/A in report
COD[Mn]	3.2-4.9 l, 2.8-5.2 m	N/A in report

Note: l = left sampling point, m = middle sampling point
According to YU data for the Station Banatska Palanka (5 km upstream of Bazias) the range of BOD5 during 1994-97 was 2.8 - 5.6 mg/l. Average value was 3.6 mg/l.
Between Draft III and Draft VI, 18 corrections were made to the TNMN Max-Min Values in the table.

Danube River, Vilkova Station, RO06, L0450, lmr		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	2,330-8,500	2,090-5,410
Suspended solids	16-121 l, 14-119 m, 18-116 r	ok l, ok m, 19-116 r
Ammonium-N (NH4+)	.14-.31 l, .13-.38 m, .14-.29 r	.14-.41 l, .13-.39 m, .14-.39 r
Nitrite-N (NO2)	.03-.072 l, .024-.089 m, .03-.072 r	.025-.09 l, .024-.075 m, .025-.072 r
Nitrate-N (NO3)	.96-2.24 l, .91-2.16 m, .96-2.13 r	.92-2.24 l, .91-2.16 m, .90-2.13 r
Organic-N	N/A in report	N/A in report
Ortho-P	.03-.09 l, .033-.09 m, .03-.09 r	N/A in report
Total P	.07-.12 l, .07-.12 m, .07-.12 r	.07-.12 l, .07-.11 m, .07-.11 r
BOD5	1.9-3.3 l, 1.5-3.8 m, 1.3-3.3 r	1.87-3.3 l, 1.54-3.8 m, 1.27-3.2 r
COD[Cr]	9.4-15.2 l, 10.0-14.6 m, 9.8-14.9 r	N/A in report
COD[Mn]	3.4-4.4 l, 3.3-4.3 m, 3.2-4.7 r	N/A in report

Note: l = left sampling point, m = middle sampling point, r = right sampling point
Between Draft III and Draft VII, 40 corrections were made to the TNMN Max-Min Values in the table.

Danube River, Silistra/Chiciu Station, BG05, Lo850, lmr		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different) - [only one number presented without reference to sampling point]
Flow	N/A in report	
Suspended solids	N/A in report	
Ammonium-N (NH4+)	.29-1.78 l, .17-1.24 m, .13-.85 r	.21-.44
Nitrite-N (NO2)	.01-.05 l, .01-.04 m, .01-.04 r	.02-.05
Nitrate-N (NO3)	.63-2.3 l, .48-3.0 m, .51-2.72 r	1.2-2.2
Organic-N	N/A in report	
Ortho-P	.02-.09 l, .02-.06 m, .04-.08 r	.02-.02
Total P	.11-.15 l, .10-.13 m, .11-.13 r	
BOD5	1.6-4.2 l, 1.2-3.8 m, 1.5-4.4 r	2.5-4.5
COD[Cr]	10.7-13.9 l, 11.8-13.9 m, 12.9-18.2 r	N/A in report
COD[Mn]	2.6-5.4 l, 2.9-5.1 m, 2.9-5.4 r	N/A in report

Note: l = left sampling point, m = middle sampling point, r = right sampling point
Between Draft III and Draft VII, 6 corrections were made to the TNMN Max-Min Values in the table.

Drava River, Ormoz Station, SI01, L1390, l		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	201-685	
Suspended solids	4-14	N/A in report
Ammonium-N (NH4+)	.06-.23	ok
Nitrite-N (NO2)	.009-.021	ok
Nitrate-N (NO3)	.90-1.74	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.003-.016	ok
Total P	.01-.03	
BOD5	1.3-3.3	ok
COD[Cr]	3.2-10.1	ok
COD[Mn]	2.5-3.9	ok

Between Draft III and Draft VII, 12 corrections were made to the TNMN Max-Min Values in the table.

Drava River, Varazdin Station, HR03, L1290, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	N/A in report	N/A in report
Suspended solids	6-22	N/A in report
Ammonium-N (NH4+)	.04-.24	N/A in report
Nitrite-N (NO2)	.01-.03	N/A in report
Nitrate-N (NO3)	.05-3.2	N/A in report
Organic-N	N/A in report	N/A in report
Ortho-P	.02-.16	.01-.18
Total P	N/A in report	N/A in report
BOD5	1.0-5.7	N/A in report
COD[Cr]	2.3-6.7	1.3-11
COD[Mn]	1.5-5.4	N/A in report

Between Draft III and Draft VII, 2 corrections were made to the TNMN Max-Min Values in the table.

Danube River, Sulina Station, RO07, L0480, lmr		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different) [sampling point is not specified]
Flow	1,260-1,890 l & r, 864-2,519 m	ok
Suspended solids	14-49 l, 12-47 m, 17-50 r	11.6-83
Ammonium-N (NH4+)	.11-.31 l, .11-.37 m, .10-.35 r	ok
Nitrite-N (NO2)	.032-.05 l, 033-.07 m, .032-.04 r	ok
Nitrate-N (NO3)	1.46-1.65 l, .77-3.59 m, 1.48-1.63 r	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.08-.09 l, .04-.082 m, .08-.082 r	N/A in report
Total P	.10-.10 l, .08-.19 m, .10-.11 r	0-.19
BOD5	1.5-3.0 l, 1.4-3.3 m, 1.2-3.1 r	ok
COD[Cr]	1.5-3.0 l (mean values only for m & r)	N/A in report
COD[Mn]	4.3-6.1 l, 3.3-5.9 m, 4.2-5.9 r	N/A in report

Note: l = left sampling point, m = middle sampling point, r = right sampling point
Between Draft III and Draft VII, values for l and r were added, and 6 corrections were made to the TNMN Max-Min Values for m in the table.

Danube River, Sf. Gheorge Station, RO08, L0490, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	1,105-2,260 l, 951-2,260 m, 1,105-2,260 r	ok
Suspended solids	13-97 l, 15-50 m, 12-87 r	ok
Ammonium-N (NH4+)	.14-.39 l, .12-.35 m, .14-.37 r	ok
Nitrite-N (NO2)	.027-.04 l, .03-.07 m, .026-.04 r	ok
Nitrate-N (NO3)	1.42-1.73 l, .82-3.48 m, 1.39-1.73 r	ok
Organic-N	N/A in report	N/A in report
Ortho-P	.01-.08 l, .040-.10 m, .01-.08 r	N/A in report
Total P	.10-.11 l, .08-.19 m, .10-.10 r	0-.19
BOD5	1.4-3.3 l, 1.8-3.0 m, 1.4-3.2 r	ok
COD[Cr]	10-18 m (mean values only for l & r)	N/A in report
COD[Mn]	3.7-5.6 l, 3.5-5.7 m, 3.8-5.9 r	N/A

Between Draft III and Draft VII, values for l and r were added, and 11 corrections were made to the TNMN Max-Min Values for m in the table.

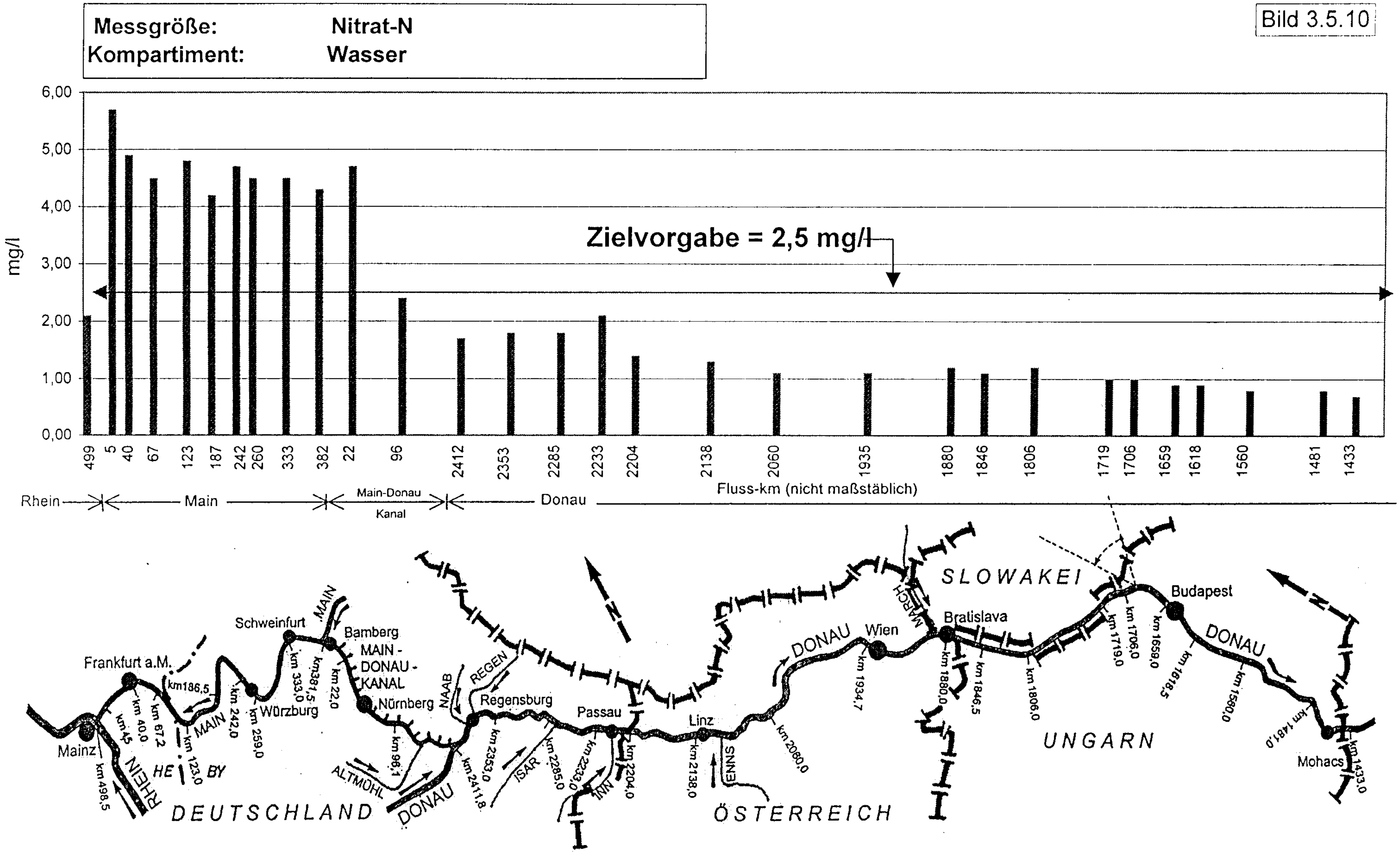
Vah River, Komaro Station, SK04, L1960, m		
Parameter	TNMN Max-Min. Values	National Review Max-Min. Values (if different)
Flow	N/Ain report	N/A in report
Suspended solids	3-208	N/A in report
Ammonium-N (NH4+)	.29-1.18	ok
Nitrite-N (NO2)	.022-.103	ok
Nitrate-N (NO3)	1.54-3.43	ok
Organic-N	.01-1.2	ok
Ortho-P	.011-.28	N/A in report
Total P	.07-.67	ok
BOD5	.9-13.0	ok
COD[Cr]	9.0-54.5	ok
COD[Mn]	2.9-41.3	N/A in report

Between Draft III and Draft VII, no corrections were made to the TNMN Max-Min Values in the table.

Annex 3.1 - C

Massfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11 Mai bis 20 Juni 1998 - Nitrat-N-Wasser

Bild 3.5.10

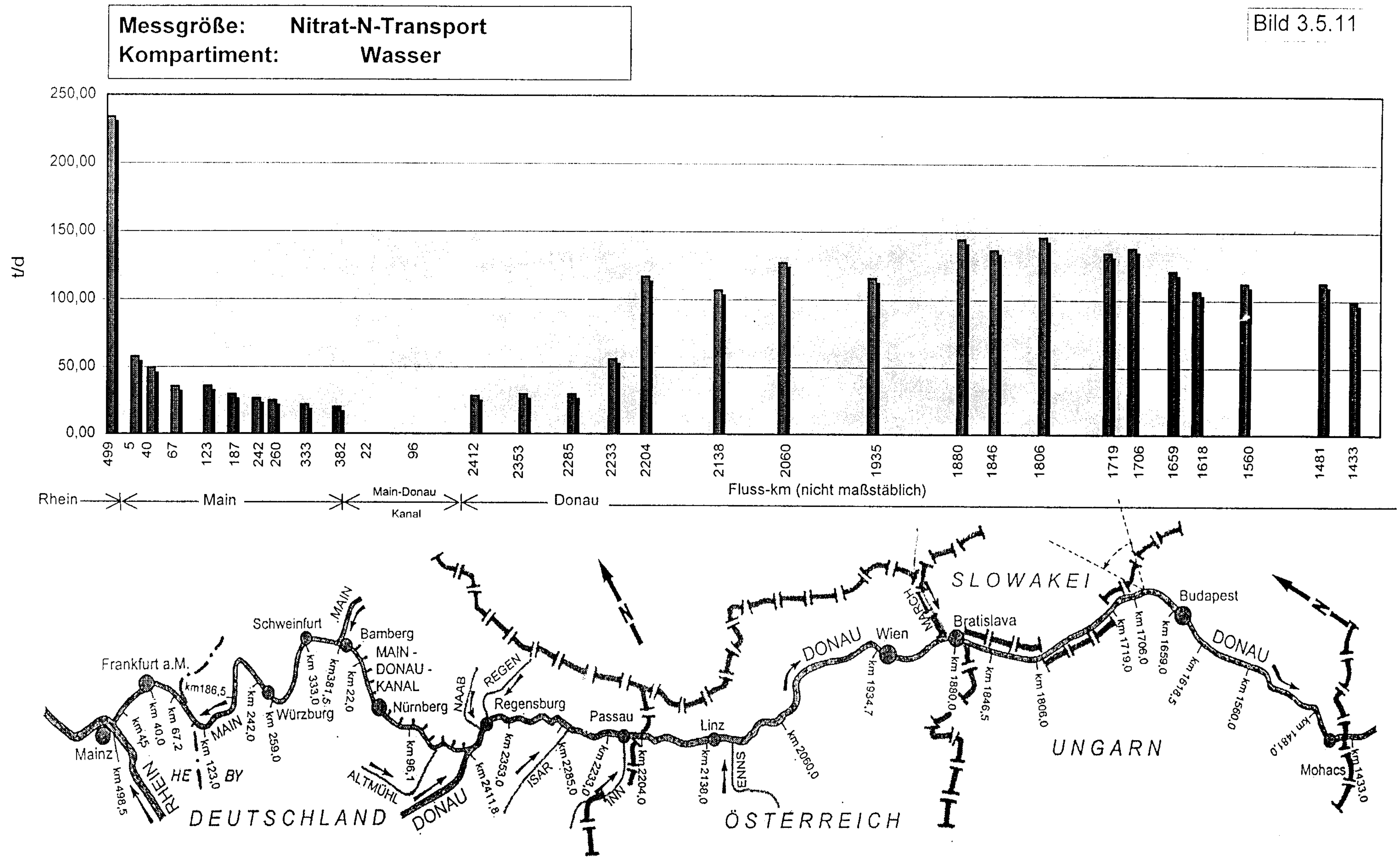


Meßfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11.Mai bis 20.Juni 1998

Annex 3.1 - D

Massfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11 Mai bis 20 Juni 1998 - Nitrat-N-Transport-Wasser

Bild 3.5.11



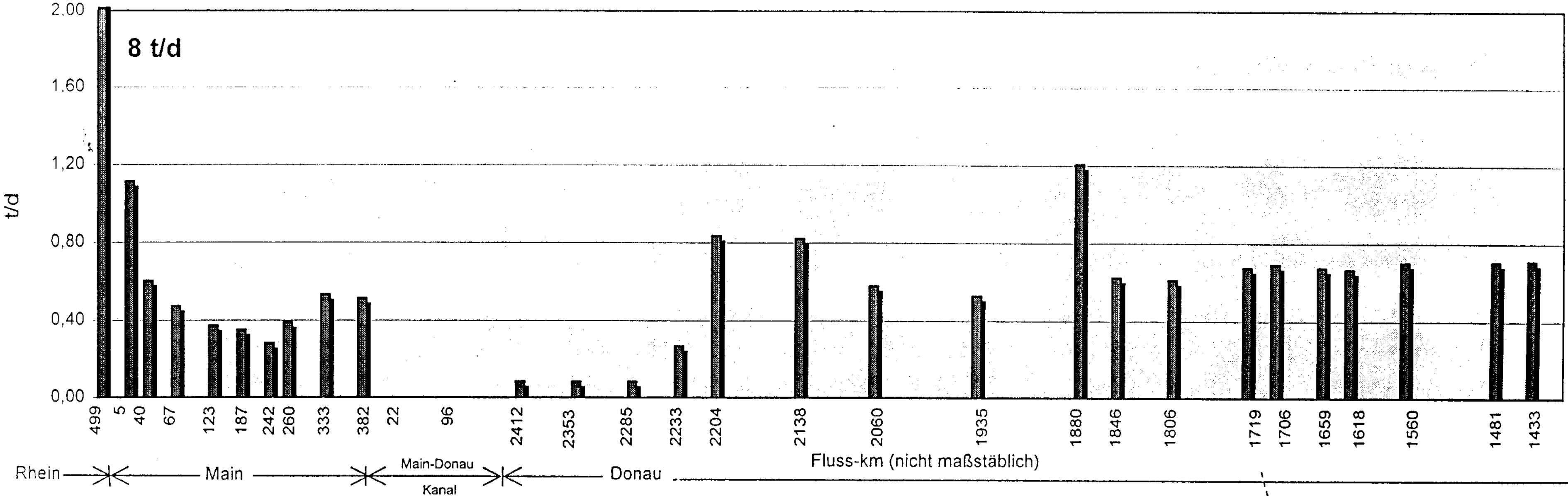
Meßfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11.Mai bis 20.Juni 1998

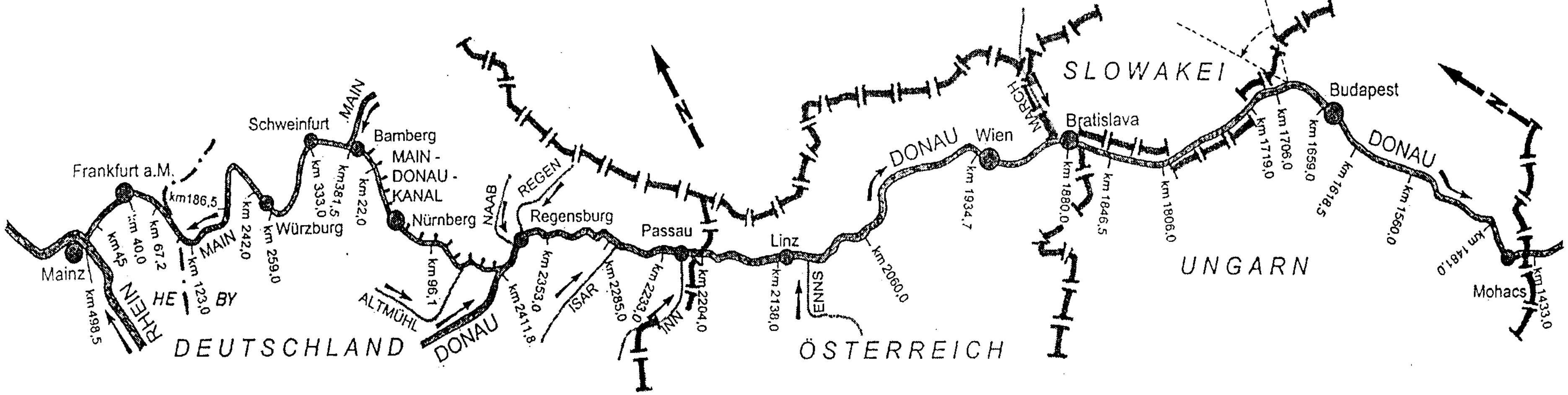
Annex 3.1 - E

Massfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11 Mai bis 20 Juni 1998 - o-Phosphat-P-Transport-Wasser

Bild 3.5.13

Messgröße: o-Phosphat-P-Transport
Kompartiment: Wasser





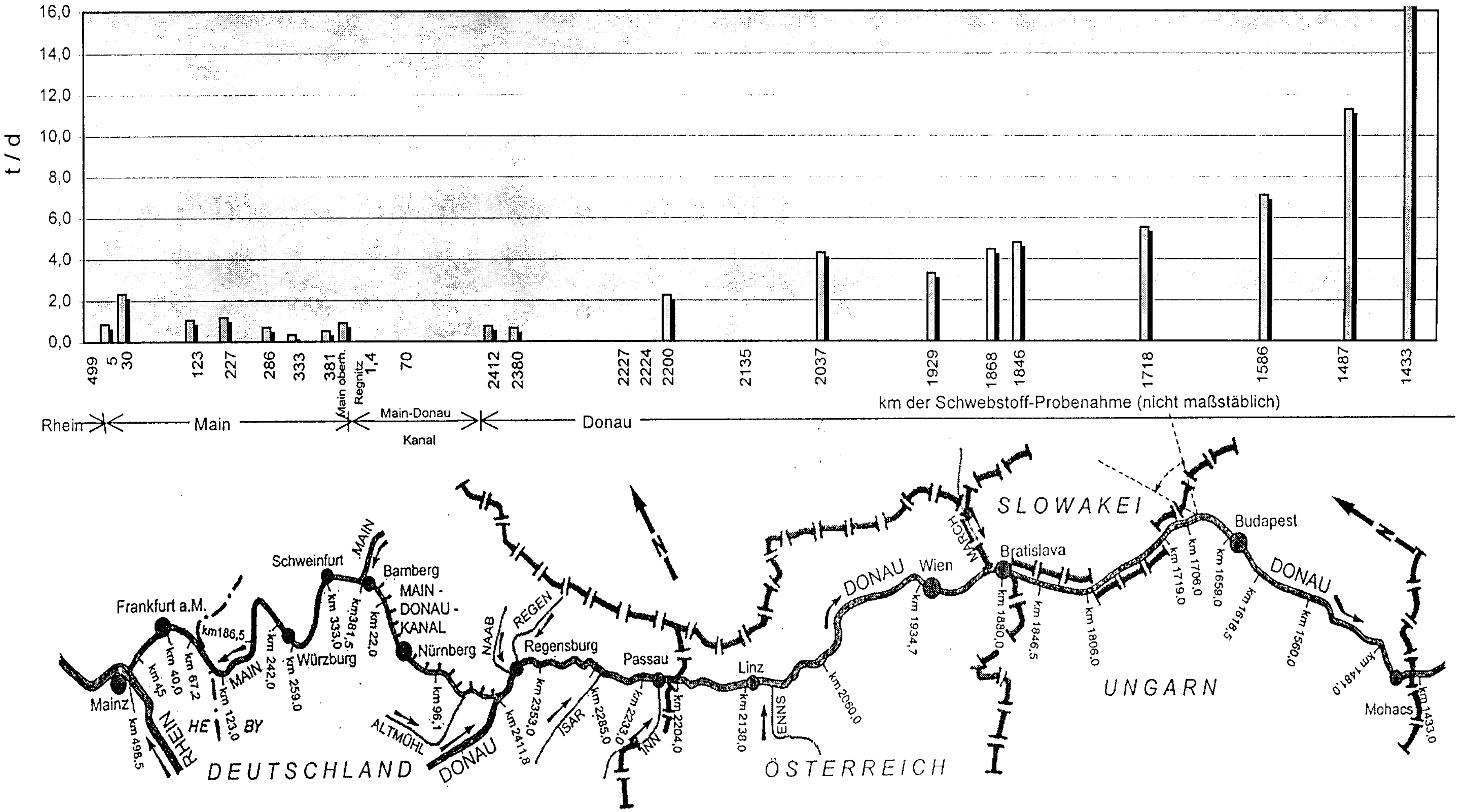
Meßfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11.Mai bis 20.Juni 1998

Annex 3.1 - F

Massfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11 Mai bis 20 Juni 1998 - P-gesamt-Transport-Schwebstoff

Bild 3.5.15

Messgröße:	**P-gesamt - Transport**
Kompartiment:	**Schwebstoff**



Meßfahrt der MS BURGUND auf Main, Main-Donau-Kanal und Donau vom 11. Mai bis 20. Juni 1998

Annex 3.2 - A

Description of High Priority Hot Spots

- **Czech Republic**
- **Slovak Republic**
- **Slovenia**
- **Croatia**
- **Bosnia-Herzegovina**
- **Federal Republic of Yugoslavia**
- **Hungary**
- **Romania**
- **Bulgaria**
- **Ukraine**
- **Moldova**

Description of High Priority Hot Spots - Czech Republic

Summary of Information for the High Priority Hot Spots

Name of the Hot Spot:	BRNO											
Name of the receiving water:	Svratka											
River km of the effluent:	39,1											
	Discharge ($10^3 m^3.year^{-1}$)			COD ($t.year^{-1}$)			$N\text{-}NH_4^+$ ($t.year^{-1}$)			P_t ($t.year^{-1}$)		
Critical Emissions	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996
	47000	39027	44897	3525	1592	1913	992	355	552	99	101	139
Seasonal Variations	Downstream the hot spot there is rather critical dilution factor (Q_{355}:$Q_{effl.}$= 2), which in the period of summer low flows causes unpleasant states of water quality. This may affect principal users or the state of aquatic life.											
Immediate Causes of Emissions	Old sewerage system in the city as well as insufficient capacity of the WWTP esp. in P and N uptakes - intensification of this WWTP is strongly needed.											
Root Causes of Water Quality Problems	Relatively large city lying on the river with relative small discharge in combination with the insufficient treatment (esp. in nutrients) create problem to downstream users and aguatic life as well.											
Receiving Waters	Receiving waters are formed by two rivers: The Svratka River and the Svitava River. The first one has water quality in referring parameters (COD, P, N) responding to IIIrd water quality class. The Svitava River which is comparable in discharge with the Svratka River is mostly ranked to the IVth quality class (COD, Pt, Hg).											
Nearby Downstream Uses	Small irrigation and other uptakes several kilometres downstream the effluent of WWTP. Vulnerability of the drinking water underground accumulation area lying downstream is high, vulnerability of the recreation area of low N.Mlýny reservoir as well as the natural area for birds in central N.Mlýny reservoir is not neglectable.											
Transboundary Implications	The Dyje River near its confluence with the Svratka River forms border with Austria. In this part the Dyje River is rich in fishery attractive fish. Due to the unique nature parts and very natural state of this area there is prepared a concept of Trilateral National Park.											
Rank	High											

Source: National Review - Czech Republic, Part C, Tab. C-11

Summary of Information for the High Priority Hot Spots

Name of the Hot Spot:	ZLÍN											
Name of the receiving water:	Dřevnice											
River km of the effluent:	6,5											
	Discharge ($10^3 m^3.year^{-1}$)			COD ($t.year^{-1}$)			N-NH_4^+ ($t.year^{-1}$)			P_t ($t.year^{-1}$)		
Critical Emissions	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996
	11220	11316	11242	994	990	1147	278	238	302	30	37	46
Seasonal Variations	Capacity of the Dřevnice River is rather small to dilute the emission esp. in storm flows and in the summer low flow periods. In combination with higher temperature it influences the water quality in the Morava River and subsequently the downstream users.											
Immediate Causes of Emissions	To improve insufficient treatment a reconstruction of Zlín WWTP has been started. Lack of money caused a delay of the reconstruction. It is necessary to involve the removal of nutrients into the treatment process.											
Root Causes of Water Quality Problems	Combination of insufficient treatment and low dilution factor, which is caused by drinking water uptakes from the dam upstream the hot spot.											
Receiving Waters	Water quality of the Dřevnice River was in the last period classified by IIIrd class, the Morava River water was also in the IIIrd class of water quality.											
Nearby Downstream Uses	The Dřevnice and Morava Rivers downstream Zlín flow through the Protected area of Natural Water Accumulation. Drinking water uptakes from the accumulation (alluvial ground water resources and qravel pits area) are influenced by the emitted pollution as well as the aquatic life esp. fish in transboundary area.											
Transboundary Implications	There is some effect on water uptakes in transboundary Morava River stretch, further impact on aquatic life in suggested Trilateral Natural Park is also evident.											
Rank	High											

Source: National Rewiew - Czech Republic, Part C, Tab. C-12

Summary of Information for the High Priority Hot Spots

Name of the Hot Spot:	UHERSKÉ HRADIŠTĚ											
Name of the receiving water:	Morava											
River km of the effluent:	157,1											
	Discharge ($10^3 m^3.year^{-1}$)			COD ($t.year^{-1}$)			N-NH_4^+ ($t.year^{-1}$)			P_t ($t.year^{-1}$)		
Critical Emissions	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996
	3783	2896	3108	265	188	246	78	87	73	13	41	11
Seasonal Variations	Due to the reduction of food processing industry connected to the WWTP the seasonal variations are at present nearly neglectable. More serious problems arise in connection with the low flow periods in combination with high water temperatures.											
Immediate Causes of Emissions	Present waste water treatment plant should be strenghtened by unit enabling reduction of N and P emissions to receiving water.											
Root Causes of Water Quality Problems	Root cause reffers to combination of high nutrient emissions and water quality uptakes in the Morava River.											
Receiving Waters	The receiving Morava River is influenced by several sources of pollution so that its water quality is classified by IV^{th} class of water pollution (excluding parameter P_t in V^{th} class).											
Nearby Downstream Uses	The Morava River is an important water source from which water is infiltering into the Protected Area of Natural Water Accumulation in the adjacent Morava River alluvial plain. Downstream Uherské Hradiště is the largest user of water in the Morava River Basin -thermic power plant Hodonín.											
Transboundary Implications	In the Morava River transboundary stretch aquatic life and water uptakes are adequately influenced by this hot spot as well as the nature of the prepared Trilateral National Park at the confluence of the Dyje and Morava Rivers.											
Rank	High											

Source: National Review - Czech Republic, Part C, Tab. C-13

Summary of Information for the High Priority Hot Spots

Name of the Hot Spot:	HODONÍN											
Name of the receiving water:	Morava											
River km of the effluent:	99,0											
	Discharge ($10^3 m^3.year^{-1}$)			COD ($t.year^{-1}$)			$N\text{-}NH_4^+$ ($t.year^{-1}$)			P_t ($t.year^{-1}$)		
Critical Emissions	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996
	2816	2801	2585	386	305	228	24	27	31	5	5	3
Seasonal Variations	Connected food processing industry does not cause any evident seasonal variation of discharge or water quality.											
Immediate Causes of Emissions	Situated so close to border of the Slovak Republic and Austria this Hot Spot urgently heeds a further treatment unit enabling adequate reduction of nutrients in discharged waters.											
Root Causes of Water Quality Problems	Combination of nutrient emissions with polluted receiving water.											
Receiving Waters	The Hodonín Hot Spot is situated downstream several sources of pollution including two hot spots so that the water quality of the Morava River is adequate to IV^{th} - V^{th} class.											
Nearby Downstream Uses	Except of drinking water uptakes from Protected Area of Natural Water Acumulation there is an urgent need to preserve aquatic and terrestrial life of this very natural part of alluvial plane at the confluence of two major Moravian rivers in this transboundary section.											
Transboundary Implications	There is an urgent need of improvement of conditions not only for water uptakes but predominantly for the nature preservation at the transboundary region suggested for the Trilateral National Park.											
Rank	High											

Source: National Review - Czech Republic, Part C, Tab. C-14

Summary of Information for the High Priority Hot Spots

Name of the Hot Spot:	KOŽELUŽNY OTROKOVICE											
Name of the receiving water:	Morava											
River km of the effluent:	177,3											
	Discharge ($m^3.year^{-1}$)			COD ($t.year^{-1}$)			$N\text{-}NH_4^+$ ($t.year^{-1}$)			P_t ($t.year^{-1}$)		
Critical Emissions	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996
	6111	5787	5314.4	1533.9	1365.8	791.85	208.39	255.22	229.58	7.76	5.79	3.72
Seasonal Variations	This industrial hot spot causes the largest problems during low discharge period when unpleasant effect of dilution of effluent from Zlín WWTP and higher water temperature enlarge eutrophication process in staqnant water in weirs on the Morava River.											
Immediate Causes of Emissions	Insufficient capacity of the present WWTP, where also municipal waste water are treated esp. in N-pollution stays as the immediate cause of the unacceptable high emissions (treatment effect of this WWTP in $N\text{-}NH_4^+$ in 1996 was only 34%).											
Root Causes of Water Quality Problems	High level of $N\text{-}NH_4^+$ emissions in combination with low quality of receiving water.											
Receiving Waters	Water quality of the Morava River upstream Otrokovice hot spot can be characterized mostly by III^{rd} water quality class. Only one parameter ($N\text{-}NH_4^+$) was in the last period ranked to IV^{th} quality class (PCB, DCB concentrations are higher than those acceptable for streams).											
Nearby Downstream Uses	The Morava River is the main water source supplying the protected area of natural water accumulation where several water uptakes are realized. The discharged pollution also influences the aguatic life of the dowstream stretch of the Morava River.											
Transboundary Implications	Beside of effect on water uptakes, pollution from this hot spot influences the aquatic life of downstream stretch supposed to be involved into the Trilateral National Park.											
Rank	High											

Source: National Review - Czech Republic, Part C, Tab. C-15

Description of High Priority Hot Spots - Slovakia

SUMMARY OF INFORMATION OF THE MUNICIPAL HOT SPOT - HIGH PRIORITY

<table>
<tr><th>Name of the Hot Spots</th><th>WWTP Košice</th></tr>
<tr><td>Critical Emissions</td><td>Waste waters discharged into Hornad (r.km. 24.3). Analysis of wastewaters in year 1996:

Parameter | mg/l | t/y
BOD-5 | 30 | 1 182.6
COD-Cr | 75 | 2 956.5
DS | 490 | 19 315.0
DAS | 360 | 14 191.0
NES | 1.5 | 59.1
N-NH4 | 6.2 | 245.7
total P | 0.9 | 36.2

Volume of discharged waters and discharge regime
1250l/s / 39 420 000 m3/y 24 h. / 365 days

Data concerning total N and total P are not listed, because they are not required for State Water Management Balance. Those data (total N and total P) are calculated for municipal hot spots proposed to be solved in this programme (in detail in Part C - Water Environmental Engineering, where other data except SWMB are used as well).</td></tr>
<tr><td>Seasonal Variation</td><td>Hornad as recipient of waste water has in check point upstream of WWTP Kosice following long-time hydrological characteristics :
Sampling site - r. km 27.0: Q355 4.383 m3/s
“Krasna nad Hornadom” Q270 7.969 m3/s
Qa 20.970 m3/s

For emission of year 1996 (above listed) average daily discharges were as follows:
8.888 m3/s (March) min. value
52. 668 m3/s (July) max. value
21. 243 m3/s average year value</td></tr>
<tr><td>Root Causes of Water Quality Problems</td><td>Mechanical WWTP Kosice has been started on year 1968. Here are treated municipal waste water, phenol waters of VSZ Kosice and waters of local industry and services. Original WWTP was hydraulic and mass overloaded. For this reason construction of new mechanical part and decay tanks has been started. New mechanical WWTP part is in operation since 1988. The decay tanks are in operation as well.
During years 1991-1992 started construction a new parallel biological WWTP which is not yet finished. At the present it is necessary 3rd building part of biological level to finalize and technology fix up. Finalization exposes to danger because lack of money.</td></tr>
<tr><td>Immediate Causes of Emissions</td><td>At the present wastewaters flowing into WWTP are distributed. About 1000 l/s of waste waters are treated at original MB WWTP, others, volume about 200-400 l/s are treated at new mechanical part of WWTP and after that are discharged into recipient (without additional treatment).</td></tr>
</table>

<table>
<tr><th>Name of the Hot Spots</th><th>WWTP Košice</th></tr>
<tr><td>Receiving Waters</td><td>Check profiles (sampling sites) in which is possible to evaluate public sewerage-Kosice impact to recipient water quality are:
Hornad “Krasna nad Hornadom” r.km 27.0
Hornad “Zdana” r.km 17.2
In year 1996 for which emission values of point source were listed, water quality in the check profiles was as follows :
<table>
<tr><th>PARAMETER</th><th>(mg/l)</th><th>KRASNA N. HORNADOM</th><th>ZDANA</th></tr>
<tr><td>Dissolved</td><td>min</td><td>7.8</td><td>6.2</td></tr>
<tr><td>Oxygen</td><td>max</td><td>14.0</td><td>11.8</td></tr>
<tr><td></td><td>mean</td><td>10.9</td><td>9.6</td></tr>
<tr><td>BOD-5</td><td>min</td><td>3.0</td><td>5.0</td></tr>
<tr><td></td><td>max</td><td>10.0</td><td>1.0</td></tr>
<tr><td></td><td>mean</td><td>6.1</td><td>6.8</td></tr>
<tr><td>COD Cr</td><td>min</td><td>8.0</td><td>9.0</td></tr>
<tr><td></td><td>max</td><td>18.0</td><td>26</td></tr>
<tr><td></td><td>mean</td><td>13.0</td><td>17.4</td></tr>
<tr><td>N/NH4</td><td>min</td><td>0.039</td><td>0.210</td></tr>
<tr><td></td><td>max</td><td>0.342</td><td>1.724</td></tr>
<tr><td></td><td>mean</td><td>0.173</td><td>0.840</td></tr>
<tr><td>N-NO2</td><td>min</td><td>0.006</td><td>0.036</td></tr>
<tr><td></td><td>max</td><td>0.042</td><td>0.107</td></tr>
<tr><td></td><td>mean</td><td>0.018</td><td>0.070</td></tr>
<tr><td>N-NO3</td><td>min</td><td>1.807</td><td>1.807</td></tr>
<tr><td></td><td>max</td><td>4.608</td><td>4.125</td></tr>
<tr><td></td><td>mean</td><td>2.829</td><td>2.850</td></tr>
<tr><td>total P</td><td>min</td><td>0.050</td><td>0.100</td></tr>
<tr><td></td><td>max</td><td>0.400</td><td>0.450</td></tr>
<tr><td></td><td>mean</td><td>0.126</td><td>0.260</td></tr>
<tr><td>Hg</td><td>min</td><td>0.05</td><td>0.05</td></tr>
<tr><td>microgram/l</td><td>max</td><td>1.9</td><td>0.55</td></tr>
<tr><td></td><td>mean</td><td>0.53</td><td>1.18</td></tr>
</table></td></tr>
<tr><td>Nearby Downstream Uses</td><td>Sewerage Kosice together with other pollution sources influence Hornad river quality such important, that water intakes are realized only in stretch upstream Spisska Nova Ves (r. km 129.9), upstream Krompachy (r. km 97.5) and upstream Kosice ahead of tributary Torysa (r. km 31.4). Water intakes are used by industry with lower demands for water quality.
Classification of the Hornad river in transboundary profile :
oxygen regime III class (polluted water)
nutrients(N-NH4, total P) IV class (heavily polluted water)
heavy metals, biological
and microbiological parameters V class (strongly polluted water)</td></tr>
<tr><td>Transboundary Implications</td><td>From point of view of transboundary impact is WWTP Kosice one of the biggest point sources of the Hornad river in border stretch with Hungary. For this reason is not possible to realize water intakes from water resources downstream.</td></tr>
<tr><td>Rank</td><td>High Priority</td></tr>
</table>

Source: National Review - Slovakia, Part C

SUMMARY OF INFORMATION OF THE MUNICIPAL HOT SPOT - HIGH PRIORITY

<table>
<tr><th>Name of the Hot Spots</th><th>WWTP N I T R A</th></tr>
<tr><td>Critical Emissions</td><td>Waste water discharged into the Nitra river (r. km 52.5). Analysis of waste waters in year 1996 :
<table>
<tr><th>Parameter</th><th>mg/l</th><th>t/y</th></tr>
<tr><td>BOD-5</td><td>108.0</td><td>1 262</td></tr>
<tr><td>COD-Cr</td><td>174.3</td><td>2 037</td></tr>
<tr><td>SS</td><td>93.0</td><td>1 086</td></tr>
<tr><td>N-NH4</td><td>14.6</td><td>170.6</td></tr>
<tr><td>NES (UV)</td><td>0.21</td><td>2.45</td></tr>
<tr><td>total P</td><td>2.28</td><td>26.5</td></tr>
</table>
Volume of discharged waters and discharge regime
<table>
<tr><td>369 l/s</td><td>1 168 794 m3/y</td><td>24 h. / 365 days</td></tr>
</table>
</td></tr>
<tr><td>Seasonal Variation</td><td>Long-time hydrological characteristics at the check point profile Nitra-“Luzianky”, r. Km 65.1 :
<table>
<tr><td>Q355</td><td>3.5 m3/s</td></tr>
<tr><td>Q270</td><td>6.99 m3/s</td></tr>
<tr><td>Qa</td><td>17.76 m3/s</td></tr>
</table>
Discharges in profile Nitra-“Luzianky” in year 1996:
<table>
<tr><td>5.86 m3/s</td><td>min value</td></tr>
<tr><td>50.70 m3/s</td><td>max value</td></tr>
<tr><td>10.45 m3/s</td><td>average year value</td></tr>
</table>
</td></tr>
<tr><td>Root Causes of Water Quality Problems</td><td>WWTP was built in year 1968 and is hydraulic and mass overloaded. Outmodel technology, construction of a new WWTP.</td></tr>
<tr><td>Immediate Causes of Emissions</td><td>Insufficient treated waters, part of them discharged into recipient after mechanical treatment</td></tr>
<tr><td>Receiving Waters</td><td>Check profiles (sampling sites) in which is possible to evaluate impact of WWTP Nitra :
<table>
<tr><td>Nitra “Luzianky”</td><td>r.km 65.1</td></tr>
<tr><td>Nitra “Cechynce”</td><td>r.km 47.8</td></tr>
</table>
Surface water quality in those profiles in year 1996 :
<table>
<tr><th>PARAMETER</th><th>(mg/l)</th><th>LUZIANKY</th><th>CECHYNCE</th></tr>
<tr><td>Dissolved</td><td>min</td><td>8.3</td><td>8.5</td></tr>
<tr><td>oxygen</td><td>max</td><td>13.2</td><td>13.5</td></tr>
<tr><td></td><td>mean</td><td>10.7</td><td>10.2</td></tr>
<tr><td>BOD-5</td><td>min</td><td>3.0</td><td>4.0</td></tr>
<tr><td></td><td>max</td><td>6.3</td><td>9.2</td></tr>
<tr><td></td><td>mean</td><td>4.7</td><td>5.5</td></tr>
<tr><td>COD-Cr</td><td>min</td><td>6.0</td><td>4.0</td></tr>
<tr><td></td><td>max</td><td>38.0</td><td>43.0</td></tr>
<tr><td></td><td>mean</td><td>21.5</td><td>21.8</td></tr>
</table>
</td></tr>
</table>

Name of the Hot Spots	WWTP N I T R A			
	N-NH4	min	0.45	0.47
		max	2.3	3.0
		mean	0.91	0.99
	N-NO2	min	0.001	0.005
		max	0.142	0.138
		mean	0.058	0.065
	N-NO3	min	2.60	2.23
		max	4.30	4.05
		mean	3.28	3.12
	total P	min	0.14	0.13
		max	0.71	0.56
		mean	0.29	0.31
	total N	min	-	5.6
		max	-	7.0
		mean	-	6.3
	NES (UV)	min	0.01	0.01
		max	0.14	0.11
		mean	0.06	0.06
	Hg microgram/l	min	0.18	0.11
		max	1.04	0.53
		mean	0.48	0.29
	As microgram/l	min	3.4	5.2
		max	21.0	20.2
		mean	11.89	12.84
Nearby Downstream Uses	Municipal and industrial waters of town Nitra together with other important pollution sources upstream of town Nitra are causes of the ground water deterioration in Nitra river alluvium. In this river stretch were not any more important water intakes realized during years 1996-1997			
Transboundary Effect	Nitra river with regard to content of Hg and chlorine (chlorine hydrocarbons) and high salinity contributes to Danube river pollution.			
Rank	High Priority			

Source: National Review - Slovakia, Part C

SUMMARY OF INFORMATION OF THE INDUSTRIAL HOT SPOT - HIGH PRIORITY

Name of the Hot Spots	NOVÁCKE CHEMICKE ZAVODY (CHEMICAL PLANTS) NOVAKY
Critical Emissions	Wastewaters are discharged into Nitra river by two outfalls.

Wastewaters are discharged into Nitra river by two outfalls.

I From sedimentation tanks

Waste waters containing $CaCl_2$, $Ca(OH)_2$, chlorinated hydrocarbons are pumped into sedimentation tanks. After continuous neutralization by HCl, they are discharged to Nitra in r. km 129.7

Waste water quality and amount of pollution

Y	Q355 (l/s)	BOD-5 (mg/l)	COD-Cr (mg/l)	DAS (mg/l)	NES-UV (mg/l)
1996	130.2	14.3	35.6	638	0.85
1995	186.3	75.2	240.6	3691	2.7
1994	179.7	95.5	350.3	3154	2.8

Y	Q355 (m3/y)	BOD-5 (t/y)	COD-Cr (t/y)	DAS (t/y)	NES-UV (t/y)
1996	4 117 997	58.9	146.6	2 627	3.5
1995	5 875 649	441.8	1707.5	21 687	15.9
1994	5 666 258	541.1	1984.7	17 871	16.1

II. from sewerage X and mech.-biolog. WWTP to the Nitra river in r. km 130.6

- by sewerage x -untreated rain waters, sewage the old part of factory and cooling waters after oil traps
- from WWTP from new part of factory, sewage and municipal waste from Novaky and excrements from VVO Kos (pigs)

Waste water quality and discharged pollution

Y	Q355 (l/s)	BOD-5 (mg/l)	COD-Cr (mg/l)	DAS (mg/l)	NES-UV mg/l
1996	95.9	144.3	654.2	7 361	3.9
1995	25.5	149.1	808.1	10 526	3.1
1994	12.5	209.0	1 033.1	7 431	4.6

Y	Q 355 (m3/s)	BOD-5 (t/y)	COD-Cr (t/y)	DAS ((t/y))	NES-UV (mg/l)
1996	3 033 116	437.7	1 985.3	22 327	11.8
1995	802 796	119.7	648.7	8 450	2.5
1994	393 085	82.2	406.1	2 921	1.8

specif. pollution:

	sedim. tanks		MB WWTP	
	mg/l	t/y	mg/l	t/y

Name of the Hot Spots	NOVÁCKE CHEMICKE ZAVODY (CHEMICAL PLANTS) NOVAKY
	chlorinated hydrocarbons 5.14 19.4 140.7 449 detergents 0.59 2.25 2.66 8.5 active chlorine 0.94 3.56 0.29 0.94 Hg 0.002 0.00816 0.13 0.42 Regime of discharging 24 hours/ 365 days in year
Seasonal Variation	In profile Nitra-Opatovce, r. km 138.7 upstream of pollution source NCHZ (Chemical Plants) are long term discharged as follows: Q355 0.55 m3/s Q270 1.11 m3/s Qa 2.90 m3/s Maximum discharges occur on March and April, min. on July and August
Root Causes of Waste Quality Problems	In 1992 the construction of new MB WWTP has started. It should consist of two parallel lines. In the frame of the sewage system reconstruction it should have been divided into organic and anorganic part with pre-treatment facilities such as facility for abstraction of mercury and two-step neutralization stations. Due to the changes in production programme new plan of WWTP construction was design. Following this plan only one line of MB WWTP should be built with capacity 155 l/s (91 324 PE) The term of its ending was planned on June 1996. This was not accomplished because of financial constrains.
Immediate of Causes Emissions	Insufficient capacity and efficiency of treatment
Receiving Water	Sampling Sites for comparison of influence are: Nitra-Opatovce r.km 138.7 QA 2.96 m3/s Nitra-Chalmova r.km 123.8 Qa 6.3 m3/s Impact of wastewaters has caused significant increase of chloride and mercury concentration in the Nitra river. The mean concentration of chlorides increased from 9.84 mg/l in Nitra-Opatovce up to 128.8 mg/l in Nitra Chalmova. Mercury contents from background concentration 0.03 microgram/l up to 3.63 microgram/l. As the waste waters contain chlorinated hydrocarbons, in sampling site Nitra-Chalmova wide range of chlorinated hydrocarbons is regularly analyzed; 1,1-dichlorethane 0.0005 - 0.003 microgram/l chloroform 2 -10 microgram/l 1,2-dichlorethane 10 - 500 microgram/l 1,1,2-trichlorethane 6.6 - 190 microgram/l 1,1,2,2, tetrachlorethene 8 - 73 microgram/l Water quality related to relevant emissions from point sources in check points: Parameter (mg/l) Nitra-OpatovceNitra-Chalmova -- 1996 3.4 6.7 BOD-5 1995 2.6 4.6 1994 3.3 5.3

<table>
<tr><th>Name of the Hot Spots</th><th colspan="4">NOVÁCKE CHEMICKE ZAVODY
(CHEMICAL PLANTS) NOVAKY</th></tr>
<tr><td rowspan="16"></td><td>COD-Cr</td><td>1996</td><td>21.2</td><td>35.1</td></tr>
<tr><td></td><td>1995</td><td>12.6</td><td>24.5</td></tr>
<tr><td></td><td>1994</td><td>-</td><td>20.9</td></tr>
<tr><td>N-NH4</td><td>1996</td><td>0.30</td><td>1.5</td></tr>
<tr><td></td><td>1995</td><td>0.38</td><td>1.2</td></tr>
<tr><td></td><td>1994</td><td>0.18</td><td>1.0</td></tr>
<tr><td>N-NO2</td><td>1996</td><td>0.034</td><td>0.047</td></tr>
<tr><td></td><td>1995</td><td>0.027</td><td>0.068</td></tr>
<tr><td></td><td>1994</td><td>0.035</td><td>0.085</td></tr>
<tr><td>N-NO3</td><td>1996</td><td>2.08</td><td>2.21</td></tr>
<tr><td></td><td>1995</td><td>1.92</td><td>2.00</td></tr>
<tr><td></td><td>1994</td><td>2.26</td><td>1.86</td></tr>
<tr><td>Tot P</td><td>1996</td><td>0.13</td><td>0.34</td></tr>
<tr><td></td><td>1995</td><td>0.13</td><td>0.26</td></tr>
<tr><td></td><td>1994</td><td>0.12</td><td>0.22</td></tr>
<tr><td colspan="4">From the other point sources of pollution in this stretch of river Nitra-Opatovce and Nitra-Chalmova are electric power plant Novaky (Zemianske Kostolany) and tributary Handlova</td></tr>
<tr><td>Nearby Downstream Uses</td><td colspan="4">Water of Nitra river downstream of NCHZ Novaky is not possible to use for any purpose.</td></tr>
<tr><td>Transbondary Implications</td><td colspan="4">Nitra river-sub catchment belongs to Vah river basin and does not influence Danube river direct, even if NCHZ Nitra is big polluter with strong negative impact on whole environment in Horna Nitra .</td></tr>
<tr><td>Rank</td><td colspan="4">High priority</td></tr>
</table>

Source: National Review - Slovakia, Part C

SUMMARY OF INFORMATION OF THE INDUSTRIAL HOT SPOT - HIGH PRIORITY

<table>
<tr><th>Name of the Hot Spots</th><th>BUKOCEL a.s. HENCOVCE
(BUKOZA VRANOV NAD TOPLOU)</th></tr>
<tr><td>Critical Emissions</td><td>Waste water are discharged into Ondava river by three outfalls :
1. from MB WWTP, r. km 48.7
2. outfall „Railway bridge“, r. km
3. outfall „under pumping station“, r. km 50.1

Waste water quality and amount of pollution :
<table>
<tr><th></th><th>1.</th><th></th><th>2.</th><th></th><th>3.</th><th></th></tr>
<tr><td>Parameter</td><td>mg/l</td><td>t/y</td><td>mg/l</td><td>t/y</td><td>mg/l</td><td>t/y</td></tr>
<tr><td>BOD-5</td><td>28</td><td>295.7</td><td>8.0</td><td>4.1</td><td>30.0</td><td>41.7</td></tr>
<tr><td>COD-Cr</td><td>240.0</td><td>2534.8</td><td>55.6</td><td>28.1</td><td>133.0</td><td>185.1</td></tr>
<tr><td>NES-UV</td><td>1.58</td><td>16.69</td><td>0.12</td><td>0.06</td><td>0.70</td><td>0.97</td></tr>
<tr><td>Cl</td><td>300.6</td><td>3174.9</td><td>25.2</td><td>12.7</td><td>12.2</td><td>16.9</td></tr>
<tr><td>DAS</td><td>969</td><td>10213.3</td><td>278.0</td><td>140.7</td><td>265.0</td><td>368.7</td></tr>
<tr><td>Discharge</td><td>l/s</td><td>m3/y</td><td>l/s</td><td>m3/y</td><td>l/s</td><td>m3/y</td></tr>
<tr><td></td><td>334</td><td>10 561 882</td><td>16.0</td><td>505 958</td><td>44.0</td><td>139 1386</td></tr>
</table>
Regime of: the same for all - 24 hours, 365 days / year
discharge</td></tr>
<tr><td>Seasonal Variation</td><td>In upstream sampling side „ Ondava-Kucin“, r. km 53.9 long-range discharges :
Q355 1.0 m3/s
Q270 2.3 m3/s
Qa 9.97 m3/s
Max. values in 1996 were in January to April and min. values in September and October</td></tr>
<tr><td>Root Causes of Water Quality

Problems</td><td>MB WWTP is hydraulic and mass overloaded and is in bad technical state. It has been started construction of a new system of suspended solids fasten, so called white water. Primary sludge would be after sedimentation and thickening pressed and burned in existing facilities for wood waste incinerator.

It is necessary the reconstruction and the extention of WWTP and after that would be possible to treat waste waters from outfalls 2 and 3, which are discharged without treatment into Ondava river at present (rain waters and and septic waters in territory of factory).

The second till now not solved problem - potential danger - is dump (fly ash, dross from past, now wood waste sludge from cellulose production). Top of the dump is 8 m above field and its periphery is bank of Ondava river. High discharge could be reason for dam damage and following to the accident pollution of water. Rain water from dump flows into Ondava river.</td></tr>
<tr><td>Immediate Causes of Emissions</td><td>The reconstruction and extention of WWTP started in years 1992-1993, but later on was stopped because lack of money.
Consequence: not sufficient treated wastewaters and part of untreated waters discharged into Ondava river.</td></tr>
<tr><td>Receiving Waters</td><td>Water quality check points upstream and downstream of source of pollution are :
Ondava – Kucin r.km 53.9
Ondava – Posa r.km 45.7</td></tr>
</table>

Name of the Hot Spots	**BUKOCEL a.s. HENCOVCE (BUKOZA VRANOV NAD TOPLOU)**
	Water quality in those profiles: Parameter (mg/l) — Ondava-Kucin — Ondava-Posa Q mean (m3/s) — 7.14 — 7.20 BOD-5 — 5.5 — 6.6 COD-Cr — 16.6 — 28.9 N-NH4 — 0.20 — 0.44 N-NO2 — 0.013 — 0.023 N-NO3 — 1.17 — 1.29 total P — 0.06 — 0.14 formaldehyde free — 0.034 — 0.63 formaldehyde tot. — 0.061 — 1.00 phenols vol. — 0.024 — 0.026
Nearby Downstream Uses	Upstream uses of water : by Chemko Strazske and Bukocek Hencovce Downstream uses of water : there is not possible to use water, for industry with low demand for water quality as well
Transboundary Implications	Ondava river with main tributaries is the second branch of Bodrog river, our transboundary river with Hungary. Sampling site Ondava-Posa is one of the most polluted river stretch, together with profile Ondava-Nizny Hrusov
Rank	High priority

Source: National Review - Slovakia, Part C

Description of High Priority Hot Spots - Slovenia

Municipal Hot Spots - High priority

Hot Spot #1:	**WWTP Maribor (3rd phase)**
(a) Emissions (today):	110 000 PE of inh. and 50 000 PE ind., 300 000 PE 2nd stage biol. WWTP in construction
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	nonexisting nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Drava
(f) Nearby Downstream Uses:	Ptuj lake - recreation
(g) Transboundary Implications:	eutrophication of HEPP impoundments in Croatia

Hot Spot #2:	**WWTP Ljubljana (3rd phase)**
(a) Emissions (today):	275 000 PE of inh. and 110 000 PE ind. 500 000 PE 1st stage mech. WWTP in function, will be upgraded to 2nd stage shortly
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	nonexisting nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Ljubljanica, Sava
(f) Nearby Downstream Uses:	Ljubljanica as a water course in urban area
(g) Transboundary Implications:	eutrophication of HEPP impoundments in Croatia

Hot Spot #3:	**WWTP Murska Sobota (3rd phase)**
(a) Emissions (today):	16 000 PE of inh. and 35 000 PE ind. 20 000 PE 2nd stage biol. WWTP in operation, upgrade to 60 000 PE 2nd stage in near future
(b) Seasonal Variations:	relatively small
(c) Immediate Causes of Emiss.:	nonexisting nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Ledava, Mura
(f) Nearby Downstream Uses:	Ledava as a water course in densly populated area
(g) Transboundary Implications:	eutrophication of river Mura in Croatia

Hot Spot #4:	**WWTP Celje (3rd phase)**
(a) Emissions (today):	45 000 PE of inh. and 12 000 PE ind. planned 90 000 PE 2nd stage biol. WWTP
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	nonexisting WWTP, nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Savinja, Sava
(f) Nearby Downstream Uses:	Savinja as a water course in urban area, bathing
(g) Transboundary Implications:	eutrophication of Sava in Croatia, water supply (Zagreb)

Hot Spot #5:	**WWTP Rogaška Slatina**
(a) Emissions (today):	6 000 PE of inh. and 3 000 PE ind. + tourism planned 12 000 PE 3rd stage biol. WWTP
(b) Seasonal Variations:	relatively small
(c) Immediate Causes of Emiss.:	nonexisting water treatment, nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Sotla, Vonarsko lake, Sava
(f) Nearby Downstream Uses:	Vonarsko lake, bathing
(g) Transboundary Implications:	eutrophication of Vonarsko lake, and Sava in Croatia, water supply (Zagreb)

Hot Spot #6:	**WWTP Lendava**
(a) Emissions (today):	3 600 PE of inh. and 13 000 PE ind. planned 22 000 PE 3rd stage biol. WWTP
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	nonexisting water treatment, nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Ledava, Mura
(f) Nearby Downstream Uses:	Ledava as a water course in densly populated area
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Hot Spot #7:	**WWTP Ljutomer**
(a) Emissions (today):	3 600 PE of inh. and 8 000 PE ind., planned 15 000 PE 2nd stage in near future
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	nonexisting water treatment, nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Ščavnica, Mura
(f) Nearby Downstream Uses:	Ščavnica as a water course in densly populated area
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Source: National Review - Slovenia, Part C

Industrial Hot Spots - High priority

Hot Spot #1:	**WWTP Leather Industry Vrhnika**
(a) Emissions (today):	500 PE of inh. and 100 000 PE ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	bad performance of existing ind. WWTP, lack of toxicity removal (Cr^{6+})
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution, toxic waste
(e) Receiving Waters:	Ljubljanica, Sava
(f) Nearby Downstream Uses:	Ljubljanica as bathing and recreational water, as water in proposed protected area (Ljubljana moor)
(g) Transboundary Implications:	eutrophication of Sava river in Croatia, water supply in Croatia (Zagreb)

Hot Spot #2:	**WWTP Paper Factory ICEC Krško**
(a) Emissions (today):	500 PE of inh. and 450 000 PE ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	insufficient performance of existing ind. WWTP, lack of removal of suspended solids, toxic matter (Cl)
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution, toxic waste
(e) Receiving Waters:	Sava
(f) Nearby Downstream Uses:	NEPP Krško cooling system, Brežice bathing resort
(g) Transboundary Implications:	eutrophication of Sava river in Croatia, water supply in Croatia (Zagreb)

Hot Spot #3:	**WWTP Food Industry Pomurka Murska Sobota**
(a) Emissions (today):	200 PE of inh. and cca 15 000 PE ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	connected to existing (overloaded) municipal WWTP
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Ledava, Mura
(f) Nearby Downstream Uses:	Ledava as recreational water, and water in densly populated area, Mura with wetlands
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Hot Spot #4:	**WWTP Pulp and Paper Plant Paloma**
(a) Emissions (today):	1 000 PE of inh. and cca 50 000 PE ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	lack of treatment
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution, suspended solids
(e) Receiving Waters:	Mura
(f) Nearby Downstream Uses:	Mura with wetlands
(g) Transboundary Implications:	eutrophication/deterioration of Mura river in Croatia

Source: National Review - Slovenia, Part C

Agricultural Hot Spots - High priority

Hot Spot #1:	**Pig farm Ihan**
(a) Emissions (today):	1 000 PE of inh. and cca 110 000 PE agric. + ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	Ind. WWTP yielding 11 000 PE at output, but nonexisting nutrient removal and disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Kamniška Bistrica, Sava
(f) Nearby Downstream Uses:	Kamniška Bistrica as bathing and recreational water in densly populated area, Sava as recreational water
(g) Transboundary Implications:	eutrophication of Sava river in Croatia, water supply (Zagreb), bathing and recreational water (Zagreb)

Hot Spot #2:	**Pig farm Podgrad**
(a) Emissions (today):	200 PE of inh. and cca 40 000 PE agric. + ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	bad maintenance of well designed WWTP with insufficient nutrient removal (only N) and lack of disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Mura
(f) Nearby Downstream Uses:	spa Radkesburg in Austria (bad smell), Mura as recreational water and water in protected area (wetlands)
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Hot Spot #3:	**Pig farm Nemščak**
(a) Emissions (today):	200 PE of inh. and cca 55 000 PE agric. + ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	bad maintenance of WWTP, lack of nutrient removal and lack of disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Mura
(f) Nearby Downstream Uses:	Mura as recreational water and water in protected area (wetlands), infiltrates groundwater
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Hot Spot #4:	**Pig farm Rakičan**
(a) Emissions (today):	200 PE of inh. and cca 55 000 PE agric. + ind.
(b) Seasonal Variations:	small
(c) Immediate Causes of Emiss.:	bad maintenance of WWTP, lack of nutrient removal and lack of disinfection
(d) Root Causes of Water Quality Problems:	BOD, COD, sanitary pollution
(e) Receiving Waters:	Mura
(f) Nearby Downstream Uses:	Mura as recreational water and water in protected area (wetlands), infiltrates groundwater
(g) Transboundary Implications:	eutrophication of Mura river in Croatia

Source: National Review - Slovenia, Part C

Description of High Priority Hot Spots - Croatia

Municipal Hot Spots - High priority

ZAGREB	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=108 735 000 m^3/a – discharged w.w. in 97. Number of connected population: around 850 000 Pollution load in 97: COD Cr=38 818 t/a BOD5=13 048 t/a (data for other indicator has not been available) In year1995. was: Q= 110 480 000 m^3/a COD Cr= 37 784 t/a BOD5=14 031 t/a NO2= 35 t/a NO3= 93 t/a PO_4= 801 t/a mineral oil= 384 t/a F= 46 t/a
Seasonal Variations	On the Zagreb sewage system are being connected some of streams in Zagreb area. So Zagreb sewage system has great dilution of the waste water and emission variations also depends of variations of this streams. But detail information's about this are not available.
Immediate Causes of Emissions	As potential polluters are being controlled around 230 industries facilities which are being connected to the waste water system. Structures of polluters have been changed. The level of " serious industry" fall and level of service activity rise. Ratio of habitants and industry is 1:1 with rising trend of habitant pollution. There is no treatment plant on the waste water system and pretreatment of mostly industries facilities are not appropriate.
Root Causes of Water Quality Problems	High polluted load, which need reduction.
Receiving Waters	Sava II category
Nearby Downstream Uses	There is no important nearby downstream uses.
Transboundary Implications	National problem with national cause.
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.5

OSIJEK	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=9 300 000 m^3/a – discharged w.w in 97. Number of connected population: 90 % habitants of city Osijek Pollution load in 97: COD Cr= 3562 t/a BOD5=1362 t/a N= 237 t/a NO2= 1 t/a NO3= 53 t/a NH4= 255 t/a Total P=69 t/a PO_4= 52 t/a detergent= 28 t/a total oil= 300 t/a
Seasonal Variations	There are not existing important seasonal variations that can affect.
Immediate Causes of	Quantity of waste water from industries represents around 40 % of total

OSIJEK	Summary of Information Used for Ranking the Hot Spot
Emissions	discharged waste water from municipality. Connected industries not have all necessary pretreatment facilities (absence, insufficient capacity etc.). Municipal waste water system without treatment plant.
Root Causes of Water Quality Problems	High polluted load, which need reduction
Receiving Waters	Drava II category
Nearby Downstream Uses	There is no important nearby downstream uses
Transboundary Implications	national problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.5

VARAŽDIN	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	Q=8 200 000 m^3/god - discarded ww in 97 Number of connected population: around 90% of total population Pollution load in 97: COD Cr= 3559 t/a BOD5=1936 t/a N= 440 t/a Total P=33 t/a total oil= 99 t/a
Seasonal Variations	Recipient is right drainage channel of accumulation lake Hydro Power Plant Čakovec, which after few km flow in Old Drava river (biological minimum - 8 m3/sec)
Immediate Causes of Emissions	After accidental pollution (April 1997) when was destroyed biological part of treatment plant municipal waste water has been treated only mechanical. Connected industries not have all necessary pretreatment facilities (absence, insufficient capacity etc.).
Root Causes of Water Quality Problems	High pollution load, which need reduction. High priority of reconstruction biological part of treatment plant.
Receiving Waters	Drava , II category
Nearby Downstream Uses	Because of biological minimum final recipient became sensitive area.
Transboundary Implications	national problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.7

KARLOVAC	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	Q=6 853 790 m^3/a – discharged ww in 97 Number connected population: around 55 120 Pollution load in 97: COD Cr= 1570 t/a BOD5=2532 t/a N= 184 t/a Total P=21 t/a
Seasonal Variations	There are not existing important seasonal variations that can affect.
Immediate Causes of Emissions	Waste water system has 5 bigger discharged places - 4 in Kupa river and 1 in Mrežnica river and some of small discharged places. Future plans calculate with connection waste water from city Duga Resa on Karlovac system. Only part of waste water have been treated biological and discharged in Mrežnica river. Its takes around 90 359 m^3/a or 1200 PE. Rest of waste water has not been treated, but without treated have been discharged in recipients.

KARLOVAC	**Summary of Information Used for Ranking the Hot Spot**
Root Causes of Water Quality Problems	Lack of pretreatment in industries, to many discharged places, small capacity of treatment plant produces high pollution load, which need reduction.
Receiving Waters	Kupa II category, Mrežnica II category
Nearby Downstream Uses	Kupa river downstream have impact on water supply chachment area for city Petrinja Mrežnica- river downstream have impact on water supply chachment area for city Karlovac
Transboundary Implications	national problem with national causes
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.8

Industrial Hot Spots - High priority

BELIŠĆE paper industry	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=1 801 073 m3/a Pollution load in 97 COD Cr= 5951 t/a BOD5=1586 t/a
Seasonal Variations	There are not existing important seasonal variations that can affect.
Immediate Causes of Emissions	Treatment plant - mechanic – biological (treatment plant also used for sewage system Belišće - Hot Spot)
Root Causes of Water Quality Problems	Only 1/3 of waste water has been treated on treatment plant
Receiving Waters	Drava II category
Nearby Downstream Uses	Periodical has affect water supply area of Osijek
Transboundary Implications	national problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.20

IPK OSIJEK sugar factory	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=1 414 740 m^3/a- discharged ww in 97 Pollution load in 97: COD (Cr= 1328 t/a BOD5= 676 t/a total oil= 24t/a
Seasonal Variations	There are not existing important seasonal variations that can affect.
Immediate Causes of Emissions	Treatment plant - partially cleaning with press for saturated sludge
Root Causes of Water Quality Problems	High pollution load and insufficient treatment
Receiving Waters	Drava II category
Nearby Downstream Uses	navigation
Transboundary Implications	national problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.21

PLIVA – pharmacies industry from Savski Marof	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=1 615 420 m^3/a - discharged in 97 Pollution load in 97: COD (Cr= 1390 t/a BOD5=321 t/a SO_4=271 t/a, C_6H_5OH= 0,15 t/a Ni= 0,16 t/a Fe=2 t/a,
Seasonal Variations	There are not existing important seasonal variations that can affect.
Immediate Causes of Emissions	Treatment plant - biological, oil separation, neutralization. Waste water has been discharged in stream Gorjak which flow in Sava. In plans connection waste water on sewage system Zaprešić and on central treatment plant completely cleaned. Building of central treatment plant partially will be financed by PLIVA. Main pipe for connection Pliva on sewage system pass through water supply area and pipe need to be water-resistant.
Root Causes of Water Quality Problems	High pollution load discharged in small recipient. Waste water need to be connected on sewage system
Receiving Waters	Sava, Gorjak II category

PLIVA – pharmacies industry from Savski Marof	**Summary of Information Used for Ranking the Hot Spot**
Nearby Downstream Uses	There is no important nearby downstream uses
Transboundary Implications	National problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.22

"SLADORANA" Županja	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=1 084 308 m^3/a - discharged in 97 Pollution load in 97: COD Cr= 1240 t/a BOD5=560 t/a SS= 14 t/a
Seasonal Variations	Emission variation in producing campaign
Immediate Causes of Emissions	Treatment plant - under construction. Now I treated phase
Root Causes of Water Quality Problems	High pollution load need reduction
Receiving Waters	Sava II category
Nearby Downstream Uses	There is no important nearby downstream uses
Transboundary Implications	Transboundary problem with national causes (Sava boundary with Bosnia and Hercegovina)
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.23

Agricultural Hot Spots - High priority

FARM LUŽANI – pig farm	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Q=63 550 m^3/a - discharged in 97 Pollution load in 97 COD Cr= 51 t/a BOD5=4 t/a Total P= 2 t/a NH4= 28 t/a SS= 5 t/a
Seasonal Variations	There are not existing important seasonal variations that can affect
Immediate Causes of Emissions	Treatment plant - biological lagoon
Root Causes of Water Quality Problems	Small recipient, which pass across fish - pond, after that affect water supply area Jasinje
Receiving Waters	Sava, melioration cannel III category
Nearby Downstream Uses	fish – pond, water supply
Transboundary Implications	natioal problem with national cause
Rank	High priority

Source: National Review - Croatia, Part C - Table 2.17

Description of High Priority Hot Spots - Bosnia - Herzegovina

Municipal Hot Spot - High Priority

SARAJEVO	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	484.467 PE
Seasonal Variations	During summer period small discharge of river Miljacka
Immediate Causes of Emissions	Malfunction of treatment facilities, part of Sarajevo has combined sewerage system
Root Causes of Water Quality Problems	Pollution of water intake for town Sarajevo
Receiving Waters	River MILJACKA
Nearby Downstream Uses	Part of town Sarajevo
Transboundary Implications	no data
Rank	High Priority

TUZLA	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	110.017 PE
Seasonal Variations	Small discharge in river during summer period (in JALA only 9 l/s)
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	Pollution of protected area where are water intakes
Receiving Waters	JALA and SPRECA
Nearby Downstream Uses	Lake MODRAC (swimming, irrigation, water supply)
Transboundary Implications	no data
Rank	High Priority

BANJA LUKA	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	203.117 PE
Seasonal Variations	no data
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	Pollution of agriculture land
Receiving Waters	VRBAS
Nearby Downstream Uses	Agriculture area LIJEVCE POLJE
Transboundary Implications	no data
Rank	High Priority

Source: National Review - Bosnia-Herzegovina, Part C - Table 2.2.3.1

Industrial Hot Spot - High Priority

BANJA LUKA	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	INCEL 1.922.584 PE; Pivara 185.958 PE
Seasonal Variations	no data
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	Pollution of agriculture land
Receiving Waters	VRBAS
Nearby Downstream Uses	Agriculture farms
Transboundary Implications	no data
Rank	High Priority

PRIJEDOR	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	CELPAK 1.207.963 PE
Seasonal Variations	no data
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	Infiltration on underground water
Receiving Waters	SANA
Nearby Downstream Uses	Bosanski Novi
Transboundary Implications	no data
Rank	High Priority

MAGLAJ	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	NATRON 400.920 PE
Seasonal Variations	no data
Immediate Causes of Emissions	Malfunction of treatment facilities
Root Causes of Water Quality Problems	Infiltration in underground water
Receiving Waters	BOSNA
Nearby Downstream Uses	DOBOJ, agriculture land
Transboundary Implications	no data
Rank	High Priority

TUZLA	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	Poliuretanska hemija 422.292 PE
Seasonal Variations	water discharge is only 9 l/s in summer time
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	pollution of source of potable water
Receiving Waters	JALA
Nearby Downstream Uses	Agriculture land
Transboundary Implications	no data
Rank	High Priority

LUKAVAC	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	KOKSARA 214.093 PE
Seasonal Variations	no data
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	water discharge is insufficient in summer
Receiving Waters	SPRECA
Nearby Downstream Uses	MODRAC lake
Transboundary Implications	no data
Rank	High Priority

Source: National Review - Bosnia-Herzegovina, Part C - Table 2.4.4.1

Agriculture Hot Spot - High Priority

NOVA TOPOLA	**Summary of Information Used for Ranking the Hot Spot**
Critical Emissions	The most jeopardize area where 25% of tested samples contains N above the allowed level
Seasonal Variations	During the summer period pollution is much more evident
Immediate Causes of Emissions	Absence of treatment facilities
Root Causes of Water Quality Problems	Infiltration in ground and pollution of underground water
Receiving Waters	SAVA
Nearby Downstream Uses	Agriculture land
Transboundary Implications	no data
Rank	High Priority

Source: National Review - Bosnia-Herzegovina, Part C - Table 2.3.2.1

Description of High Priority Hot Spots - Yugoslavia

Municipalities - High Priority Hot Spots

Name of the Hot Spot:	**City of Belgrade** (Central Sewage System)
Name of the receiving water :	Danube River
River km of the effluent discharge:	1165
Critical Emissions	Discharge (m^3/y) 146,000,000 BOD_5 (t/y) 35,040 Tot N (tN/y) 5,840 Tot P (tP/y) 1,314 Susp. Solids (t/y) 28,850
Seasonal Variations	The CDF-critical dilution factor (Q95:Qeffl), is rather high (i.e. 450-500) accounting at whole river flow but in the mixing zone after bank outlet of sewage, CDF is around 80-120. The emission affects water quality but doesn't change it dramatically even in the mixing zone.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there are several sewage outlets distributed along 5 km river stretch. It is planned to connect all of its to main collector (i.e. Interceptor).
Root Causes of Water Quality Problems	The emission of pollution from a large Metropolitan area located on the river bank. The lack of money for investment.
Receiving Waters	Direct outflow in the Danube River (right bank)
Nearby Downstream Uses	The impoundment of surface water for the Small Water Treatment Plant (capacity ~ 5000 m^3/d) supplying the southern suburban area of the City is located 10 km kilometers downstream of the planned sewage outflow. Also, there is a large recreational area downstream of sewage outlet.
Transboundary Implications	There is no direct transboundary implications (the beginning of the stretch making the State border with Romania is 100 km downstream of Belgrade) but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of Belgrade** (Sewage System "Ostru`nica")
Name of the receiving water :	**Sava River**
River km of the effluent discharge:	15
Critical Emissions	Discharge (m^3/y) 5,000,000 BOD_5 (t/y) 1,205 Tot N (tN/y) 201 Tot P (tP/y) 45 Susp. Solids (t/y) 925
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is rather high (i.e. 250-300) accounting at whole river flow but in the mixing zone after bank outlet of sewage, CDF is around 50-60. The emission affects water quality but doesn't change it dramatically.
Immediate Causes of Emissions	There is no WWTP. Actually, there are several outlets, which are planned to be connected in one.
Root Causes of Water Quality Problems	The emission of pollution from a part (mixed urban/rural) of large Metropolitan area. Actually, there are several smaller outlets of sewage distributed along the river bank. Just a part (55%) of users are connected on the sewage system in this horizon.
Receiving Waters	Direct outflow in the Sava River (right bank).
Nearby Downstream Uses	Several withdrawals (wells) of bank filtrate for two Water Treatment Plant (total capacity ~ 250000 m^3/d) as well as the withdrawal of surface water for the "Maki{" Water Treatment Plant (actual capacity ~ 250000 m^3/d) supplying the largest part of Metropolitan Area are all located along the river bank downstream of planned sewage outlet. Also, there is a large recreation area downstream of planned sewage outlet.
Transboundary Implications	There is no direct transboundary implications but indirect ones.
Rank	High

Name of the Hot Spot:	**City of Novi Sad** (Left bank Sewage System)
Name of the receiving water :	**Danube River**
River km of the effluent discharge:	1255
Critical Emissions	Discharge (m^3/y) 31,142,000 BOD_5 (t/y) 6,285 Tot N (tN/y) 988 Tot P (tP/y) 298 Susp. Solids (t/y) 5,205
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is rather high (i.e. 850-900) accounting at whole river flow, but in the mixing zone after bank outlet of sewage, CDF is around 150-200. The emission affects water quality but doesn't change it dramatically.
Immediate Causes of Emissions	There is no WWTP. Actually, there are two larger and several smaller outlets, which are planned to be connected to the 10 km long main collector.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial City. The lack of money for investment.
Receiving Waters	Direct outflow in the Danube River (left bank).
Nearby Downstream Uses	Several withdrawals (wells) of bank filtrate for Water Treatment Plant (total capacity ~ 150000 m^3/d) supplying the largest part of City Area are all located along the river bank downstream of existing sewage outlets. Planned outlet will be move downstream. Also, there is a large recreation area downstream of sewage outlet.
Transboundary Implications	There is no direct transboundary implications but rather indirect ones.
Rank	High

Name of the Hot Spot:	**City of Ni{**
Name of the receiving water :	**Ni{ava River** (right tributary of South Morava River)
River km of the effluent discharge:	9 (upstream of the mouth in South Morava River)
Critical Emissions	Discharge (m^3/y) 28,335,000 BOD_5 (t/y) 5,891 Tot N (tN/y) 826 Tot P (tP/y) 289 Susp. Solids (t/y) 4,959
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is extremly low (i.e. 3-5). The emission affects water quality dramatically. Anoxic and anaerobic conditions in river are frequently observed. During low flow season fish kills are observed. Strong influence on water quality of South Morava river.
Immediate Causes of Emissions	There is no WWTP. Actually, there are two large outlets. It is planned to connect its to the main collector.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial City. The lack of money for investment.
Receiving Waters	Direct outflow to Ni{ava River.
Nearby Downstream Uses	Several withdrawals of water for irrigation. Also, there is a large potential recreation area 20 km downstream of sewage outlet.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of Pri{tina**
Name of the receiving water :	Sitnica River
River km of the effluent discharge:	1165
Critical Emissions	Discharge (m^3/y) 16,500,000 BOD_5 (t/y) 3,959 Tot N (tN/y) 570 Tot P (tP/y) 148 Susp. Solids (t/y) 3,207
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extremly low (i.e. 1.5-2.5). The pollution emission has a detrimental effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are regularly observed during the largest part of the year. There is also a strong influence on water quality of Ibar river.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there is one large outlet ending at location of planned WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a large Metropolitan area located on the river bank. The lack of money for investment.
Receiving Waters	Direct outflow in the Pri{tevka stream, tributary of small Sitnica river (Watershed of Velika Morava).
Nearby Downstream Uses	There are not nearby downstream users as the water quality is out of any class. The water would be potentially use for irrigation and for industrial water supply. There is the strong influence on water supply of settlements in Sitnica and Ibar river valleys.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	City of Zrenjanin
Name of the receiving water :	Bega River
River km of the effluent discharge:	25
Critical Emissions	Discharge (m^3/y) 15,750,000 BOD_5 (t/y) 4,161 Tot N (tN/y) 975 Tot P (tP/y) 226 Susp. Solids (t/y) 3,905
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extremly low (i.e. 3-5). The pollution emission has a detrimental effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are regularly observed during the large part of the year. There is also the influence on water quality of Tisa river (10 km long river section upstream of the mouth in Danube River.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there are several outlets, which are planned to be connected to the main collector.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment. There is also strong influence of polluters from Romania. (i.e. Temisoara, Industry, several livestocks, etc.)
Receiving Waters	Direct outflows in the Bega River, tributary of Tisa river.
Nearby Downstream Uses	There are several nearby downstream users ; Fish ponds, irrigation, industry. The use of water is limited on the periods of higher flows as the water quality during low flow periods is out of any class. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Bega River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**Vrbas – Kula Regional System**
Name of the receiving water :	DTD Canal
River km of the effluent discharge:	40
Critical Emissions	Discharge (m^3/y) 9,450,000 BOD_5 (t/y) 3,592 Tot N (tN/y) 547 Tot P (tP/y) 151 Susp. Solids (t/y) 3,022
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extremly low (i.e. 2-3). The pollution emission, particularly during the full production of food processing industry, has a detrimental effect on water quality as well as on the ecosystem of DTD Canal. Anoxic and anaerobic conditions along the downstream section of Canal are regularly observed. During the full production of seasonal industry the fish kills are observed. There is also the influence on water quality of Tisa river as DTD Canal empties in Tisa River near Becej Gate.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there are several outlets, which will be connected to the Regional Sewage System.
Root Causes of Water Quality Problems	The emission of pollution from two industrial (large food processing industry) towns located on the Canal bank. The lack of money for investment.
Receiving Waters	Direct outflows in the DTD Canal, about 40 km upstream from the mouth with Tisa river.
Nearby Downstream Uses	There are several nearby downstream users, i.e. fish ponds, irrigation, industry. The use of water is limited on the periods of higher flows as the water quality during low flow periods is out of any class. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Bega River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	City of Leskovac
Name of the receiving water :	Ju`na (South) Morava River
River km of the effluent discharge:	128
Critical Emissions	Discharge (m^3/y) 12,600,000 BOD_5 (t/y) 3,193 Tot N (tN/y) 295 Tot P (tP/y) 132 Susp. Solids (t/y) 2,903
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is low (i.e. 12-15). The pollution emission has an extremely adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are occasionally observed. There is also the influence on water quality of Velika Morava river.
Immediate Causes of Emissions	There is no Municipal WWTP. The existing outlet on the Veternica River (tributary of South Morava River) bank will be moved (10 km long collector) downstream to the location planned for WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment.
Receiving Waters	As it is planned, the effluent will be discharged to the Ju`na (South) Morava River, tributary of Velika Morava river.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited on the periods of higher flows as the water quality during low flow periods is bad. There is a need of several downstream users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of J. Morava River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of Kru{evac**
Name of the receiving water :	Zapadna (West) Morava River
River km of the effluent discharge:	17
Critical Emissions	Discharge (m^3/y) 10,100,000 BOD_5 (t/y) 3,088 Tot N (tN/y) 333 Tot P (tP/y) 179 Susp. Solids (t/y) 2,689
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is rather low (i.e. 35-45). The pollution emission has an adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are observed during the low flow periods. There is also the influence on water quality of Velika Morava River.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there is the outlet and structure for pumping station at the location of planned WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment.
Receiving Waters	Direct outflow to the Zapadna (West) Morava River, tributary of Velika Morava River.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited. There is a need of several down-stream users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Z. Morava River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of ^a^ak**
Name of the receiving water :	Zapadna (West) Morava River
River km of the effluent discharge:	168
Critical Emissions	Discharge (m^3/y) 10,930,000 BOD_5 (t/y) 2,740 Tot N (tN/y) 410 Tot P (tP/y) 139 Susp. Solids (t/y) 2,350
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is rather low (i.e. 15-20). The pollution emission has an adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are observed during the low flow periods. There is also the influence on water quality of Velika Morava River.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there is two outlets which are planned to be connected to the main collector.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment.
Receiving Waters	Direct outflows in the Zapadna (West) Morava River, tributary of Velika Morava River.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited. There is a need of several downstream users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Z. Morava River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of [abac**
Name of the receiving water :	**Sava River**
River km of the effluent discharge:	101
Critical Emissions	Discharge (m^3/y) 8,500,000 BOD_5 (t/y) 2,124 Tot N (tN/y) 287 Tot P (tP/y) 113 Susp. Solids (t/y) 1,805
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is rather high (i.e. 100-120) accounting at whole river flow but in the mixing zone after bank outlet of sewage, CDF is around 20-30. The emission affects water quality but doesn’t change it dramatically even in the mixing zone.
Immediate Causes of Emissions	There is no WWTP. Actually, there are several outlets, which are planned to be connected in one.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment.
Receiving Waters	Direct outflow in the Sava River (right bank).
Nearby Downstream Uses	Several withdrawals (wells) of bank filtrate for several smaller towns as well as dozens withdrawals (wells) for two Belgrade Water Treatment Plant (total capacity ~ 450000 m^3/d are all located along the Sava river banks downstream of planned sewage outlet. Also, there is a large recreation area downstream of planned sewage outlet.
Transboundary Implications	There is no direct transboundary implications but indirect ones.
Rank	High

Name of the Hot Spot:	**City of Vranje**
Name of the receiving water :	Ju`na (South) Morava River
River km of the effluent discharge:	221
Critical Emissions	Discharge (m^3/y) 9,450,000 BOD_5 (t/y) 2,059 Tot N (tN/y) 286 Tot P (tP/y) 92 Susp. Solids (t/y) 1,782
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extremely low (i.e. 2-3). The pollution emission has an extremely adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are frequently observed. There is also the influence on water quality of Velika Morava river.
Immediate Causes of Emissions	There is no Municipal WWTP. Existing outlet in small Vranjska stream (tributary of South Morava River) will be moved (7 km long main collector) downstream to the location planned for WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The lack of money for investment.
Receiving Waters	The direct outflow in the Ju`na (South) Morava River, tributary of Velika Morava river.
Nearby Downstream Uses	There are several nearby downstream users; water supply (bank filtrate), irrigation, industry. The use of water is limited as the water quality during low flow periods is bad. There is a need of several downstream users to increase use of water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of J. Morava River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	**City of Valjevo**
Name of the receiving water :	Kolubara River
River km of the effluent discharge:	77
Critical Emissions	Discharge (m^3/y) 8,750,000 BOD_5 (t/y) 1,883 Tot N (tN/y) 293 Tot P (tP/y) 122 Susp. Solids (t/y) 1,498
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extremely low (i.e. 2.5-3). The pollution emission has an extremely adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are frequently observed.
Immediate Causes of Emissions	There is no Municipal WWTP. The WWTP is under construction. About 80% of civil works are finished. The lack of money to finish the work.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the top of watershed.
Receiving Waters	The direct outflow in the Kolubara River, tributary of Sava river.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited on the periods of higher flows as the water quality during low flow periods is bad. There is a need of several downstream users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Kolubara River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	City of Subotica
Name of the receiving water :	Lakes ; Pali} and Ludo{
River km of the effluent discharge:	
Critical Emissions	Discharge (m^3/y) 17,350,000 BOD_5 (t/y) 4,161 Tot N (tN/y) 696 Tot P (tP/y) 187 Susp. Solids (t/y) 4,267
Seasonal Variations	The variation of pollution emission depends on seasonal industry (food processing).
Immediate Causes of Emissions	The overloading of existing WWTP (110,000 p.e., activated sludge process) which was built in 1975. Lack of capacity (for additional 90,000 p.e.) of existing Municipal WWTP as well as the lack of facilities for nutrients removal. The need for the Renovation of existing WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the top of watershed. The lack of money for the investment.
Receiving Waters	The effluent from WWTP discharges to facultative lagoons than to Pali} Lake. Overflow discharges to Kere{ creek (enters from Hungary), the tributary of Ludo{ Lake, which is the famous wild bird reserve (Ramsar Site).
Nearby Downstream Uses	Pali} Lake is the large recreational area. The water is used for recreation. Ludo{ Lake is the famous wild bird reserve (Ramsar Site). Overflow from Ludo{ Lake is used for supply of a large fish pond.
Transboundary Implications	There are not direct transboundary implications.
Rank	High

Name of the Hot Spot:	City of U`ice
Name of the receiving water :	Djetinja River
River km of the effluent discharge:	32
Critical Emissions	Discharge (m^3/y) 7,300,000 BOD_5 (t/y) 1,643 Tot N (tN/y) 222 Tot P (tP/y) 62 Susp. Solids (t/y) 1,164
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is rather low (i.e. 5-6). The pollution emission has an adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are observed during the low flow periods.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there is several outlets which are planned to be connected on the 8 km long collector.
Root Causes of Water Quality Problems	The emission of pollution from a large industrial town located on the river bank. The Lack of money for investment.
Receiving Waters	Direct outflows in the Djetinja River, tributary of Zapadna (West) Morava.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited. There is a need of several downstream users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Djetinja and Zapadna Morava River.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones because of large emission of pollution.
Rank	High

Name of the Hot Spot:	City of Zaje^ar
Name of the receiving water :	Timok River
River km of the effluent discharge:	67
Critical Emissions	Discharge (m^3/y) 5,633,000 BOD_5 (t/y) 1,461 Tot N (tN/y) 205 Tot P (tP/y) 55 Susp. Solids (t/y) 1,121
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is rather low (i.e. 5-6). The pollution emission has an adverse effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are observed during the low flow periods.
Immediate Causes of Emissions	There is no Municipal WWTP. Actually, there is outlet which will be moved to the location of planned WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a medium size industrial town located on the river bank. The Lack of money for investment.
Receiving Waters	Direct outflows in the Timok River, direct tributary of Danube.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited. There is a need of several downstream smeller users to use water (i.e. bank filtrate) for water supply. The water would be potentially use for recreation as there is a large recreational area in riparian zone of Timok River.
Transboundary Implications	There are direct transboundary implications as the Timok River makes the State Border (19 km long) with Bulgaria.
Rank	High

Name of the Hot Spot:	City of Bor
Name of the receiving water :	Borska stream (tributary of Timok River)
River km of the effluent discharge:	27
Critical Emissions	Discharge (m^3/y) 5,494,000 BOD_5 (t/y) 1,398 Tot N (tN/y) 145 Tot P (tP/y) 43 Susp. Solids (t/y) 1,095
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is extreely low (i.e. 2-3). The pollution emission has an detrimental effect on water quality as well as on the ecosystem. Anoxic and anaerobic conditions in river are observed during the largest part of the year, particularly during low flow periods.
Immediate Causes of Emissions	There is no Municipal WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a medium size industrial town located on the river bank. The Lack of money for investment.
Receiving Waters	Direct outflows in the Borska stream, the tributary of Timok River.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry. The use of water is limited as its water quality is out of any class. The water would be potentially use for recreation as there is a large recreational area in riparian zone.
Transboundary Implications	There are direct transboundary implications as the Borska stream is the left tributary of the Timok River which makes the State Border (19 km long) with Bulgaria.
Rank	High

Name of the Hot Spot:	**City of Senta**
Name of the receiving water :	Tisa River
River km of the effluent discharge:	121
Critical Emissions	Discharge (m^3/y) 3,690,000 BOD_5 (t/y) 1,402 Tot N (tN/y) 238 Tot P (tP/y) 55 Susp. Solids (t/y) 1,138
Seasonal Variations	The CDF-critical dilution factor (Q_{95} : Q_{effl}) is 800-1000. The pollution emission has an adverse effect on the Tisa River water quality as well as on the aquatic ecosystem.
Immediate Causes of Emissions	There is no Municipal WWTP. The WWTP is under construction. About 75% of civil works are finished.
Root Causes of Water Quality Problems	The emission of pollution from upper part of watershed. The emission of pollution from the industrial (food processing industry) town located on the bank of the river. The lack of money for Investment.
Receiving Waters	The direct outflow in Tisa river.
Nearby Downstream Uses	There are several nearby downstream users; irrigation, industry, recreation. The use of water is limited as the water quality during low flow periods is out of class. The is used for recreation, supply fish ponds, irrigation.
Transboundary Implications	There are not direct transboundary implications but rather indirect ones.
Rank	High

Name of the Hot Spot:	**Ro`aje Town**
Name of the receiving water :	**Ibar River**
River km of the effluent discharge:	251
Critical Emissions	Discharge (m^3/y) 1,575,000 BOD_5 (t/y) 394 Tot N (tN/y) 38 Tot P (tP/y) 12 Susp. Solids (t/y) 302
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is rather low (i.e. 20-30). The pollution emission affects water quality as well as aquatic ecosystem.
Immediate Causes of Emissions	There is no WWTP.
Root Causes of Water Quality Problems	The emission of pollution from a small growing town located in Montenegro just on the top of Ibar river watershed. The lack of money for investment.
Receiving Waters	Direct outflow to Ibar River.
Nearby Downstream Uses	The use of bank filtrate for water supply of several smaller settlements. Several withdrawals of water for irrigation. The multipurpose reservoir “Gazivode” assigned for irrigation and industrial water supply. It is also planned for water supply of City of Pri{tina.
Transboundary Implications	There is no direct transboundary implications.
Rank	High (water resource protection)

Name of the Hot Spot:	**Blace Town**
Name of the receiving water :	**Blata{nica Stream (tributary of Rasina River)**
River km of the effluent discharge:	28
Critical Emissions	Discharge (m^3/y) 1,250,000 BOD_5 (t/y) 329 Tot N (tN/y) 48 Tot P (tP/y) 15 Susp. Solids (t/y) 211
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is extremely low (i.e. 1-2). The emission affects water quality as well as aquatic ecosystem.
Immediate Causes of Emissions	The overloading of existing WWTP (5,000 p.e., activated sludge process) which was built in 1981. Lack of capacity (for additional 15,000 p.e.) of existing WWTP as well as the lack of facilities for nutrients removal. The need for the Renovation of existing WWTP.
Root Causes of Water Quality Problems	The growing emission of pollution from a several small towns located on the top of river watershed. The lack of money for investment.
Receiving Waters	Direct outflow to the River which flows to the reservoir “]elije” assigned for water supply of City of Kru{evac.
Nearby Downstream Uses	The regional water supply. Several withdrawals of water for irrigation.
Transboundary Implications	There is no direct transboundary implications.
Rank	High (drinking water resource protection)

Name of the Hot Spot:	Mojkovac Town
Name of the receiving water :	**Tara River**
River km of the effluent discharge:	96
Critical Emissions	Discharge (m^3/y) 630,000 BOD_5 (t/y) 131 Tot N (tN/y) 19 Tot P (tP/y) 5 Susp. Solids (t/y) 118
Seasonal Variations :	The CDF-critical dilution factor (Q_{95} : Q_{effl}), is 300-320. The emission affects water quality as well as aquatic ecosystem which is the reserve of nature.
Immediate Causes of Emissions	The Direct discharge of wastewater as there is no WWTP.
Root Causes of Water Quality Problems	The growing emission of pollution from a small growing town located in Montenegro on the top of river watershed. The lack of money for investment.
Receiving Waters	Direct outflow to the Tara River whose Canyon is under protection as the UNESCO Heritage.
Nearby Downstream Uses	Especial protected mountainous ecosystem.
Transboundary Implications	There is no direct transboundary implications.
Rank	High (protection of Word Heritage)

Name of the Hot Spot:	**Kola{in Town**
Name of the receiving water :	**Tara River**
River km of the effluent discharge:	126
Critical Emissions	Discharge (m^3/y) 956,000 BOD_5 (t/y) 195 Tot N (tN/y) 35 Tot P (tP/y) 7 Susp. Solids (t/y) 145
Seasonal Variations :	The CDF-critical dilution factor ($Q_{95} : Q_{effl}$), is 200-220). The emission affects water quality as well as aquatic ecosystem which is the reserve of nature.
Immediate Causes of Emissions	The Direct discharge of wastewater as there is no WWTP.
Root Causes of Water Quality Problems	The growing emission of pollution from a small growing town located in Montenegro on the top of river watershed. The lack of money for investment.
Receiving Waters	Direct outflow to the Tara River whose Canyon is under protection as the UNESCO Heritage.
Nearby Downstream Uses	Especial protected mountainous ecosystem.
Transboundary Implications	There is no direct transboundary implications.
Rank	High (protection of Word Heritage)

Source: National Review - Yugoslavia, Part C

High Priority Municipal Hot Spots

No.	Hot Spot	First Recipient	$Q_{min.}$ 95%	Row W. Water Load	Current Treatment			Current WWTP Capacity	Hydraulic Load	Pollution Load (t/y)				Needed WWTP Capacity	Shortage of Treatment Capacity	COMMENTS
	City/Settlement		m^3/s	000 p.e.	K	M	B	000 p.e.	000 m^3/y	BOD_5	Tot. N	Tot. P	S. Sol.	000 p.e.	000 p.e.	the reasons for WWTP comstruction
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	City of Belgrade (high)	Danube		1655	x			0	151000	36245	6041	1359	29775	1660	1660	
1a	*Central Sewage System*	Danube	1800	1600	x			0	146000	35040	5840	1314	28850	1600	1600	transboundary effect, influence on the aquatic ecosystem
1b	*Ostru`ni~ki Sew. Syst.*	Sava	285	55	x			0	5000	1205	201	45	925	60	60	protect. of drinking water resource, protect. of recreation area
2	Novi Sad (*Left Bank*)	Danube	1410	287	x			0	31142	6285	988	298	5205	350	350	protect. of drinking water resource, protect. of recreation area
3	Ni{	Ni{ava	4.58	269	x			0	28335	5891	826	289	4959	300	300	low dilution rate, influence on the aquatic ecosystem
4	Pri{tina	Sitnica	0.68	181	x			0	16500	3959	570	148	3207	250	250	low dilution rate, influence on the aquatic ecosystem
5	Zrenjanin	Begej	1.76	190	x			0	15750	4161	975	226	3905	200	200	low dilution rate, influence on the aquatic ecosystem
6	Vrbas-Kula (REG)	DTD Kanal	3.00	164	x			0	9450	3592	547	151	3022	180	180	protection of irrigation system & Tisa River
7	Leskovac	J. Morava	4.01	146	x			0	12600	3193	295	132	2903	160	160	low dilution rate, influence on the aquatic ecosystem
8	Kru{evac	Z. Morava	18.10	141	x			0	10100	3088	333	79	2689	150	150	low dilution rate, influence on the aquatic ecosystem
9	^a~ak	Z. Morava	4.35	125	x			0	10930	2740	410	139	2350	150	150	protection of drinking water resource, low dilution rate
10	[abac	Sava	285	97	x			0	8500	2124	287	113	1805	100	100	protection of drinking water resource
11	Vranje	J.Morava	0.57	94	x			0	9450	2059	286	92	1782	100	100	protection of drinking water resouce, low dilution rate
12	Valjevo (CW)	Kolubara	0.58	86	x			0	8750	1883	293	122	1498	100	100	protection of drinking water res., low dilution rate
13	Subotica**	Lakes; Pali} & Ludo{		190	x	x	x	110	17350	4161	696	187	4267	200	90	protect. of ecosystem & birds reserve, protect. of recreation area
14	U`ice	Djetinja	0.74	75	x			0	7300	1643	222	62	1164	75	75	protection of drinking water resouce, low dilution rate
15	Zaje~ar	V. Timok	1.30	67	x			0	5635	1461	205	55	1121	75	75	transboundary effect, protection of Timok River
16	Senta (CW)	Tisa	120	64	x			0	3690	1402	238	55	1138	75	75	protection of Tisa River
17	Bor	Borska r.	0.58	64	x			0	5494	1398	145	43	1095	75	75	transboundary effect, protection of Timok River
18	Pirot	Ni{ava	1.58	62	x			0	6106	1361	240	56	1088	75	75	protection of drinking water resource, low dilution rate
19	Ro`aje	Ibar	1.15	18	x			0	1575	394	38	12	302	25	25	protection of drinking water resource, low dilution rate
20	Blace** (REG)	Blata{nica	0.06	15	x	x	x	5	1250	329	48	15	211	20	15	protection of resetrvoir for water supply, low dilution rate

No.	Hot Spot	First Recipient	$Q_{min.}$ 95%	Row W. Water Load	Current Treatment			Current WWTP Capacity	Hydraulic Load	Pollution Load (t/y)				Needed WWTP Capacity	Shortage of Treatment Capacity	COMMENTS
	City/Settlement		m^3/s	000 p.e.	K	M	B	000 p.e.	000 m^3/y	BOD_5	Tot. N	Tot. P	S. Sol.	000 p.e.	000 p.e.	the reasons for WWTP comstruction
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
21	Kola{in	Tara	6.00	9	x			0	956	195	35	7	145	10	10	protect. of Tara River Canyon Reserve of Nature (UNESCO)
22	Mojkovac	Tara	6.82	6	x			0	630	131	19	5	118	10	10	protect. of Tara River Canyon Reserve of Nature (UNESCO)
	AMOUNT			**4004**				**115**	**362493**	**87694**	**13737**	**3648**	**73749**	**4340**	**4225**	

Remarks:

* *Four WWTP are planned (1 600 000 p.e + 2 x 200 000 p.e. + 1 x 55 000 p.e.)*

*** Upgrading and enlarging of existing WWTP is needed*

CW - Civil Works completed 80%

REG - Regional Sewage System

K - No Treatment

M - Mechanical Treatment

B - Biological Treatment

Source: National Review - Yugoslavia, Part C - Table 2.2-1

Industrial Hot Spots (All Priorities)

No.	Pollution Source Industry	Type of Industry	Nearest Settlement	Recipient	Priority	Hydraulic Load	Pollution Load (Row wastewater)										
							BOD_5	COD	SS	N	P	Fe	Zn	Pb	Cr	Cu	Cd
						000 m^3/y	t/y	t/y	t/y	t/y	t/y	t/y	t/y	t/y	t/y	t/y	t/y
1	IHP 'Prahovo'	P - Fertilisers Production	Prahovo	Danube	High	26200	555	2530	27990	570	4760	-	146	80.9	10.20		-
2	TE 'Obili}'	Thermopower Plant, Coal Mining & Processing	Obili}	Sitnica	High	20700	4317	12100	26872	-		15.2	-	-	0.00		-
3	HI "Zorka"	Chemical Industry	[abac	Sava r.	High	8000	285	725	3084	1465	-	606	1.29	1.66	0.00	1.28	0.28
4	RTB 'Bor'	Cu Mining & Flotation	Bor	Borska r.	High	6890	723	2710	810	38	-	19.3	9.64	1.17	2.07	17.9	-
5	FAK "Lepenka"	Wood & Paper Industry	N. Kne`evac	Tisa	High	2205	1380	3980	4500	27	10	-	-	-	-	-	-
6	FOPA	Wood & Paper Industry	Vladi~in Han	J. Morava	High	2050	15947	52500	4148	-	-	-	-	-	0.00		-
7	F-ka [e}era "Kristal"	Sugar Mill	Senta	Tisa r.	High	2240	3750	6950	4017	22	3	-	-	-	-	-	-
8	REIK ” Kolubara”	Thermopower Plant, Coal Mining & Processing	Lazarevac	Kolubara	Medium	19900	3790	11250	4099	0.11	-	36.7	0.54	1.52	0.11	0.11	0.1
9	TENT-A	Thermopower Plant	Obrenovac	Sava r.	Medium	10300	225	700	1184	30.9	-	27.2	0.74	0.22	30.90	0.3	-
10	PK "Beograd"	Food Processing Ind.	Beograd	Danube	Medium	8350	13550	28700	3360	355	47	-	-	-	-	-	-
11	TE "Pljevlja"	Thermopower Plant, Coal Mining & Processing	Pljevlja	]ehotina	Medium	6000	90	290	300								
12	F-ka {e}era "Crvenka"	Sugar Mill & Destillery	Crvenka	DTD Canal	Medium	1750	2980	6150	3270	-	-	-	-	-	-	-	-
13	RTB "Bor"	Cu Mining & Flotation	Majdanpek	Pek r.	Medium	1280	-	-	565	0.37	-	4.7	-	0.07	0.00	0.15	-
14	RTK "Trep~a"-Flotacija	Pb & Zn Mining, Flotation	Zve~an	Ibar r.	Medium	1040	-	-	10406	-	-	7.88	0.02	0.05	0.04	-	-
15	RTK "Trep~a"-Flotacija "Ki{nica"	Pb & Zn Mining, Flotation	Ki{nica	Gra~anka	Medium	500	-	-	490	-	-	-	-	-	-	-	
	AMOUNT					117405	47592	128585	95095	2508	4820	717	158.2	85.59	43.32	19.74	0.38

Notes : 1) The data concerns on the period before 1992 when Industriy was opperated by 90% of full capacity

2) As the industrial production was severely decreased after the year 1992, the pollution emission in the period 1994-97 was 55-65% lower than presented in the table

3) Not all industries discharge wastewater directly into recipients. A part of it is retained in storages, retention basins or lagoons

Source: National Review - Yugoslavia, Part C - Table 2.4-1

Agricultural Hot Spots (All Priorities)

No.	Pollution Source	Location	Priority	Number of Fatlings		Hydraulic Load		Pollution Load			
	Pig Farm	the nearest Settlement		per Year *	per Cycle	(m^3/y)	p.e.	BOD_5 (t/y)	Tot.N (t/y)	Tot. P (t/y)	Susp. Sol. (t/y)
	1	2	3	6		8	9	13	14	15	16
1	DD IM "Neoplanta" (DP "^enej")	Sirig	High	50000	25000	96725	67000	1460.0	182.5	68.4	3193.8
2	FS "Sur~in"	Sur~in	High	35000	17500	67708	47000	1022.0	127.8	47.9	2235.6
3	DD "Carnex-Farmakop"	Vrbas	High	35000	17500	67708	47000	1022.0	127.8	47.9	2235.6
4	DP PIK "Varvarinsko Polje"	Varvarin	High	25000	12500	48363	34000	730.0	91.3	34.2	1596.9
5	DP "1. Decembar"-FS "Nimes"	@itoradja	High	20000	10000	38690	27000	584.0	73.0	27.4	1277.5
6	FS "D. Markovi}"	Obrenovac	High	20000	10000	38690	27000	584.0	73.0	27.4	1277.5
	AMOUNT		HIGH	185000	92500	357883	249000	5402.0	675.3	253.2	11816.9
1	PP "Panonija"	Se~anj	Medium	30000	15000	58035	40000	876.0	109.5	41.1	1916.3
2	DP "Petrovac"	Petrovac na Mlavi	Medium	22000	11000	42559	30000	642.4	80.3	30.1	1405.3
3	PKB "Vizelj"	Padinska Skela	Medium	25000	12500	48363	34000	730.0	91.3	34.2	1596.9
4	DP-IM Farma Svinja	Velika Plana	Medium	20000	10000	38690	27000	584.0	73.0	27.4	1277.5
5	PD "Zvezdan"	Zaje~ar	Medium	20000	10000	38690	27000	584.0	73.0	27.4	1277.5
6	DP "Elan"	Srbobran	Medium	17000	8500	32887	23000	496.4	62.1	23.3	1085.9
7	FS "Turekovac"	Leskovac	Medium	15000	7500	29018	20000	438.0	54.8	20.5	958.1
	AMOUNT		MEDIUM	149000	74500	288241	201000	4350.8	543.9	203.9	9517.4

Note: 1) *Two equal cycles per year*
2) *No any farm discharges wastewater directly into recipients but into lagoon. The wastes use to be disposed on to land after maturation.*
There is a danger of accidental pollution when lagoons are overloaded
Source: National Review - Yugoslavia, Part C - Table 2.3-1

Description of High Priority Hot Spots - Hungary

Municipal Hot Spots

Hot Spot Name	Győr municipal wastewater treatment plant
Critical Emissions	High emission load is presented by the effluent (37300 m3/d) of the wastewater treatment plant: 584 mg/l COD_{cr} 23.4 mg/l NH_4-N 166.3 mg/l Na 6.9 mg/l ANA-Detergents Because of the emissions exceeding the limit values of the existing regulations 12.2 million HuFt wastewater fine was imposed for the company operating the plant.
Seasonal Variations	The quality of the wastewater is equalized during the dry weather flow, changes are observed only in relation of the variations of hydrometeorological conditions
Immediate Causes of Emissions	The wastewater treatment plant has biological treatment technology using activated aeration system after the mechanical stage, disinfection, sludge centrifuges and drying beds. The plant is running with poor treatment efficiency of about 50 percent.
Root Causes of Water Quality Problems	There are significant quantity of industrial waste water discharged into the public sewer system of the town (about 40 %) with more or less acceptable pre-treatment. Partly this is the cause of the poor treatment efficiency of the plant. Moreover the flow conditions of the small size recipient are also unfavourable, the rate of dilution is low.
Receiving Waters	Substantial water quality deterioration is the impact of the emission on the recipient water body: downstream from the effluent the components of oxygen household deteriorate from class III to Class IV, the bacteriological quality fall into the worst V. quality class (see Annex 1.).
Nearby Downstream Uses	There are no sensitive water use downstream from the effluent discharge into the recipient Moson-Danube, however the outer protection zone of the Szögy drinking Highwater resource is affected by the discharge.
Transboundary Implications	No transboundary pollution effect on the main recipient River Danube because of the very long distance from the downstream border section and the significant self-purification capacity of the river.
Rank	**High Priority**

Source: National Review - Hungary, Part C - Table 2.14

Hot Spot Name	Budapest public sewer system
Critical Emissions	The Capital is outstandingly the biggest direct polluter of the Danube. Most of the wastewater (84 %) collected by the sewer system is pumped directly into the main stream of the river, only after removing the floating rough material by screens. Quality characteristics of this raw wastewater are: 500-700 mg/l COD_{cr} 250-300 Mg/l BOD The ratio of industrial wastewater discharged into the public sewer is about 40 %.
Seasonal Variations	Intensive precipitation often causes additional river pollution effect, when the storm-water overflows of the sewer system along the embankment are in operation, and discharge the highly polluted first surface runoff directly into the river.
Immediate Causes of Emissions	The main cause of the large emission into the river is the lack of adequate wastewater treatment capacity. The existing two biological treatment plant can handle only 16 % of the total dry weather wastewater flow. In case of low flow conditions in the river there are still high dilution effects on the effluent.
Root Causes of Water Quality Problems	Though the sensitive water intakes are much farther downstream from the Capital’s discharge, and there is a substantial self-purification capacity of the river, the large amount of untreated wastewater represents a potential risk from point of view of public health.
Receiving Waters	In spite of the huge dilution effect, the discharge contributes to the pollution load of the river, especially from point of view of bacteriological parameters. Public Health Authorities prohibited the bathing nearly along the whole lengths of the river. The river quality deteriorates one class downstream from Budapest concerning nutrient compounds.
Nearby Downstream Uses	The river water is not suitable for recreational purposes because of IV. class microbiological quality, partly as a consequence of the untreated wastewater discharge of Budapest (see Annex 1.).
Transboundary Implications	There is no direct transboundary pollution effect, due to the long distance from the downstream border section and the significant self-purification capacity of the river, however Budapest is the biggest point source emission along the whole Hungarian Danube stretch.
Rank	**High Priority**

Source: National Review - Hungary, Part C - Table 2.15

Hot Spot Name	**Dunaújváros public sewer system**
Critical Emissions	Considering the lack of treatment plant and the significant dilution effect of the river, special higher emission limit values were given to the system by the district Environmental Protection Inspectorate (COD_{cr}=720 mg/l, O&G=72 mg/l, NH_4-N=36 mg/l). The emission exceeded even these values and 0.6 million HuFt wastewater fine had to be payed last year.
Seasonal Variations	No characteristic seasonal change observed, concerning the quantity and quality of the wastewater collected by the public sewer system. In case of low flow conditions in the river there are still high dilution effects on the effluent.
Immediate Causes of Emissions	The actual cause of the emission (which is a direct point source discharge into the river) is the lack of wastewater treatment facilities. The wastewater is discharged into the river after a rough mechanical treatment (screen only).
Root Causes of Water Quality Problems	The Danube section where the emission enters is carries the upstream wastewater loads. The additional load (especially the microbiological compounds) makes longer the river stretch where there are potential health risk to use the water for recreation purposes in case of direct body contacts.
Receiving Waters	The emission contributes to the pollution load of the river, especially from point of view of microbiological parameters, in spite of the considerable dilution effect of the river. Public Health Authorities prohibited the bathing nearly along the whole lengths of the river. The river quality belongs to the IV. (polluted) quality class from point of view of nutrient compounds and microbiological parameters (see Annex 1.).
Nearby Downstream Uses	There are bank-filtered drinking water resources in operation downstream from the entering section of the emission, which are not so sensitive for the above mentioned quality change due to the filtration processes.
Transboundary Implications	There is no direct transboundary pollution impact, due to the long distance from the downstream border section and the significant self-purification capacity of the river, however the emission is advised to be considered in the basin-wide studies as significant direct discharge into the river
Rank	**High priority**

Source: National Review - Hungary, Part C - Table 2.16

Name of Hot Spot	**Szeged town public sewer system**
Critical Emissions	The effluent (34700 m3/d) from the public sewer system of the town represents high emission load on the lower section of River Tisza: 5130 t/a COD_{cr} 469 t/a Oil compounds 307 t/a NH_4-N No wastewater fine was imposed.
Seasonal Variations	No characteristic seasonal variations are observed in the quality of the emission.
Immediate Causes of Emissions	The lack of necessary wastewater treatment is the main cause of the emission. The wastewater is discharged into the river after a simple mechanical treatment (screen only).
Root Causes of Water Quality Problems	The root cause of water quality problem is the pollution impact of the untreated wastewater discharged into the river. The special local condition, the confluence of the highly polluted River Maros into the Tisza just downstream from the town also increases the unfavourable water quality situation.
Receiving Waters	The quality of the River Tisza deteriorates into the worst V. quality class (microbiological parameters), and IV. class concerning nutrient compounds downstream from the town. This quality deterioration is the consequence of partly the emission from the town and also the River Maris which carries very high pollution load from abroad (see Annex 1.).
Nearby Downstream Uses	Downstream water users are located in the downstream country.
Transboundary Implications	The emission represents in Hungary the only direct and permanent transboundary pollution impact at present towards downstream riparian country.
Rank	**High priority**

Source: National Review - Hungary, Part C - Table 2.18

Industrial Hot Spot

Name of Hot Spot	**Százhalombatta, MOL Rt. Oil Refinery**
Critical Emissions	The regular operation of the Oil Refinery results the following concentrations in the emission into the River Danube: Oil compounds: 4.7 mg/l Phenols: 1.0 mg/l COD_{cr}: 133.0 mg/l Only technological failures cause essential quality problems in the river, which happened for example in October 1997 in the form of an accidental oil pollution in the Danube.
Seasonal Variations	No seasonal variations in the emission. There are no wastewater discharges on holidays.
Immediate Causes of Emissions	The immediate cause of emission is the large amount of oily wastes (50 000 m3/d), which first enter into a storage tank of 1000 m3 capacity. Two stages biological treatment plant is in operation with adequate treatment efficiency. The sludge is transported away from the plant in liquid condition because locally can not be dewatered.
Root Causes of Water Quality Problems	Usually the effluent from the Refinery does not cause water quality problems under normal operational conditions. The breakdown of production technology however can cause significant oil pollution problem in the river. To avoid such risks the company has an effective emergency control unit to prevent potential pollution damages.
Receiving Waters	The treated wastewater discharge is entered into the main stream of the river. There is a considerable dilution effect of the river even during low flow periods, thus no characteristic change of river quality is observed downstream from the effluent.
Nearby Downstream Uses	The bank-filtered drinking water resource of the town Ercsi is in operation 0.5 km downstream from the effluent of the Refinery. No quality complaints are registered.
Transboundary Implications	No direct transboundary pollution impact, because of the long distance from the downstream border section, however due to the considerable amount of discharge into the Danube and the potential risk of technological failures, it is advised to consider this hot spot in the further transboundary studies.
Rank	**High priority**

Source: National Review - Hungary, Part C - Table 2.19

Name of Hot Spot	Balatonfűzfő, NIKE Rt. Chemical Industrial Plant
Critical Emissions	The emission of the industrial plant represent high pollution load, the effluent limit values are significantly exceeded in case of COD, TDS (Total Dissolved Solids) and NH_4-N. This is why the Industrial plant was imposed to an outstandingly high amount of wastewater fine of 17.9 million HuFt.
Seasonal Variations	There are no seasonal variations in the emission, there are changes only within a day. The emission is more concentrated during the first shift of the working day. The recipient of the wastewater discharge (biologically treated) is a relatively small size creek, dilution factor is under 10. During low flow period the discharge should be stored in a wastewater reservoir, according to the regulation made by the District Water Authority.
Immediate Causes of Emissions	There is an up-to-date biological wastewater treatment plant in operation, but the industrial wastewater contains non-degradable chemical compound in large amount. This is the basic quality problem of the emission. The industrial plant carries out effective self-control activity on the effluent quality.
Root Causes of Water Quality Problems	The water quality problem is caused by the outstandingly high concentration of pollutants in the raw wastewater, which are above the effluent limit values after the treatment processes, and the low dilution ratio of the recipient Veszprémi Séd Creek. The discharge from the wastewater reservoir also cause quality problems along the river system.
Receiving Waters	The recipient Veszprémi Séd is a tributary of the Séd-Nádor river system. The emission from the industrial plant deteriorates the water quality into the worst V. class (see Figure 4-5). The release from the wastewater reservoir often causes fish kills along the river courses.
Nearby Downstream Uses	There are different downstream water users (fish ponds, irrigation systems) which facing regular water quality problems. The periodical release of the wastewater reservoir blocks the operation of water uses along the river courses.
Transboundary Implications	No direct transboundary pollution impact, however even in the Danube some of the non-degradable pollutants from this industrial plant can be detected.
Rank	**High priority**

Source: National Review - Hungary, Part C - Table 2.20

Name of Hot Spot	**Kazincbarcika, BorsodChem Rt. Chemical Industrial Plant**
Critical Emissions	There are components in the emission of the industrial plant, which are essential from point of view of pollution control: TDS = 7350 t/a Na = 1650 t/a O&G = 3.6 t/a Hg = 63.4 kg/a The recipient River Sajó do not provide enough dilution effect for the wastewater discharge of the industrial plant
Seasonal Variations	There is no seasonal variation, the composition of discharge is depending from the actual production processes.
Immediate Causes of Emissions	The existing biological wastewater treatment plant is overloaded, and the critical emission components imply the lack of necessary industrial wastewater treatment processes.
Root Causes of Water Quality Problems	The release of the high Na concentration wastewater cause problems to meet effluent limit value. The material loss of obsolete production technology during the past decades caused major mercury pollution of the soil and groundwater resource under the area of an already abandoned unit of the factory.
Receiving Waters	The pollutant load of the industrial plant generally do not cause major water quality deterioration in the recipient River Sajó. Water quality problems arise mainly in the vegetation period. The fine fraction of bottom sediment of the river downstream from the effluent contains mercury in concentrations of large variety because of mobility.
Nearby Downstream Uses	Drinking water resource (Sajólád Waterworks) is in operation downstream, using bank-filtered water. The applied technology of the Waterworks is not sensitive for the moderate changes of river quality.
Transboundary Implications	No direct transboundary impact, due to the outstandingly long distance from the downstream border section of River Tisza, however as outstanding industrial water user and discharger, it is advised to be considered during basin-wide pollution reduction studies.
Rank	**High priority**

Source: National Review - Hungary, Part C - Table 2.21

Description of High Priority Hot Spots - Romania

High Priority Hot Spots - Municipal

Ser. No	Discharger/ Location	Receiver River/ Cachement area	PREVIOUS LISTS OF HOT SPOTS				Raw water load (TPE)*	Curent treatment*					Curent capacity of WWTP (TPE)	Waste water volume discharged Tm^3/y	TOTAL LOAD DISCHARGED INTO RECIVING WATERS T/year							FINAL CAPACITY (TPE)
			SAP 93	PNA PM 95	Tab 2.2	PNA PM 97		No	Mul	Biol	N	P			BOD	COD	N	P	PATHO GENS	OIL	OTHE RS	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
5	Braila	Danube / Danube	5		5	41	230.0	x						27,740	4886		952	223				
7	Iasi	Bahlui / Prut	18	1	19		310.0		x	x			450	53,600	1750	1930	368	60.4				450
17	Galati	Danube / Danube	16		17	42	300.0	x						38,250	6428	6660	1044	293				
28	Craiova	Jiu / Jiu	27	59	29	44	283.0	x						43,200	6071	6080	985	277				400
30	Resita	Bârzava / Bega-Timis		11		45	35.1	x						5,986	1475	1780.09	235	71.7				
31	Resita	Bârzava / Bega-Timis					61.1		x				100	10,420	162.97	284.47	122.52					150
32	Timisoara	Bega / Bega-Timiş	28	6	31		217.0	x						70,618	3241	3952	676	97.7				
33	Timisoara	Bega / Bega-Timiş	28	6	31		88.0		x	x			194	28,650	1149	1453	316	75				340
34	Deva	Mures / Mureş				47	70.2		x				75	22,238	1026.3	1780	186.2	52.4				150
43	Zalau	Zalău / Crasna				43	35.2	x						8,782	499.6	563.47	162.3	45.6				
44	Zalau	Zalău / Crasna		19			35.1		x	x			50	8,610	66.14	222.64	20.35					80
52	Campulung Muscel	r. Tirgului / Arges	8	13	8	46	45.0		x	x			80	8,360	388.6	706	82	23				80
54	Bucuresti	Dâmboviţa / Arges		8			2,500.0	x						189,200	53330	70686	10872	2218				3,500
	Sum						4,209.7						949	515,654	80474	96097.7	16021	3437				5,150

Source: National Review - Romania, Part C - Table 2.2.1.1

Ser. No	Discharger/ Location	Receiver River/ Cachement area	DATE OR POSSIBLE DATE FOR STARTING OF CONSTRUCTION (MONTH/YEAR)		START OR POTENTIAL START OF OPERATION YEAR		COST ESTIMATE FOR TREATMENT PLANT (milion D-MARKS)		ESTIMATED LEVEL OF REMAINING POLLUTION - T / year -					
			B	N/P	B	N/P	B	N/P	BOD	COD	N	P	OIL	OTHERS
	1	2	23	24	25	26	27	28	29	30	31	32	33	34
5	Braila	Danube / Danube							360	920	130	13		
7	Iasi	Bahlui / Prut	1997		1999		75.5		360	1158	203	25		
17	Galati	Danube / Danube			1999				400	1120	232	18		
28	Craiova	Jiu / Jiu	1996		2000				74	216	388	32		
30	Resita	Bârzava / Bega-Timis							40	108	43	7		
31	Resita	Bârzava / Bega-Timis							96	227	74	12		
32	Timisoara	Bega / Bega-Timiş							650	1972	374	41		
33	Timisoara	Bega / Bega-Timiş	1996		1999				456	872	174	31		
34	Deva	Mures / Mureş	1997		1999				210	624	123	21		
43	Zalau	Zalău / Crasna							52	160	60	10		
44	Zalau	Zalău / Crasna	1997		1999				38	180	11	2		
52	Campulung Muscel	r. Tirgului / Arges					1.3		152	424	45	5		
54	Bucuresti	Dâmboviţa / Arges	1991		1998				10600	14120	3363	444		
	Sum								13488	22101	5220	661		

Source: National Review - Romania, Part C - Table 2.2.1.1

Place of municipal hot spots from high priority list

Place	DISCHARGER NAME OF ECONOMIC UNIT	Transboundarytransfer of polution
1	Braila	yes
2	Galati	yes
3	Zalau	yes
4	Craiova	yes
5	Resita	yes
6	Campulung Muscel	
7	Deva	
8	Timisoara	yes
9	Bucuresti	yes
10	Iasi	yes

Source: National Review - Romania, Part C - Table 2.2.1.2

High Priority Hot Spots - Industrial

Ser. No	DISCHARGER NAME OF ECONOMIC UNIT	RECEIVER RIVER/ MAIN CACHEMENT AREA	PREVIOUS LISTS OF HOT SPOTS				ECONOMIC SECTOR / NR.	Problems / ISSUES Type of problem	DISCHARGED POLLUANT LOADS t/year									
			SAP 93	PNA PM 95	Tab. 2.2	PNA PM 97			COD	BOD	SSM	N	Fe	Mn	Cu	Pb	Zn	OTHERS
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
7	Phoenix Baia Mare	Săsar / Somes-Tisa	0	0	0	0	mine-5	0	98.0	0.0	944	0	27.4	0.0	8.4	0.3	0.0	0
13	Petrom Suplac de Barcau	Barcău / Cris	0	0	0	0	oil-11	0	0.0	138.7	153	0	0.0	0.0	0.0	0.0	0.0	oil extraction
16	Sometra Copsa Mica	Târnava Mare / Mures	12	1	12	0	nonfer.met.-2	0	0.0	2.6	367	4,467	7.1	0.8	0.0	33.0	12.2	2,9 t/a Cd, CN-
17	Azomures Tg.Mures	Mureş / Mures	40	0	40	0	chim-2	0	0.0	0.0	920	1,641	4.8	0.5	1.3	0.0	0.5	UREA = 884 t/a, TDS = 11678 t/a
46	Doljchim Craiova	Jiu / Jiu	0	0	0	0	chim-2	0	591.6	464.0	3,809	992	0.0	0.0	0.0	0.0	0.0	0
55	Arpechim Pitesti	Dâmbovnic / Arges	25	B57	27	90	petrochim-2	0	607.0	298.0	1,410	92	14.6	0.0	0.1	0.0	0.2	3,5 t/a P; 1t/a CN ; 0.9 t/a Phen
56	Petrobrazi Ploiesti	Prahova / Ialomita	26	0	28	89	petrochim-2	0	1,523.0	4,297.0	2,651	0	0.0	0.0	0.0	0.0	0.0	10.4 t/a Phenols
65	Letea Bacau	Bistriţa / Siret	2	40	2	82	pulp+paper-3	0	0.0	11,324.0	1,325	1,838	0.0	0.0	0.0	0.0	0.0	517 t/a P
70	Fibrex Savinesti	Bistriţa / Siret	0	0	0	0	chim-2	0	3,054.0	1,811.0	2,290	831	0.0	0.0	0.0	0.0	0.0	0
71	Pergodur P.Neamt	Bistriţa / Siret	23	45	25	0	pulp+paper-3	0	1,572.0	156.0	381	18	5.2	0.0	0.0	0.0	0.0	1,3 t/a P
76	Sidex Galati	Siret / Siret	15	0	15	0	iron-6	0	2,983.0	0.0	2,903	1,078	15.1	0.0	0.0	0.0	12.7	114 t/a Phen;4,5 t/a P
77	Antibiotice Iasi	Bahlui / Prut	19	58	20	85	chim.pharm.-2	0	64.3	40.4	34	12	0.0	0.0	0.0	0.0	0.0	3.6 t/a P
79	Siderca Calarasi	Danube/Dunare	7	0	7	88	iron-6	0	21.2	0.0	337	0	6.4	0.0	0.0	0.0	0.0	8.1 t/a Phen. 0.4 t/a CN
87	Somes Dej	Someşul Mic / Somes-Tisa	0	0	0	0	chim-2	0	4,144.2	1,168.7	0	130	0.0	0.0	0.0	0.0	0	0
93	Indagrara Arad	Mureş / Mures	0	0	0	0	food-1	0	1,308.0	1,880.0	2,859	400	0.0	0.0	0.0	0.0	0	0
100	Oltchim Rm. Valcea	Olt / Olt	0	0	0	0	chim-2	0	1,870.0	737.0	11,607	548	0.0	0.0	0.0	0.0	0	31,12,1997
119	Sinteza SA Oradea	Crişul Repede / Criş	0	0	0	92	chim-2	0	0	0	0	0	0.2	0	0	310	845	0.012 t/a CN ; 11 t/a Phen
120	Clujana SA Cluj Napoca	Someşul Mic / Someş-Tisa	0	0	0	93	lether-9	0	0	0	0	0	0	0	0	0	0	0
121	Colorom Codlea	Vulcăniţa / Olt	10	25	10	84	chim-2	0	544	141	74	9	11.7	0	0.3	0	0	31,12,1997 0.28 Phen
122	SC Favior Blănuri Orăştie	Mureş	0	0	0	94	lether-9	0	0	0	0	0	0	0	0	0	0	dfish. in WWTP Orăştie
125	Celohart Donaris Brăila	Danube/Dunare	0	0	0	83	pulp+paper-3	0	0	691	0	0	0	0	0	0	0	0
128	UPS Govora	Olt / Olt	0	0	0	0	chim-2	0	0	0	2642	175	0	0	0	0	0	31/12/1997
129	Manpel Tg. Mureş	Sewage / Mureş	0	0	0	0	leather-9	0	189.2	0	157.7	0	0	0	0	0	0	4.1CN; 4.3 t/a Cr3+; 41.8 t oil, deterg 14.6
	Sum								18,569.5	23,149.4	34,863.0	12,230.6	92.5	1.3	10.1	343.3	870.5	

Source: National Review - Romania, Part C - Table 2.4.1.1

Ser. No	DISCHARGER NAME OF ECONOMIC UNIT	RECEIVER RIVER/ MAIN CACHEMENT AREA	EFLUENT FLOW [Qef=…m^3/day]	RECEIVER MULTI-ANNUAL AVERAGE FLOW [Qrec =…m3/s]	Qef / Qrec	RECEIVER WATER QUALITY CATEGORY		WATER QUALITY INDICATORS AFECTED IN RECEIVER			
						UPSTREAM	DOWNSTREAM	D.O.REGIM	NUTRIENTS	TOXIC GENERAL	TOXIC SPECIFIC
0	1	2	19	20	21	22	23	24	25	26	27
7	Phoenix Baia Mare	Săsar / Somes-Tisa	0.3218	0.67 - 5.73	1/2 - 1/18	I (am. Baia Sprie)	D (Baia Mare)	COD 2,4/4,3	NH4 0,5/1,74	0	Fe 0,38/0,82
13	Petrom Suplac de Barcau	Barcău / Cris	0.043	2.96 - 7.6	1/69 - 1/177	II (av. Suplacu de Barcău)	I (Parhida)	BOD 11,8/14,2	NO3 10,6/11,8	oil 2,06/3,21	Fe 0,62/0,93
16	Sometra Copsa Mica	Târnava Mare / Mures	0.133	12.1 - 14.4	1/91 - 1/108	II (am. Mediaş)	D (am. Blaj)	BOD 1,7/2,6	0	0	Fe 0,21/0,42
17	Azomures Tg.Mures	Mureş / Mures	0.7769	35.1 - 36	1/45 - 1/-46	I (Glodeni)	II (Ungheni)	COD 12,7/26	NH4 0,61/2,5	0	Fe 0,13/0,14
46	Doljchim Craiova	Jiu / Jiu	0.4499	70 - 93.2	1/156 - 1/0	II (Răcari)	II (Podari)	COD 8/9,2	NH4 0,13/2,8	0	0
55	Arpechim Pitesti	Dâmbovnic / Arges	0.394	0 - 1.12	- 1/5	I (Izvoare)	III (Suseni)	COD /17	NH4 /5,3	Fen /0,06	Fe /0,25
56	Petrobrazi Ploiesti	Prahova / Ialomita	0.411	6.98 - 8.56	1/17 - 1/21	II (Cornu)	D (Tinosu)	BOD 6,1/19,5	NH4 0,52/1,2	oil 0,16/5,23	Fe 0,51/0,63
65	Letea Bacau	Bistriţa / Siret	0.5397	13.4 - 64.5	1/25 - 1/120	D (Frunzeni)	D (am. Lac Bacău)	BOD 5,7/41,5	NH4 4,94/43,8	0	0
70	Fibrex Savinesti	Bistriţa / Siret	1.802	8.36 - 13.4	1/5 - 1/7	I (Straja)	D (Frunzeni)	COD 7,5/10,1	NH4 0,04/4,94	0	0
71	Pergodur P.Neamt	Bistriţa / Siret	0.2156	8.36 - 13.4	1/39 - 1/62	I (Straja)	D (Frunzeni)	BOD 3,8/5,7	NH4 0,04/4,94	0	0
76	Sidex Galati	Siret / Siret	1.9775	242 - 592	1/122 - 1/299	III (Şendreni)	II (Reni)	COD 17/19,5	P 0,094/0,14	0	Fe 0,33/0,6
77	Antibiotice Iasi	Bahlui / Prut	0.025	0.58 - 9.97	1/23 - 1/399	D (Podu Iloaiei)	D (Holboca)	BOD 40,6/46,6	NH4 2,55/5,87	Fen 0,017/0,02	0
79	Siderca Calarasi	Danube/Dunare	0.1199	5724 - 4700	1/47754 - 1/39211	II (Chiciu-Silistra)	II (am. Brăila)	COD 4,4/8,7	NO2 2,4/11,5	oil 0,05/1,67	0
87	Somes Dej	Someşul Mic / Somes-Tisa	0.4455	14.3 - 20.9	1/32 - 1/47	I (am. Cluj)	III (Sălăţiu)	COD 5,4/14,2	NH4 1,72/6,37	0	0
93	Indagrara Arad	Mureş / Mures	0.1095	167	1/1525	II (am. Arad)	II (Nădlac)	BOD 4,1/4,3	NH4 0,43/0,47	0	0
100	Oltchim Rm. Valcea	Olt / Olt	5.087	123 - 141	1/24 - 1/28	I (am. Rm. Vâlcea)	II (Drăgăşani)	COD 22,4/35,5	NH4 0,84/0,85	0	0
119	Sinteza SA Oradea	Crişul Repede / Criş	0.0099	23.6 - 24.8	1/2387 - 1/2509	I (am. Oradea)	II (Cheresig)	BOD 3,2/3,7	0	Fen 0,004/0,006	Fe 0,09/0,13
120	Clujana SA Cluj Napoca	Someşul Mic / Someş-Tisa	0.0829	14.3 - 20.9	1/172 - 1/252	I (am. Cluj)	III (Sălăţiu)	BOD 3.2/5.7	P 0.072/0.215	Fe 0.05/0.1	0
121	Colorom Codlea	Vulcăniţa / Olt	0.1667	0 - 0.95	- 1/30	I (Ref. Station)	D (av.st.epur. Colorom)	BOD /54,8	NH4 /12,6	Fen /0,025	Fe /1,44
122	SC Favior Blănuri Orăştie	Mureş	0.003	3.5 - 8.5	1/1163 - 1/2825	I (Costeşti)	III (av. Orăştie)	COD 3.9/35.7	NH4 0.12/0.50	0	Fe 0.15/0.31
125	Celohart Donaris Brăila	Danube/Dunare	0.2642	4700 - 5920	1/17789 - 1/22407	II (am. Brăila)	II (Grindu-Reni)	COD 4.6/5.7	NH4 0.35/0.46	Phen 0.007/0.012	0
128	UPS Govora	Olt / Olt	0.386	123 - 141	1/319 - 1/365	I (am. Rm. Vâlcea)	II (Drăgăşani)	COD 22,4/35,5	NH4 0,84/0,85	0	0
129	Manpel Tg. Mureş	Sewage / Mureş	0.02	35.1 - 36.0	1/1755 - 1/1800	II (Glodeni)	II (Ungheni)	COD 12.7/26	NH4 0.61/2.5	0	Fe 0.13/0.14
	Sum										

Source: National Review - Romania, Part C - Table 2.4.1.1

Ser. No	DISCHARGER NAME OF ECONOMIC UNIT	RECEIVER RIVER/ MAIN CACHEMENT AREA	CARACTERISTIC OF PROBLEMS CREATED IN RECEIVER				
			LEVEL OF TOXI-CITY OF THE LOADS[1]	SIZE OF THE AREA AFEC-TED	INTENSITY AND REVER-SIBILITY OF THE PRO-BLEM	SENSITI-VITY OF DOWN-STREAM USERS	SENSITI-VITY OF TRANS-BOUN-DARY AREA
0	1	2	28	29	30	31	32
7	Phoenix Baia Mare	Săsar / Somes-Tisa	SSM, Fe	0,5 km	permanent	WS, irrigation	0
13	Petrom Suplac de Barcau	Barcău / Cris	BOD, oil	2 km	permanent	WS	yes
16	Sometra Copsa Mica	Târnava Mare / Mures	SSM, Pb	2 km	permanent	WS	0
17	Azomures Tg.Mures	Mureş / Mures	N, SSM	1 km	permanent	WS	0
46	Doljchim Craiova	Jiu / Jiu	BOD, COD	2 km	permanent	WS, irrigation	0
55	Arpechim Pitesti	Dâmbovnic / Arges	COD, BOD	1 km	permanent	irrigation	0
56	Petrobrazi Ploiesti	Prahova / Ialomita	COD, BOD	2 km	permanent	WS	0
65	Letea Bacau	Bistriţa / Siret	BOD, SSM	2 km	permanent	WS, irrigation	0
70	Fibrex Savinesti	Bistriţa / Siret	BOD, COD, N	1 km	permanent	WS	0
71	Pergodur P.Neamt	Bistriţa / Siret	COD	1 km	permanent	WS	0
76	Sidex Galati	Siret / Siret	COD, N, Fe	2 km	permanent	WS	yes
77	Antibiotice Iasi	Bahlui / Prut	COD	1 km	permanent	WS	yes
79	Siderca Calarasi	Danube/Dunare	COD, Fe	1 - 2 km	permanent	WS	yes
87	Somes Dej	Someşul Mic / Somes-Tisa	COD	2 km	permanent	WS	0
93	Indagrara Arad	Mureş / Mures	BOD, COD, N	1 km	permanent	WS	yes
100	Oltchim Rm. Valcea	Olt / Olt	COD, N, SSM	1 km	permanent	WS	0
119	Sinteza SA Oradea	Crişul Repede / Criş	COD, N, P, HM	1 km	permanent	WS	yes
120	Clujana SA Cluj Napoca	Someşul Mic / Someş-Tisa	COD, SSM, Cr	sewerage	permanent	WS	0
121	Colorom Codlea	Vulcăniţa / Olt	COD	1 km	permanent	0	0
122	SC Favior Blănuri Orăştie	Mureş	0	sewerage	permanent	WS	0
125	Celohart Donaris Brăila	Danube/Dunare	COD, SSM	sewerage	permanent	WS	0
128	UPS Govora	Olt / Olt	SSM, N	1 km	permanent	WS	0
129	Manpel Tg. Mureş	Sewage / Mureş	COD, SSM, Cr	sewerage	permanent	WS	0
	Sum						

Source: National Review - Romania, Part C - Table 2.4.1.1

Place of municipal hot spots from high priority list

Place	DISCHARGER NAME OF ECONOMIC UNIT	Transboundary transfer of polution
1	Letea Bacau	
2	Celohart Donaris Brăila	yes
3	Colorom Codlea	
4	Antibiotice Iasi	yes
5	UPS Govora	
6	Siderca Calarasi	yes
7	Petrobrazi Ploiesti	
7	Phoenix Baia Mare	yes
8	Arpechim Pitesti	
9	Manpel Tg. Mureş	
10	Sinteza SA Oradea	yes
11	Clujana SA Cluj Napoca	yes
12	SC Favior Blănuri Orăştie	
14	Sometra Copsa Mica	
15	Petrom Suplac de Barcau	yes
16	Doljchim Craiova	yes
17	Sidex Galati	yes
18	Oltchim Rm. Valcea	
19	Indagrara Arad	yes
20	Somes Dej	yes
21	Fibrex Savinesti	
22	Pergodur P.Neamt	
23	Azomures Tg.Mures	

Source: National Review - Romania, Part C - Table 2.4.1.3

High Priority Hot Spots - Agricultural

Ser. No	DISCHARGER NAME OF ECONOMIC UNIT	RECEIVER RIVER/ MAIN CACHEMENT AREA	PREVIOUS LISTS OF HOT SPOTS				ECONOMIC SECTOR / NR.	Problems / ISSUES Type of problem	DISCHARGED POLLUANT LOADS t/year										
			SAP 93	PNA PM 95	Tab. 2.2	PNA PM 97			COD	BOD	SSM	N	Fe	Mn	Cu	Pb	Zn	P	OTHERS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
111	Suinprod Independenta	Birladel/Siret					agr.-10		412.0	481.0	2,765	323							
113	Comtom Tomesti	Bahluiet/Prut					agr.-10		49.7	15,768.0	29	2,560						720	
115	Comsuin Ulmeni	Danube/Dunube					agr.-10		260.0	575.0	10,231	472							
22	Romsuin Test Periş	Vlasia / Ialomita					agr.-10			25.1	38								
	Sum								721.7	16,849.1	13,062.4	3,355.0						720.0	

Source: National Review - Romania, Part C - Table 2.3.1.1

Ser. No	DISCHARGER NAME OF ECONOMIC UNIT	RECEIVER RIVER/ MAIN CACHEMENT AREA	EFLUENT FLOW [Qef=…m^3/s]	RECEIVER MULTI-ANNUAL AVERAGE FLOW [Qrec =…m3/s]	Qef --------- Qrec	RECEIVER WATER QUALITY CATEGORY		WATER QUALITY INDICATORS AFECTED IN RECEIVER			
						UPSTREAM	DOWNSTREAM	D.O.REGIM	NUTRIENTS	TOXIC GENERAL	TOXIC SPECIFIC
	1	2	19	20	21	22	23	24	25	26	27
111	Suinprod Independenta	Birladel/Siret	0.04	8.9	1/223	D (Umbraresti)	III (Sendreni - Siret)	BOD 12,9/17,3	P 0,063/0,13	Phen 0,002/0,004	
113	Comtom Tomesti	Bahluiet/Prut	0.07	7.06	1/101	D (Podu Iloaiei)	D (Holboca)	BOD 17 / 46	P 0,25 / 0,3	Phen 0,017 / 0,021	
115	Comsuin Ulmeni	Danube/Dunube	0.1014	5723 - 6384	1/56443 - 1/62963	II (Oltenita)	II (Chiciu-Silistra)	COD 10,9	P 0,13	Phen 0,019	
22	Romsuin Test Periş	Vlasia / Ialomita	0.0398	1.02	1/26	I (Băleni)	D (Siliştea Snagovului)	COD 16,5	NH4 48	Phen 0,017	
	Sum										

Source: National Review - Romania, Part C - Table 2.3.1.1

Place of agricultural hot spots from high priority list

Place	DISCHARGER NAME OF ECONOMIC UNIT	Transboundarytransfer of polution
1	Comtom Tomesti	yes
2	Romsuin Test Periş	
3	Comsuin Ulmeni	yes
4	Suinprod Independenta	

Source: National Review - Romania, Part C - Table 2.3.1.2

Description of High Priority Hot Spots - Bulgaria

High Priority Hot Spots - Municipalities

Summary of Information for the Municipal hot Spots WWTP Gorna Oryahovitza & Lyaskovetz

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Gorna Oriahovitza & Liaskovetz	Location-Yantra River Basin
Critical Emissions	Total population 49 800 ; G.Oriahovitza -96 % sewered, Liaskovetz- 68% sewered; Qav = 50 920 m3/day; BOD5=480 mg/l; raw water load= 407 TEGW; TN=27 mg/l;TP=2,7 mg/l; BOD = 8921 t/a;COD=20 430 t/a; TN=502 t/a; TP= 50 t/a; The pollution originates from the population and the industry. The contribution of the industry to the BOD5 pollution load is 85-91%. This is mainly due to the sugar and alchohol factories (75-90% of the total contribution) depending on the seasonal load.
Seasonal Variations	The sugar beet treatment campaign (60-100 days) adds additional emission loads to the typical pollution from alchohol production (shlamp). The low water quantities in the river and high tempreatures during this season lead to a compounding of the situation. The point at the Yantra River after the town of Gorna Oryahovitza. The sampling point after the town of Gorna Oryahovitza 35% of all samples show BOD concentrations (30,8 - 160 mg/l)above maximum permissible limits; in 24% of the cases of N-NH4 are above maximum permissible limits (5,3-11,9 mg/l) in 40% of the cases of N-NO2 (0,08-0,11mg/l) compounded with oxygen deficit.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of potable groundwater sources . Construction of a WWTP will improve sanitary conditions for local people The Yantra has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The wastewater at the discharge point are coplored dark brown and have the specific odour of the pollutants, including H2S
Nearby Downstream Uses	The river and terrace waters are used for water supply and irrigation and water supply. After the discharge of the municipal waste waters the waters from the Yantra river terrace are used for water supply by the villages Pissarevo, Varbitza, Dolna Oryahovitza, Dobri Dyal and Kozarevetz and as sources for industrial waste water supply by some plants in the region. This poses a higher health risk in the region.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.2.1-1

Summary of Information for the Municipal hot Spots WWTP Troyan

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Troyan	Location-Osam River Basin; Beli Osam Sub-basin
Critical Emissions 1994-1997	Population 24 721; 80 % sewered; Qav = 28 200 m3/day; BOD5 = 200 mg/l; raw water load - 94 TEGW; SS = 220 mg/l; TN = 29, 0 mg/l; N- NH4 = 18,0 mg/l; TP = 3,4 mg/l; BOD =2 059 t/a;COD =4 460 t/a ; N=298 t/a; P=35 t/a
Seasonal Variations	1. The regitered concentrations of BOD5= 30,6-71,1 mg/l and N-NH4 = 2,56-3,94 mg/l are during the low flow months at the water quality monitoring station Ossam River, town of Troyan, which makes the river dilution capacity low. 2. There are some food industrial plants (winery, dairy, meat processing) with high emissions of organics and SS – these present a high pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	The town has a combined sewerage system. The industrial plants with high BOD5 pollution load are discharging in the sewerage. Contribution of the industrial emission Wastewaters from the industry are discharged into the municipal sewerage system and they form more than 85% of the BOD5 load (“Lessoplast” factory alone produces produces about 55%)
Receiving Waters	Periodically coloration of the waters is observed after the inflow of wastewater from the town of Troyan, as well as H2S odour.
Nearby Downstream Uses	River and terrace waters are used for water supply, irrigation and animal breeding. 25 km after the discharge point of the municipal waste water 80-100 l/sec are extracted for the water supply of Lovetch. It poses a health risk to more than 30 000 people who use the terrace waters for irrigation as as a potable water source.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.2.1-2

Summary of Information for the Municipal hot Spots WWTP Lovetch

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Lovetch	Location-Osam River Basin
Critical Emissions	Population 47 477; 55 % sewered; Qav = 29 600 m3/day; BOD5=160 mg/l; raw water load- 79 TEGW; SS= 170 mg/l; TN=42 mg/l; TP=2,8 mg/l; BOD = 1729 t/a;COD = 4020 t/a; TN=454 t/a; TP=30 t/a
Seasonal Variations	1. BOD5 concentrations of 25,42 - 29,40 mg/l, N-NH4 concentrations of 3,6-4,95 mg/l and N-NO2 concentrations reaching 0,29 mg/l have been measured during the low runoff seasons at the Ossam point at the town of Lovetch. (See Annex 4). No significant dilution by the waterreceiving body may be achieved. 2. Industrial plants (foodstuffs industry – Vinprom, canning industry, milk and meat processing) with higher emissions of organics and SS. This coincides with the low water periods.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	Waste waters from the industry, discharged into the municipal sewerage system form more than 40% of the total BOD5 load (the load attributable to “Velur” leather and hide plant is 15)
Receiving Waters	The discharge point of the wastewater has a weak H2S odour at low water levels.

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Lovetch	Location-Osam River Basin
Nearby Downstream Uses	The river and terrace waters are used for potable water supply, animal breeding. After the municipal wastewater discharge point water is extracted from the river terrace near the Omarevtzi village (potable water supply of the town of Lovech) This presents a high health risk for more than 60 000 people using the river terrace waters for irrigation and water supply.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.2.1-3

Summary of Information for the Municipal hot Spots WWTP Vratza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Vratza	Location-Ogosta River Basin; Leva River Sub-basin; Botunya River
Critical Emissions	Population 76 576 ; 80 % sewered; Qav = 37 400 m3/day;raw water load- 112 TEGW; WWTP under opperation; WWTP-Qav = 34 800 m3/day; BOD5= 20 mg/l, 254 t/a; TN=15 mg/l, 191 t/a; TP=2,4 mg/l, 30 t/a untreated Qav = 2 600 m3/day;BOD5=180mg/l, 171 t/a; raw water load- 8 TEGW; SS= 180 mg/l, 171 t/a; TN=35 mg/l, 33 t/a; TP=3,4mg/l, 3 t/a;
Seasonal Variations	Industrial enterprises (foodstuffs industry-Vinprom, milk and meat processing) with a higher emmisions of rganics and SS. The higher emissions coincide with the lower water runoff seasons.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of potable groundwater sources . Construction of a WWTP will improve sanitary conditions for local people The Ogosta has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The discharge of polluted water into the river has an adverse effect on the riverine ecosystem. It also affects the shallow underground water resources, which are infiltrated by water from the river. There is already a shortage of fresh water, both underground and at the surface. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	River and terrace waters are used for water supply, irrigation and animal breeding. This represents a high health risk for the irrigational and water supply purposes.
Transboundary Implications	There are no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.2.1-4

Summary of Information for the Municipal hot Spots WWTP Sofia

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Sofia	Location- Iskar River Basin
Critical Emissions	Population 1 116 823 ; 87 % sewered; Qav =642 200 m3/day, raw water load 1 371 TEGW; WWTP under operation Qav = 466 500 m3/day;BOD5 = 15 mg/l, 2 554 t/a; TN = 11 mg/l, 1 873 t/a; TP = 4,9 mg/l, 834 t/a; untreated Qav = 175 700 m3/day; BOD5 = 115 mg/l, 7 375 t/a; SS = 100 mg/l, 6 413 t/a; TN = 20 mg/l, 1 283 t/a; TP = 5,1 mg/l, 327 t/a.
Seasonal Variations	
Immediate Causes of Emissions	The reason for the emission is the need of rehabilitation and expansion of WWTP.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of surface water.
Receiving Waters	Periodically higher values of the indicators N-NH4, N-NO2 and petroleum products has been registered
Nearby Downstream Uses	River waters are used for the irrigation of adjacent agricultural lands, water supply for animal breeding and others.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority.

Source: National Review - Bulgaria, Part C - Table 2.2.1-5

Summary of Information for the Municipal hot Spots WWTP Sevlievo

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Sevlievo	Location-Yantra River Basin; Rossitza River Sub-basin
Critical Emissions	Population 25 435 ; 80 % sewered; Qav = 14 800 m3/day; BOD5= 220 mg/l; raw water load 54 TEGW; SS= 300 mg/l; TN= 34 mg/l; TP= 4,8 mg/l BOD =1188 t/a; COD = 2 280 t/a; TN= 184 t/a; TP= 26 t/a
Seasonal Variations	At the Rossitza River, Sevlievo Town sampling point, measured BOD5 values in the low water months range from 8,92 to 15,12 mg/l, N-NH4 concentrations range from 5,31 to 9,84 mg/l, at water quantities Q=0,16-0,87 m3/s. No significant dilution of the waste water takes place in the receiver. Industrial plants from the food processing industry (canning factory, dairy and meat processing) with high organic and SS emission load which coincides with the low water flow.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of the receiving waters. Construction of a WWTP will improve sanitary conditions for local people The Rossitza has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	Industrial wastewater discharge contributes to more than 60% of the total BOD5 load (this includes “Sevko” a tannery plants whise share is 26% of the BOD5 load.) The wastewater at the discharge points within the town limits have a specific odour. Coloration of the wastewater has also been observed.
Nearby Downstream Uses	The river waters are used for irrigation after the discharge of the municipal waste waters. This poses a health risk for the population.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority.

Source: National Review - Bulgaria, Part C - Table 2.2.1-6

High Priority Hot Spots - Industry

Summary of Information for the Industrial Hot Spots "Sugar & Alchohol Factory", Gorna Oryahovitza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Gorna Oriahovitza- Sugar and alcohol factory	Location-Yantra River Basin
Critical Emissions	The sugar and alcohol industrial wastewater are highly organics polluted. The variations are in a wide range during the day and during the year, depending of the tipe and the quantity of the production and the used row material. Presantly, the factory is working with the half capacity. The annual amound of the sugar been sugar is 13 000 to 15 000 t/a and the sugar reed sugar is 58 000 - 62 000 t/a. The annual production of sugar products is 6 000-6 500 t/a. Qav = 10 000 - 34 000 m3/day or 9 455 000 m3/a BOD = 6 800 t/a; TN = 300 t/a; TP = 0,55 t/a; SS = 7 330 t/a;
Seasonal Variations	The sugar and alcohol factories have the typical seasonal character. **The sugar factory**- The quantity of the wastewater discharge is high (Qav= 25 000 - 30 000 m3/day, 2 800 000 m3/a) during the sugar been campaign, which is 60 to 100 days in a year as well as September, October, November. The organic contamination is high too as BOD5= 500 to 1 100 mg/l, 1 540 t/a; TN= 35 mg/l, 98 t/a; SS= 400 to 600 mg/l,1400t/a. The quantity of the wastewater discharge is high (Qav= 20 000 - 24 000 m3/day, 2 200 000 m3/a) during the sugar reed campaign, which is 60 to 100 days in a year as well as June, July, August. The organic contamination is high too as BOD5= 400 to 800 mg/l, 1 000 t/a; TN= 35 mg/l, 77 t/a; SS= 350 to 500 mg/l,880t/a. The quantity of the wastewater discharge is high (Qav= 10 000-12 000 m3/day) out of campaign, during the all year. The organic contamination is BOD5= 80-300 mg/l, 290 t/a; TN= 15 mg/l, 50 t/a; SS= 100-130 mg/l, 430 t/a. The total quantity of the wastewater discharge is Qav= 8 300 000 m3/a; BOD5=2 830 t/a; TN= 225 t/a; SS= 2 710 t/a. **The alcohol factory** is working temporary. The organic pollution load is BOD5= 15-70 kg/m3. The average wastewater quantity is Qav=2 500 to 4 000 m3/day, 1 155 000 m3/a. The average concentration of BOD5 is from 2 to10 mg/l or 3970 t/a; TN= 30-100 mg/l, 75 t/a; TP= 0,55 t/a; SS= 1-5 mg/l, 4 620 t/a. The high value of the organic pollution is during the month with low river runoff. The sugar been sugar production campaign is running in the same time. Taking in to account the contribution of the other production lines as the alcohol and sugar products production is possible to explain the high BOD5, COD and SS loads and oxygen deficit.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of potable groundwater sources . Construction of a WWTP will improve sanitary conditions for local people The Yantra has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Gorna Oriahovitza- Sugar and alcohol factory	Location-Yantra River Basin
Receiving Waters	The wastewater at the discharge point are coloured dark brown and have the specific odour of the pollutants, including H2S. The low water quantities in the river and high tempreatures during this season lead to a compounding of the situation. The point at the Yantra River after the town of Gorna Oryahovitza. The sampling point after the town of Gorna Oryahovitza 35% of all samples show BOD concentrations (30,8 - 160 mg/l)above maximum permissible limits; in 24% of the cases of N-NH4 are above maximum permissible limits (5,3-11,9 mg/l) in 40% of the cases of N-NO2 (0,08-0,11mg/l) compounded with oxygen deficit. (see Annex 4). Moreover, it causes severe eutrophication and degradation of the riverine ecosystem.
Nearby Downstream Uses	The river and terrace waters are used for water supply and irrigation and water supply. After the discharge of the municipal waste waters the waters from the Yantra river terrace are used for water supply by the villages Pissarevo, Varbitza, Dolna Oryahovitza, Dobri Dyal and Kozarevetz and as sources for industrial waste water supply by some plants in the region. This poses a higher health risk in the region.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.4.1-1

Summary of Information for the Industrial Hot Spots Fertilizer Plant "Chimco", Vratza

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Vratza "Himco"	Location-Ogosta River Basin; Dubnica River Sub-basin; Lewa River
Critical Emissions	Qav = 15 000-24 000 m3/day BOD5 = 5-20 mg/l, 25 t/a; SS =119,6 t/a; TN = 20- 270 mg/l, 242,3 t/a; TP=3,6 t/a
Seasonal Variations	The regitered concentrations of N-NH4 over 100 mg/l; N-NO2 to 2,9 mg/l; N-NO3 to 31 mg/l are during the low flow months at the water quality monitoring stations Lewa River and Dabnika River. The high concentration of N-NO2 and other pollution caused the high concentration of N-NO3 near the mouth of the Ogosta River. No clear defined tendency towards water quality improvement may be observed.
Immediate Causes of Emissions	The reason for the emission is the absence of treatment facilities.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of potable groundwater sources . Construction of a WWTP will improve sanitary conditions for local people The Ogosta has been classified as Category III water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	Stronger ammonia odour is observed in the summer months. The discharge of polluted water into the rivers Lewa and Dabnika has an adverse effect on the riverine ecosystems. The presence of ammonia in the surface water is detrimental due to its toxic effects on the fish. In 1995 the annual average was 16 times over the maximum permissible limits. Higher concentrations of SS and petroleum products have also been observed. It also affects the shallow underground water resources, which are infiltrated by water from the river. There is already a shortage of fresh water, both underground and at the surface. It is therefore very important to prevent contamination of those fresh water resources remaining.
Nearby Downstream Uses	The river and terrace waters are used for irrigation, water supply and animal breeding. This presents a higher health risk for the population in contact with it.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.4.1-2

Summary Information for the Industrial Hot Spots "Antibiotic" Razgrad

Name of the Hot Spot	Summary of Information Used for Ranking the Hot Spot
Razgrad - "Antibiotic"	Location- Beli Lom River, Russenski Lom River Basin
Critical Emissions	*Inflow from "Antibiotic" Co* -Qav = 60.0-75.0 l/s, 5 200-6 500 m^3/day or 2 129x10^3 m^3/year; BOD_5 = 200-500 mg/l, BOD_5av=250 mg/l; SS= 70.0-400.0 mg/l SSav=200 mg/l; N-NH_4=60-150.0 mg/l; Norg=10-30 mg/l; P-5.0-15.0 mg/l The wastewater from the factory is treated biologically together with the domestic wastewater from the town of Razgrad. *Inflow from the town*- Qav=180-200 l/s; BOD_5 = 130-207 mg/l, BOD_5av=165mg/l *Inflow from "Antibiotic" Co+ the town*- - Qav=240-270 l/s; BOD_5av=188mg/l; SS=210-250 mg/l; N-NH_4=25-55.0 mg/l; Norg=10-20 mg/l; P-5.0-8.0 mg/l Outflow- combine WWTP- BOD_5 = 55-97 mg/l, BOD_5av=60mg/l ; SS=80-200 mg/l, SSav=150 mg/l; N-NH_4 over 2.0 mg/l; P over the permissible limit.
Seasonal Variations	There are some food industrial plants (dairy, meat processing, canning) with high emission of organic, greases and SS and nutriance - these present a pollution load during the low flow months.
Immediate Causes of Emissions	The reason for the emission is the insufficient wastewater treatment from "Antibiotic Plant" in Razgrad.
Root Causes of Water Quality Problems	This refers to the combination of circumstances that together create the problem which defines the hot spot. This include, a combination of an emissions discharge and a protection of potable groundwater sources . Completion of a WWTP will improve sanitary conditions for local people The Russenski Lom River has been classified as Category II water body in this region, but the water is unsuitable for irrigation purposes because of its high organic load. If this project is implemented, it will reduce organic pollution sufficiently that the water may be used for irrigation downstream.
Receiving Waters	The organic contamination of the Beli Lom river, indicated by the parameter BOD5 is high, BOD5max=27.43 mg/l (Q=0.46 m3/s-10/11/94 for the whole period Qmin=0.44 m3/s) and BOD5av= 16.42 mg/l (see Table 4.8-27); N-NO3av is 6.46 mg/l and N-NO3max is 11.88 mg/l (Q=0.49m3/s-23/02/95 for the whole period Qmin=0.44m3/s); N-NH4av is 4.62 mg/l (see table 4.8-27)and N-NH4max is 6.5 mg/l (Q=0.51m3/s -14/03/95, Qmin = 0.44m3/s, see table 4.8-20);
Nearby Downstream Uses	The river and terrace water are used for water supply of the village of Getzovo and Drianovetz and partly of the town of Razgrad. After the discharge of the industrial & municipal wastewater, there are about 19 sallow wells. The nearest one is located at 8 km. down the discharge.
Transboundary Implications	There is no transboundary implications.
Rank	The hot spot is presented as a simple statement of high priority

Source: National Review - Bulgaria, Part C - Table 2.4.1-3

Description of High Priority Hot Spots - Ukraine

Municipal Hot Spots - High Priority

Chernivtsy WWTP Hot Spot	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	Capacity: 285 TPE Load: 343 TPE Total BOD: 467.2 t. per year COD 966 t per year N 145.1 t per year P 18.3 t per year Chemical and Biological treatment Total discharge 33,387.9 th.cub.m per year
Seasonal Variations	Discharge into Prut river;
Immediate Causes of Emissions	insufficient capacity of waste water treatment facilities; poor condition of sewer system
Root Causes of Water Quality Problems	a large emissions discharge into a river with a small discharge especially in seasons with low water level
Receiving Waters	scarcity of aquatic organisms in the vicinity of the hot spot.
Nearby Downstream Uses	does not effect drinking water supply; effects ecosystem and water life of downstream rivers, recreation and sport fishing;
Transboundary Implications	may have transboundary impact on water users in Moldova and Romania
Rank	high priority

Source: National Review - Ukraine, Part C - Table 2.8

Uzhgorod WWTP Hot Spot	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	Capacity: 187.5TPE Load: 297.0 TPE Total BOD: 646 t. per year COD 807.5t per year N 326.7 t per year P 130.1 t per year Nutrient discharge, bacteriological pollution Chemical and Biological treatment Total discharge 28,908 th.cub.m per year
Seasonal Variations	Discharge into Uzh river;
Immediate Causes of Emissions	insufficient capacity of waste water treatment facilities for current situation, poor condition of the sewer system
Root Causes of Water Quality Problems	large emissions discharge into a river with a small discharge especially in seasons with low water level; outdated technological equipment resulting in bacteriological pollution;
Receiving Waters	scarcity of aquatic organisms in the vicinity of the hot spot in Uzh river; possible pollution by pathogenic microflora
Nearby Downstream Uses	does not effect drinking water supply; effects ecosystem and aquatic life of downstream rivers, recreation and sport fishing;
Transboundary Implications	may have transboundary impact on water users in; may be a source of bacteriological pollution
Rank	high priority

Source: National Review - Ukraine, Part C - Table 2.9

Kolomyia WWTP Hot Spot	Summary of Information Used for Ranking the Hot Spot
Critical Emissions	Capacity: 56.3 TPE Load: 71.3 TPE Total BOD: 149.0 t. per year COD 223.0 t per year N 106.0 t per year P 34.5 t per year Chemical and Biological treatment Total discharge 6,935 th.cub.m per year
Seasonal Variations	Discharge into Prut river; dilution factor under elaboration
Immediate Causes of Emissions	insufficient capacity of waste water treatment facilities; potentially pollution will increase along with improvement of economic situation
Root Causes of Water Quality Problems	a large emissions discharge into a river with a small discharge especially in seasons with low water level; poor condition of sewer system
Receiving Waters	scarcity of aquatic organisms in the vicinity of the hot spot in Prut river
Nearby Downstream Uses	effect drinking water supply; effects ecosystem and water life of downstream rivers, recreation and sport fishing;
Transboundary Implications	risk of transboundary impact on water users in Moldova and Romania is very low
Rank	high priority

Source: National Review - Ukraine, Part C - Table 2.10

Description of High Priority Hot Spots - Moldova

NN: 8

District: Ungeni
Treatment Plant: Town, TREATMENT PLANT
Water discharge ML/year - 3991
Percentage of each stage: Stage 1 - 100%; Stage 2 - 100%, Stage 3 - 0%
Population connected to sewer system: - 17200
Discharges of main pollutants in tones/year:

BOD	SS	N	P	Detergents	Petrol. prod.
25,2	47,1	122,6	7,5	1,18	0,2

Discharges are going to the Prut river. Industrial enterprises like railway station, carpet plant, food factory, some galvanic facilities etc. work without any seasonal variations and discharge waste waters directly to the municipal sewer system. Analytical equipment of the WWTP does not allow to analyze some ingredients, like heavy metals and some organic pollutants. The type of industries, developed in this town, allows to assume, that these ingredients should be in the waste waters. That is why, this Hot Spot can be ranked as a **high priority.**

NN: 12

District: Cantemir
Treatment Plant: Town, TREATMENT PLANT
Water discharge ML/year - 956
Percentage of each stage: Stage 1 - 100%; Stage 2 - 0%, Stage 3 - 0%
Population connected to sewer system: - 3150
Discharges of main pollutants in tones/year:

BOD	SS	N	P	Detergents	Petrol. prod.
52,6	41,4	13,9	1,8	0,21	0,11

Only mechanical treatment, with seasonal variation September-December (cannery plant). About 80% of all discharges are coming during this period. This region is beginning of the desiccated wetland area, which is only partially used in agriculture. In the nearest future this area can be used for large scale wetland restoration. Water quality of the Prut river in this region is deteriorated (see fig.1). At the same time, water resources from the river are largely used for different purposes, including drinking ones (towns Cantemir, Cahul some villages). Estimated population using this water is around 70000 inhabitants. Installation of the second stage of treatment is necessary. **High priority.**

Assortment and amounts (tones) of pesticides, buried in the repository in the district of Vulcanesti

NN	Name	tons	NN	Name	tons
1	2,4 -D Buthil ether	2,3	56	Magnesium chlorate	6,6
2	2,4-D Na	8,6	57	Metabiosulphate	0,1
3	2,4 -DA	148,9	58	Metaphos	21,0
4	2,4-DB	6,2	59	Metathion	0,3
5	AB preparation	8,4	60	Methaldehide	0,3
6	Anabasin sulfate	0,1	61	Methyl-parathion	1,0
7	Anthio	0,4	62	NRV	0,4
8	Atrazine	13,0	63	Naphtaline	2,4

NN	Name	tons	NN	Name	tons
9	Bensophosphate	0,5	64	Nemagone granulated	294,2
10	Betanal	0,2	65	Nitrafen	45,3
11	Calcium arsenate	9,1	66	Novozir	8,8
12	Carbolineum	23,6	67	Off Shut	1,4
13	Carbophos	1,9	68	Olgin	0,3
14	Carbothion	124,1	69	Pentatiuram	0,9
15	Chlorophos 7%	0,6	70	Perosine	17,5
16	Chlorophos 80%	17,2	71	Phosalon	0,2
17	Chomezin	13,0	72	Phtalophos	3,6
18	Copper acetate+arsenate	0,5	73	Polycarbacin	0,8
19	Copper chlorooxide	2,7	74	Polychlorcamphene	104,4
20	Copper naphtenate	24,5	75	Polychlorpiren	37,1
21	Copper sulfate	8,0	76	Polychome	0,5
22	Cosan	11,1	77	Polytriazine	67
23	Cupricol	1,2	78	Preparation 30	39,8
24	Cupritox	0,7	79	Prometrine	0,5
25	DCU	0,3	80	Radocor	1,7
26	DDT 15%	3,1	81	Ramrod	4,0
27	DDT 30%	318,9	82	Redion	1,5
28	DDT 5,5%	187,7	83	Rogor	2,1
29	DDT 75%	22,6	84	Rovicurt	1,5
30	DDT, technical	107,5	85	Semeron	0,1
31	DDT, paste	14,3	86	Sevine	21,5
32	Dalatone	30,7	87	Sulphur 80%	17,6
33	Dendrobacilline	6,4	88	Sulphur colloidal	16,6
34	Dicol	5,8	89	Sulphur ground	52,1
35	Difenamide	8,0	90	Symazine	31,9
36	Dinitroortocresol	3,8	91	TCA Na	5,1
37	Ditox	27,7	92	TMTD	9,0
38	Dosanex	0,3	93	Tetral	0,2
39	Enide	10,9	94	Thiosulphate	1,4
40	Entobacterine	70,5	95	Tiason	21,0
41	Ethersulphonate	39,0	96	Tilt	4,2
42	Fentiuram	0,5	97	Treflan	0,2
43	Ferrum sulfate	7,3	98	Tricholole - 5	10,0
44	Fundasol	0,1	99	Tritox	6,7
45	Granosane	11,6	100	Tur	10,9
46	HCH 12-25%	96,6	101	Unknown powders	680,5
47	HCH 16%	2,1	102	Venzar	0,1
48	HCH 20%	14,3	103	Vofatox	29,2
49	HCH technical	17,1	104	Zeapos	0,4
50	Hungazine	2,7	105	Zeazine	6,7
51	Isofen	0,5	106	Zineb	22,1
52	Keltane	12,3	107	Ziram	66,0
53	Lindane	0,2	108	Mixture of ferroconcrete & pesticides (fire remains)	800

NN	Name	tons	NN	Name	tons
54	Linuron	6,8	109	Fumigant G-17 grenades	800 units
55	MCPB	1,1		**TOTAL: 3937,9 Tones**	

This Hot Spot was constructed in 1978. Fulfilling of the dump had been going till 1986. Only official figures are presented in this table. At the same time on the base of the interview with the people participated in the construction of this dump the depth of each tank was 7-8 m and pesticides are deposited on the pressed clay surface. The volume of each tank is 8 m depth x 7-8 m width and 22-23 m length or about 1350 m3. Taking into account that plastic cellars with pesticides were pressed by bulldozers, it is possible to assume that the aggregation of the deposited material was close to the soil one and could be on the level of 1,6 - 1,8 t/m3. Based on it we can assume that there about 2300 tones of banned material in each tank. So as there are 15 tanks, it is possible to assume around 35-40000 tones of deposited material in this dump (it is only *estimations*, which seem reasonable, but for any estimations for the Pollution Reduction Programme official figures should be used). Adjacent area was also covered by the unauthorized dumping of pesticides. Recently all these plastic or paper cellars are covered by the runoff and are visible only partially.

There had been no special studies aimed on the studying of this dump on the state of environment in this region. At the same time, international expedition held in 1991 on the Danube river (Danube for whom and for what) reported about the detection of DDT and Lindane in the sediments only in this part of the Danube. Underground and shallow waters have not been studied for last 15-17 years and any information on the influence of the dump on the sate of environment is absent. Taking into account amounts, types of the deposited material, ways of deposition and lack of information this Hot Spot can be ranked as a **High priority.**

Annex 3.2 - B

Revision of Hot Spots and Identification of Transboundary Effects

Annex 3.2 – B Revision of Hot Spots and Identification of Transboundary Effects

COUNTRY: GERMANY				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Municipality	Abwasserzweck - weband Oberes Laucherttal	ok	N	eutrophication
	Mergelstetten - Brenz		N	eutrophication
	Leutkirch - Eschach, Iller		N	eutrophication
	Zweckeverband Obere Iller, Sonthofen	ok	N	eutrophication
	Munchen I - Isar	ok	N	eutrophication
	Munchen II - Isar	ok	N	eutrophication
	Zweckverband Starnberger See - Isaar	ok	N	eutrophication
	Zweckeverband Chiemsee - Inn	ok	N	eutrophication
Industry	ESSO AG Ingolstadt - Donau		N	eutrophication
	WNC - Nitrochemie GmBH Aschau - Inn		N	eutrophication

COUNTRY:AUSTRIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Municipality	Wien - HKA	ok	BOD,COD, N	Organic pollution, eutrophication
	Linz - Asten	ok	COD, N, P	
	Graz	ok	BOD,COD, N, P	Organic pollution, eutrophication
	Klagenfurt	ok	N	
	Salzburg / Siggerw.	hot spot deleted since WWTP was adapted for N and P removal in 1998	COD, N, P	
Industry	SCA Fine Paper Hallein	ok	BOD, COD	Organic pollution
	Biochemie GmbH Kundl	ok	N	

COUNTRY: CZECH REPUBLIC				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effect
High priority				
Municipality	1. Brno - Svratka [1]	ok	BOD, N, P	eutrophication, organic pollution
	2. Zlin - Little Drevnice [2]	ok	organic pollution, N, P	eutrophication, organic pollution

COUNTRY: CZECH REPUBLIC

Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effect
	3. Uherske Hradiste - Morava [5]	ok	organic pollution, N, P	eutrophication, organic pollution
	4. Hodonin - Morava [14]	ok	N, P	eutrophication, organic pollution
Industry	1. Otrokovice (tannery) - Morava [2]	ok	NH3, P	irrigation water, nature in border regions
	2. FOSFA Postorna (phosphate factory) - Dyje [3]	HOT SPOT DELETED SINCE NEW WWTP OPERATES AS OF 98		
Agriculture	1. Milotice (pig farm) - Kyjovka	ok	BOD, N	
	2. Gigan Dubnany - Kyjovka			
Medium priority				
Municipality	1. Breclav - Dyje [15]	ok		
	2. Olomouc - Morava [3]	HOT SPOT DELETED SINCE THIRD PHASE TREATMENT OPERATES AS OF 98		
	3. Prerov - Becva [4]	ok		
Industry	1. Hame - Babice	HOT SPOT DELETED SNCE NEW WWTP CONSTRUCTED		
	2. Tanex Vladislav - Jihlava	ok		
Agriculture	1.Kunovice - Morava	ok		
	2.Vel.Nemcice - Svratka	ok		
Low priority				
Municipality	1. Kromeriz - Morava [13]			
	2. Prostejov - Valova [6]			
	3. Znojmo - Dyje [9]			
Industry	1.Snaha Brtnice - Brtnice			
Agriculture	1. Strachotice - Dyje			

COUNTRY:SLOVAKIA

Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects in terms of Water Quality and Impact	
			Water Quality	Effect
High priority				
Municipality	1. Kosice - Hornad [10 GEF]	ok	BOD5, hazardous substances	on bathing and recreation and nature
	2. Nitra - Nitra [1 GEF]	ok		negligible
Industry	1. Novaky Chemical Plants - Nitra [4]	ok		no
	2. Bukocel Hencovce - Ondava [6 ?]	ok	SO4, chloride, BOD	drinking water in Hungary
Agriculture	Point sources are not reported.			
Medium priority				
Municipality	1. WWTP Malacky [2 GEF]			
	2. WWTP Banska Bystrica [3 GEF]			
	3. WWTP Humenne [7 GEF]			
	4. WWTP Michalovce [4 GEF]			
	5. WWTP Svidnik - [5 GEF]			

	6. Sewerage Trencin, right side - [6GEF]			
Industry	1. Istrochem Bratislava [1]			
	2. Povazske Chemical Plants Zilina [12]			
	3. Slovhodvab Senica n. Myjavou			
	4. Chemko Strazske [7]			
Agriculture	Point sources are not reported.			
		Low priority		
Municipality	1. Ruzomberok - Vah [8]			
	2. Topolcany - Nitra [9]			
Industry	1. ASSI DOMAN Sturovo - Danube [2]			
	2. Tanning Factory Bosany - Nitra [11]			
	3. Biotika Slovenska Lupca - Hron [10]			
	4. Bucina Zvolen - Hron / Trib [9]			
Agriculture	Point sources are not reported.			

COUNTRY: HUNGARY				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effect
		High priority		
Municipality	1. Gyor - Danube [6]			high
	2. Budapest - Danube [1, 2, 3]			high
	3. Dunaujvaros - Danube			high
	4. Szolnok - Tisza [7]	40000 inhabitants		small
	5. Szeged - Tisza [4]	construction to be finished		high
Industry	1. Szazhalombatta MOL (oil refinery) - Danube [4]			high
	2. Balatonfuzfo: NIKE Rt. (chemical ind.) - Sed-Nador [5]			high
	3. Kbarcika: Borsodchem (chemical ind.) - Sajo	?		medium
Agriculture	No at present.			
		Medium priority		
Municipality	1. Sopron – Ikva Creek	60000 inhabitants		
	2. Tatabanya – Altaler Creek	less than 100000		medium
	3. Veszprem – Veszpremi Sed	less than 100000		
	4. Szekesfehervar – Gaja Creek [15]			
	5. Kaposvar – Kapos Creek	?		
	6. Szombathely – Sorok Perint [11]			
	7. Zalaegerszeg – River Zala [9]			
	8. Keszthely – Lake Balaton	smaller than 100000		
	9. Balaton Region	smaller than 100000		
	10. Nagykanizsa – Cigeny Ch. [10]			
	11. Pecs – Pecsi viz Cr [8]			no
	12. Nyiregyhaza I. – No. VIII and IX Canal -Tisza [12]			

COUNTRY: HUNGARY				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effect
	13. Miskolc - Sajo [5]			medium
	14. Eger – Eger Creek	smaller than 100000		
	15. Debrecen – Kosely / Tisza [13]			high
	16. Kecskemet – Csukas Ch	smaller than 100000		
	17. Hodmezovasarh – Hodto-Kistisza	smaller than 100000		
	18. Bekescsaba – Eloviz Ch [14]			
Industry	1. Gyor: Szeszip. V. – Danube	?		medium
	2. Labatlan: Piszke Paper RT – Danube [9]			
	3. Nyergesujfalu: Viscosa – Danube	?		medium
	4. Budapest: Buszesz Works – Danube industrial plant	not on EMIS list		
	Budapest: Csepel Works - Danube [12]	industrial plant		
	5. Dunaujvaros: Dunapack – Danube [3]	paper		medium
	Dunaujvaros: Dunaferr - Danube [1]	metal		medium
	6. Petfurdo: Nitrogen Works – Sed-Nador [11]			
	7. Sajobabony: Waste Man. – Sajo	closed!		
	8. Tiszaujvaros:TVK Rt. – Tisza [15]			high
	9. Szolnok:TVM – Tisza (industrial plant)	not on EMIS list		high
	10. Rt Neusiedler paper - Tisza [6]	industrial plant		medium
Agriculture	No			
Low priority				
Municipality	1. Mosonmagyarovar - Mosoni Duna	all municipalities are below 100000 inhabitants		
	2. Esztergom - Kenyerm. Cr.			low
	3. Vac - Duna			
	4. Budaors - Hosszuret Cr.			
	5. Godollo - Rakos Creek			
	6. Salgotarjan - Tarjan Creek			
	7. Baja - Duna			
	8. Szazhalombatta - Duna			
	9. Papa - Bakony Creek			
	10. Siofok - Sio			
	11. Szekszard - Sio			
	12. Ozd - Hangony Cr.			
	13. Kazincbarcika - Sajo River			
	14. Gyongyos - Gyongyos Cr.			
	15. Nagykoros - Koros Cr.			
Industry	1. Dorog: Richter G. Ch. - Danube			
	2. Mohacs: Wood Ind. - Danube [2]			high
	3. Paks: Canning Fact. - Danube			
	4. Simon Tornya: Leather Fact. - Danube [10]			

COUNTRY: HUNGARY				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effect
	5. Pecs: Leather Factory - Drava [8 under municipal]			
	6. Kaba: Agroferm - Kosely [8]			
	7. Hszoboszio: MOL Rt. - Berettyo			
	8. Kfelegyhaza: GYTV - Tisza			
	9. Szolnok: Solami Ltd. - Tisza			
	10. Szolnok: Sugar Fact. - Tisza [7]			seasonally high impact
	11. Szarvas: Thermal W. - Koros			
	12. Mako: Floratom - Tisza			
Agriculture	1. Mocsa: Agr.Co-op. - Danube			
	2. Kornye: Agroindusrty - Danube			
	3. Budapest: Csepei Dunanekt. - Danube			
	4. Hildpuszta: Hajosvin - Local cr.			
	5. Heviz: Balaton Fishery Pic. - Balaton			
	6. Dalma Transdanubian Fruit - Local cr			
	7. Zagyvarekas: Conavis Rt. - Zagyva			
	8. Oroshaza: Agr. Co-op. Dozsa - Tisza			
	9. Folddeak: Agr.Co-op. - Tisza			

COUNTRY: SLOVENIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects in terms of Water Quality and Impact	
			Water Quality	Effect
		High priority		
Municipality	1. Maribor (3rd Phase) [2]			eutrophication - impact on HR Drava (impounded sections)
	2. Ljubljana (3rd phase) [1]			Sava eutrophication due to planned new dams (1 out of 7 already finished)
	3. Murska Sobota (3rd phase) [13]			small eutrophication
	4. Celje (3rd phase) [5]			medium eutrophication of Sava
	5. Rogaska Slatina	too small		high: Sava (drinking water inHR)
	6. Lendava	too small		low (Mura)
	7. Ljutomer	too small		low (Mura)
Industry	1. Vrhnika leather industry	should be on EMIS!		Sava: high (heavy metals + organic)
	2. ICEC Krsko paper factory [7]			Sava: high (heavy metals + organic)
	3. Pomurka Murska Sobota food industry [3]			Mura: medium
	4. Paloma pulp & paper plant [1]			Mura: high

Agriculture	1. Farm Ihan [12] very big			Sava: high
	2. Farm Podgrad	treatment not operational		Mura: high
	3. Farm Nemscak-Isakovci	treatment under construction		Mura: high
	4. Farm Jezera-Rakican [2]			Mura: high
Medium priority				
Municipality	1. Krsko	too small		Sava: high (Zagreb)
	2. Brezice	too small		Sava: high (Zagreb)
	3. Crnomelj	too small		Kolpa: high (Karlovac, Sisak)
	4. Metlika	too small		Kolpa: high (Karlovac, Sisak)
Industry	1. Pivovarna Lasko / Brewery Lasko - Sava [5]			medium
	2. Radece papir / Paper Radece - Sava [6]			low
Agriculture	None			
Low priority				
Municipality	1. Novo Mesto - Sava [12]			low (Zagreb)
	2. Velenje - Sava [10]			low
	3. Sevnica	too small		low
	4. Vrhnika - Sava [4]			low
	5. Trbovlje	too small		low
Industry	1. Mariborske / Dairy Maribor - Drava [4]			high
	2. Ljubljanske mlekarne / Dairy FactoryLjubljana - Sava [11]			low
	3. Pivovarna Union Ljubljana / Brewery Union Ljubljana - Sava [10]			low
Agriculture	None			

COUNTRY: CROATIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	1. Zagreb - Sava [8]			high
	2. Osijek - Drava [6]			high
	3. Varazdin - Drava [2]			
	4. Karlovac - Kupa [10]			
Industry	1. Belisce paper industry-Drava [3]			high
	2. IPK Osijek sugar factory - Drava [4]			organic load sesonally high
	3.Pliva - Savski Marof - Sava [6]			
	4. Sugar factory Zupanja [9]			organic load sesonally high
Agriculture	1. Luzani (pig farm) - Sava			impact on fish ponds only
Medium priority				
Municipality	1. Sisak - Sava [9]			medium
	2. Slavonski Brod - Sava [11]			medium

	3. Bjelovar - Cesma [12]			
	4. Belisce - Drava [5]			high
	5. Koprivnica - Drava [3]			high (Podravka - food industry)
Industry	1. Petrokemija Kutina - Sava [9]			
	2. Gavrilovic Petrinja - Kupa	production started latter then EMIS		
	3. Pik Vrbovec - Sava [11]			
	4. Ina - Oil Refinery Sisak	accidental pollution possible		high during the accidents
Agriculture	1. Farm Senkovac (pig farm) - Drava [2]			
Low priority				
Municipality	1. Cakovec - Drava [1]			
	2. Bilje - Drava	impact on Kopacki Rit		
	3. Vukovar - Danube [7]			small
Industry	1. Zeljezara Sisak - Sava [12]			medium
	2. IPK Vegetable Oil Factory Osijek - Drava	connected to Osijek sewage system (see beginning)		high
Agriculture	1. Farm Dubravica - Sava [7]			proposed protected area (in SLO)

COUNTRY: BOSNIA-HERZEGOVINA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	1. Sarajevo - Bosna [1]		high BOD	downstream high impact
	2. Tuzla - Bosna/Jala [4]		high BOD	
	3. Banja Luka - Vrbas [6]		high BOD	
Industry	1. Incel (Banja Luka) - Vrbas		pulp factory high BOD	high
	2. Celpak (Prijedor) - Una/Sana		pulp	high
	3. Natron (Maglaj) - Bosna [5]		pulp	high (low degradation)
	4. HAK(Tuzla) - Bosna/Jala		chlorinated organic compounds	high
	5. Koksara (Lukavac) - Bosna/Spreca		high N load	high
Agriculture	1. Nova Topola - Sava (90,000 pigs)			high
Medium priority				
Municipality	1. G. Vakuf, Bugojno, Vakuf - VRBAS			low
	2. Sarajevo Visoko regional system			low
Industry	1. Zenica - Bosna			medium
	2. Sodium factory Lukavac-Bosna			high
	3. Gorazde fertilizer company			medium
Agriculture	1. Farm BRCKO - Sava			low
	2. Farm Spreca - Tuzla - Bosna			low

COUNTRY: BOSNIA-HERZEGOVINA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Low priority				
Municipality	1. Travnik - Lasva			low
	2. Jajce - Pliva & Vrbas			low
	In addition The National Review lists all the communities (approximately 73) with over 5000 inhabitants that require WWTP's.)			
Industry	1. Teslic - Usora wood destilation			low
	2. Foca - Drina plywood sheet factory			low
	In addition , 19 big sources of industrial pollution and 19 sources of toxic pollution are not ranked. These cannot be identified in the EMIS list.			
Agriculture	1. Batmir - Bosna			low
	2. Farm Bijeljina - Sava			low

COUNTRY: YUGOSLAVIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	1. City of Belgrade (Central sewer system (Danube) and Ostruzmicki sewer system (Sava)	yet no EMIS list produced !!		high
	2. Novi Sad I - Danav			high
	3. Nis - Nisava			high
	4. Pristina - Sitnica			high
	5. Zrenjanin - Begej			high (together with Timisoara
	6. Pancevo - Danube			medium
	7. Vrbas/Kula/Crvenka - DTD Canal			medium
	8. Leskovac - J.Morava			medium
	9. Krusevac (Reg) - Z. Morava			medium
	10. Cacak - Z. Morava			medium
	11. Indjija-Pazova (Reg) - Danube			medium
	12. Sabac - Sava			high (industry)
	13. Vranje - J Morava			medium
	14. Valjevo - Kolubara			low
	15. Novi Pazar - Z Morava			low
	16. Subotica - Palic & Ludos Lakes			low
	17. Uzice - Z. Morava			low
	18. Zajecar - V. Timok			high
	19. Senta - Tisa			low
	20. Bor - Borska			high
	21. Priot - Nisava			low
	22. Pljevlja - Cehotina			medium
	23. Rozaje - Ibar			low
	24. Blace - Blatasnica			low

COUNTRY: YUGOSLAVIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	25. Kolasin - Tara			low
	26. Mojkovac - Tara			low
	27. Gusinje - Plavsko Lake			low
Industry	HI "Zorka"			
	Trepca - Flotacija			
	RTB "Bor" - Majdanpek			
	Trepca - Topionica			
	"FOPA"			
	TE "Obilic" A and B			
	Fab. amb. i kartona "Lepenka"			
	IHP "Prahovo"			
	RTB "Bor"			
Agriculture	1. DD IM Neoplanta - DD Cenji (pig farm) - Sirig			low
	2. DP 1. Decembar - pig farm - Zitoradja			medium
	3. DP Pik Varvarinsko Polje (pig farm) - Varvarin			medium
	4. Surcin (pig farm) - Surcin			medium
	5. Dragan Markovic (pig farm) Obrenovac			medium
	6. DD Carnex -Farmakop (pig farm) - Vrbas			high
	7. PDP Galad (pig farm) Kikinda			low
Medium priority				
Municipality	1. City of Belgrade: Batajnicki and Banatski sewer systems (Danube)			medium
	2 S. Mitrovica - Sava			low
	3. Kraljevo - Z. Morava			low
	4. Smederevo - Dunav			medium
	5. K. Mitrovica - Ibar			low
	6. Pozarevac** - V. Morava			low
	7. Knjazevac - B. Timok			low
	8. Gnjilane - Bin. Morava			low
	9. Vladicin Han - J. Morava			low
	10. Prokuplje - Toplica			low
	11. Bijelo Polje - Lim			low
	12. Pozega - Z. Morava			low
	13. Cuprija - V. Morava			low
	14. Berane - Lim			low
	15. Ruma - Sava			low
	16. Lazarevac - Kolubara			low
	17. Sjenica - Vapa			low

COUNTRY: YUGOSLAVIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	18. Lipljan - Sitnica			low
Industry				
Agriculture	1. "Pobeda" Gunaros - Subotica			low
	2. DP "Elan" - Srbobran			low
	3. PIK "Becej" - Becej			low
	4. PD "Halas Jozef" - Ada			low
	5. PK "Coka" - Coka			low
	6. DD "Stari Tamis" - Pancevo			low
	7. DP.IM Farma Svinja - Velika Plana			low
	8. DP "Petrovac" - Petrovac na Mlavi			low
	9. PD "Zajecar" - Zajecar			medium
	10. PKB "Viselj" - Padinska Skela			low
	11. PP "Panonija" - Secanj			low
Low priority				
Municipality	1. Loznica - Drina			medium
	2. Novi Sad II (desna obala) - Dunav			low
	3. Prijepolje - Lim			medium
	4. Priboj - Lim			medium
	5. Kovin - Dunav			low
	6. Ivanijica - Moravica			low
Industry	Secerana "Cuprija"			
	TENT - A			
	F-ka secera "Kristal"			
	TENT - B			
	REIK "Kolubara"			
	TE "Kostolac"			
Agriculture	1. DP "Cenej" - Cenej			low

COUNTRY: BULGARIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	1. Gorna Oriahovitza & Liaskovets - Yantra [4]			the high priority hot spots are located upsteream and in middle stream of the tributaries - very small transboundary effects
	2. Troyan - Ossam [10]			
	3. Lovetch - Ossam [13]			
	4. Vratza (rehab. and expansion) Dabnika Leva [11]			
	5. Sofia (rehab. and expansion) - Iskar [1]			
	6. Sevlievo - Rossitza [15]			

COUNTRY: BULGARIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Industry	1. Gorna Oriahovitza sugar and alcohol factory - Yantra [7]			the industrial plants are located upsteram and in the middle stream of the tributaries - very small transboundary effect
	2. "Chimco" Vratza fertilizer plant - Ogosta [13]			
	3. "Antibiotic" Razgrad pharmaceutics plant - Beli Lom [15]			
	Eliseina - copper smelter	was not in the Hot-Spots list, because of the ongoing programme for the improvement of the environmentt - financial support by japanese government		
Agriculture	Agriculuture has not been inclded in the ranking due to the incomleted land reforme and privatization of animal breeding facilities			
Medium priority				
Municipality	1. Montana - Ogosta [5]			
	2. Popovo Russenski Lom River Basin - Popovska [18]			
	3. Kostinbrod & Bojurishte (Blato River Basin/Several Small Towns) - Iskar	these towns are not in the EMIS list, because they have less than 10000 inhabitants		
Industry	1. Kremikovtzi (Metallurgical Plant) - Iskar Lessnovska [9]			the industrial plants are located upsteram and in the middle stream of the tributaries - very small transboundary effect
Agriculture	1. (All Classified as High Priority)	Agriculture has not been included in the ranking due to the incompleted land reforme and privatization of animal breeding facilities		
Low priority				
Municipality	1. Russe - Danube River [2]			
	2. Levski - Ossam River	is not in the EMIS list - less than 10000 inhabitants		there is an insignifficant transboundary effects due to the effluents of the identified hot spots; dilution ratio 1:2200
	3. Svishriv - Danube River			
	4. Vidin - Danube River [19]			
	5. Lom - Danube River [20]			
	6. Silistra - Danube River [16]			

COUNTRY: BULGARIA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Industry	1. Iskar River Basin (Elatzite Mining) - Malak Iskar River	it is not in the EMIS list, because the additional WWT facilities will be put into operation very soon		the industrial plants are located upsteram and in the middle stream of the tributaries - very small transboundary effect
Agriculture		Agriculture has not been included in the ranking due to the incompleted land reforme and privatization of animal breeding facilities		

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	7. Lasi - Bahlui / Prut [7]		BOD=1750 t/y COD=1930t/y N=368t/y P=60,4t/y	IASI has transboundary transfer of pollution in Prut on RO/MO border - resulting in degradation of the Prut River in downstream
	5. Braila - Danube / Danube [5]		the type of pollutant is mixed municipal and industrial waters	Braila and Galati towns are discharging without WWTP directly into the Danube
	17. Galati - Danube / Danube [17]			
	28. Craiova - Jiu / Jiu [28]			
	30. Resita - Barzava/Bega-Timis [30]			Resita as municipality has bacteriological, COD-Cr, BOD5 and heavy metal loads discharged in Birzava/Timis rivers few km upstream of RO/YU borders
	31. Resita - Barzava/Bega-Timis [31]			
	32. Timisoara-Bega/Bega-Timis [32]		BOD=3241+1149 t/y COD=3952+1453t/y N=6676162+20t/y P=97,7+75t/y	Timisoara in - TT in Bega/Timis. Going into Yugoslavia ??
	33. Timisoara-Bega/Bega-Timis [33]			
	34. Deva - Mures / Mures [34]			

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	43. Zalau - Zalau - Crasna [43]		BOD=499,6+66,14 t/y COD=563,47+222 t/y N=162+20t/y	Zalau discharging in Crasna - going into Hungary
	44. Zalau - Zalau - Crasna [44]			
	52. Campulung Muscei - Targului / Arges [52]			
	54. Bucharest-Dambovita/Arges [54]			
Industry	7. Phoenix Baia Mare (mine) - Sasar / Somes - Tisa [1]		COD=98,0t/y SSM=994t/y Fe=27,4t/y Cu=8,4t/y Lead=?03t/y	River Sasar-Somes TTP Hungary; change in water quality of receiver from I to degraded
	13. Petrom Suplac de Barcau (oil) - Barcau / Cris [4]	is in phase of implementation with 75% completed with GEF/USAID financial support	BOD=138,1t/y COD=153t/y SSM=153t/y	River Barclau /Cris; TTP Hungary; oil pollution and acccidents
	16. Sometra Copsa Mica (non-ferrous metal) - Tamava Mare / Mures [6]			
	17. Azomures Tg. Mures (chemicals) - Mures / Mures [7]			
	48. Doljchim Craiova (chemicals) - Jiu / Jiu [13]			
	55. Arpechim Pitesti (petrochemicals) - Dambovnik / Arges [23]			
	56. Petrobrazi Ploiesti (petrochemicals) - Prahova / Lalomita [24]			
	65. Letea Bacau (pulp & paper) - Bistrita / Siret [28]			
	70. Fibrex Savinesti (chemicals) - Bistrita / Siret [30]			
	71. Pergodur P Neamt (pulp & paper) - Bistrita / Siret [31]			
	76. Sidex Galati (iron)-Siret/Siret [34]		COD=2983t/y SSM=2903t/y Fe=15,1t/y Zn=8,4t/y Phenols=114t/y	River Siret/Danube; TTP in MO/UA
	77. Antibiotice Lasi (chemical pharmaceuticals) - Bahlui / Prut [35]		BOD=40,4t/y COD=64,3994t/y N=12t/y P=3,6t/y	River Bahlui Prut; TTP Moldova; river degraded in dowstream part
	79. Siderca Calarasi (iron) - Danube / Danube [36]		COD=21,2t/y SSM=331t/y Fe=6,4t/y Phenols=8,1t/y	River Danube; TTP RO/BG

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
Industry	87. Somes Dej (chemicals) - Somesul Mic / Somes - Tisa [2]		BOD=1168,1t/y COD=4144,2t/y N=130t/y	Somes Dej (chemicals); Somes River TTP in Hungary
	93. Indagrara Arad (food) - Mures / Mures [47]			
	100. Oltchim Rm. Valcea (chemicals) - Olt / Olt [52]			
	119. Sinteza SA Oradea (chemicals) - Crisul Repede / Cris [5]	??? USAID finance	Lead=310t/y Zn=845t/y Phenols=115t/y CN=0,1253t/y	River Cris; TTP in Hungary
	120. Clujana SA Cluj Napoca (leather) Somesul Mic/Somes-Tisa			Clujana sa Cluz Napoca (leather); river Somes TTP in Hungary; wq changes in river - receiver from I to III wq class
	121. Colorom Codlea (chemicals) - Vulcanita / Olt [18]			
	122. SC Favior Blanun Orashe (leather) - Mures			
	125. Celohart Donanis Braila (pulp & paper) - Danube / Danube		BOD=691t/y	River Danube; water quality changes in II category
	128. UPS Govora (chemicals) - Olt / Olt [19]			
	129. Manpel Tg. Mures (leather) - Sewage / Mures			
	Uranium Mining Stei Bihor (GEF/USAID)	was not included in HS list as well as on EMIS list; high transboundary effect in Hungary		River Cris; TTP Hungary
	Non ferrous Metals Mining Stei-Bihor on the Black Cris River			
	Oradea - metal works ???			
	Favior Orastie on the Mures r.			
	Celohart Braila on the Danube			
	Pianpel Tg Mures on Mures	are not included in EMIS lit this are on HS list and in NR		
Agriculture	111. Suiprod Independenta - Birladel / Siret			
	113. Comtom Tomesti - Bahlulet / Prut		BOD=15,8t/y COD=49,1t/y N=25,6t/y P=120t/y	Rivers Bahlui/Prut;TTP RO/MO
	115. Comsuin Ulmeni - Danube / Danube		BOD=575t/y COD=260t/y N=472t/y	Danube River; TTP RO/BG

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	22. Romsuin Test Peris - Vlasia / Lalomita	it is not included in EMIS list; proposal to remain		
	Medium priority			
Municipality	18. Targoviste-lalomita/lalomita [18]			
	23. Rm. Valcea - Olt / Olt [23]			
Industry	12. E.M.Borod-Borod/Crisul Repede	is not included on EMIS list because the minig activity will be partly reduced and may be cancelled		
	22. Siderurgica Hunedoara - Cerna / Mures [9]			
	23. E.M. Coranda Certej - Certej / Mures [10]			
	24. E.M. Rosia Montana - Abrud / Mures [11]			
	26. Ind. Sarmei Campia Turzil - Aries / Mures [12]			
	47. Nitramonia Fagaras-Olt/Olt [14]			
	48. Romacril Rasnov-Ghimbasel/Olt [16]			
	50. Celohart Zarnesti-Bistra/Olt [17]			
	54. Dacia Pitesti-Doamnei/Arges [22]			
	57. Romfosfochim Valea Calugareasca - Teleajen / IaIomita [25]			
	60. Astra Romana Ploiesti - Dambu / IaImita [26]			
	61. Petrotel Teleajen - Teleajen / IaIomita [27]			
	66. Chimcomplex Borzesti - Trotus / Siret [29]			
	72. Sofert Bacau-Bistrita/Siret [32]			
	73. Carom Onesti-Trotus/Siret [33]			
	80. Alum Tulcea-Danube/Dunare [37]			
	81. CICH Tr. Magurele - Danube / Dunare [38]			
	83. Romag Tr. Severin - Topolnita / Dunare [42]			
	89. Terapia Cluj - Somesul Mic / Somes Tisa			
Industry	91. Stratus Mob Blaj - Tarnave / Mures [46]			
	95. Nutrimur Iernut - Mures / Mures [48]			
	102. Ulcom Slobozia - IaIomita / IaIomita [54]			
	103. Beta Tandareni - IaIomita / IaIomita [55]			

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	110. Spirt Ghidiceni - Barlad / Siret [59]			
	126. Verachim Giurgiu - Danube / Dunare [40]			
	130. Comcem SA Calarasi - Danube / Dunare [41]			
Agriculture	88. Agrocomsuin Bontida -Somes Mic / Somes Tisa			
	90. Comsuin Moftin - Crasna / Somes Tisa			
	9. Comsuin Beregsau - Bega Veche / Bega - Timis			
	116. Braigal Braila - Danube / Danube			
	25. Combil Gh. Doja - IaIomita / IaIomita			
	29. Avicola Satu Mare - Sar / Somes			
Low priority				
Municipality	1. Calarsi - Danube [1]			
	2. Giurgiu - Danube [2]			
	3. Tulcea - Danube [3]			
	4. Drobeta Tr. Severin - Danube [4]			
	6. Botosani - Siret / Prut [6]			
	8. Barlad - Siret [8]			
	9. Vaslui - Siret [9]			
	10. Onesti - Siret [10]			
	11. Roman - Siret [11]			
	12.Focsani - Siret [12]			
	13. Suceava - Siret [13]			
	14. Piatra Neamt - Siret [14]			
	15. Bacau - Siret [15]			
	16. Buzau - Buzau [16]			
	19. Slobozia - lalomita [19]			
	20. Ploiesti - lalomita [20]			
	21. Sf. Gheorghe - Olt [21]			
	22. Slatina - Olt [22]			
	24. Sibiu - Olt [24]			
	25. Brasov - Olt [25]			
	26. Petrosani - Jiu [26]			
	27. Tg. Jiu [27]			
	29. Lugoj - Timis [29]			
	35. Turda - Mures [35]			
	36. Alba Iulia - Mures [36]			
	37. Hunedoara - Mures [37]			
	38. Medias - Mures [38]			
	39. Medias - Mures [39]			
	40. Tg. Mures - Mures [40]			
	41. Arad - Mures [41]			
	42. Oradea - Cris [42]			

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	45. Bistrita - Somes [45]			
	46. Bistrita - Somes [46]			
	47. Satu Mare - Somes [47]			
	48. Baja Mare - Somes [48]			
	49. Cluj - Somes [49]			
	50. Alexandria - Vedea [50]			
	51. Curtea de Arges - Arges [51]			
	53.Pitesti - Arges [53]			
Industry	1. E.M. Turt - Somes / Tisa			
	2. E.M Bala Borsa - Somes / Tisa			
	3. E.M Rodna - Somes / Tisa			
	4. Silcotub Zalau - Somes / Tisa			
	5. E.M Bala Mare Est-Somes/Tisa			
	6. E.M Bala Mare Vest-Somes/Tisa			
	8. Romplumb Bala Mare - Somes / Tisa			
	9. E.M Brad Barza - Cris			
	10. E.M Deva Brusturi - Cris			
	11. E.M Borod - Borod / Cris			
	14. E.M Voivozi - Cris			
	15. Petrom Marghita - Cris			
	18. Ampellum Alatna - Mures			
	19. E.M Bala de Aries - Mures			
	20. E.M Abrud - Mures			
	21. E.M Zlatna - Mures			
	27. Metalurgica Alud - Mures			
	28. Mecanica Cujmir - Mures			
	29. Sldermef Calan - Mures			
	30. E.M Polana Rusca Telluc-Mures			
	31. E.M Deva - Mures			
	32. Automecanica Medias - Mures			
	33. Resial Alba Lulla - Mures			
	34. Mins Deva - Mures			
	35. Socomef Otelul Rosu-Bega/Timis			
	36. E.M. Ruschita - Bega / Timis			
	37. Culocanul Nadrag - Bega / Timis			
	38. UCMR Resita - Bega / Timis			
	39. C.S. Resita - Bega / Timis			
	40. E.M Cludanovita - Bega/Timis			
	41. E.M Sasca Montana-Bega/Timis			
	42. Semag Toplet - Dunare			
	43. E.M. Petrila - Jiu			
	44. E.M. Lupeni - Jiu			
	45. E.M. Coroesti - Jiu			
	49. E.M. Capeni - Olt [20]			
	51. Mecanica Mirsa - Olt			
	52. Alro Slatina - Olt			
	53. Aro Campulung - Arges			

COUNTRY: Romania				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
	55. Arpechim Pitesti - Dambovnic / Arges			
	58. COS Targoviste - Ialomita			
	59. I.M. Mija - Ialomita			
	62. Cord Buzau - Buzau			
	63. Ductil Buzau - Buzau			
	64. Gerom Buzau - Buzau			
	67. S.P. Tarnita - Siret			
	68. E.M. Mestecanis - Siret			
	69. E.M. Tolovanu - Siret			
	74. Rafo Onesti - Siret			
	75. Rulmentul Barlad - Siret			
	78. Fortus lasi - Prut			
	82. I.M. Moldova Noua - Danube / Dunare			
	84. Corapet Corabia-Danube/Dunare			
	85. Tamico Corabia- Danube/Dunare			
	86. Dunacor Braila - Danube/Dunare [39]			
	92. Suinprod Salcud - Mures			
	94. Avicola Ungheni - Mures			
	96. Comsuin Periam-Mures/Aranca			
	97. Comsuin Birda - Bega / Timis			
	98. Comseltest Padureni - Bega / Timis [50]			
	101. Combilcarim Cazanesti - Ialomita			
	104. Suinded Dedulesti - Buzau			
	105. Suinprod - Siret			
	106. Mark Pork Vanatori - Siret			
	107. Suintest Focsani - Siret			
	108. Martincom Martinesti - Siret			
	109. Agricola Bacau - Siret			
	112. Pyretus Falclu - Prut [61]			
	114. Prodsuis Ulmeni - Prut			
	117. Cement Plant Alesd - Cris			
	118. Carbosim Copsa Mica - Mures			
	123. Rafo Darmanosti - Siret			
	124. Goscom Roman - Siret			
	127. Crescatoria Peris - Ialomita			
	131. SC Stimas Suceava - Siret			
Agriculture	114. Prodsuis Stanilesti - Prut			
	23. Integrata Comsuim Calarasi - Danube / Danube			
	26. Avicola Zalau - (None Listed)			
	27. Suin Prod Suceava - (None Listed)			
	28. ISCIP Zalau - (None Listed)			

COUNTRY: MOLDOVA				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
		High priority		
Municipality	1. Ungeni Town [7]			BOD, P,N and microbiology pollution of the border river (Prut) - MO/RO
	2. Cantemir Town [11]			
Industry	1. Vucanesti dump	?? It is soupposed, that it could be a sources of DDT and lindan pollution to the Danube		Assumed pollution of the Danube, Prut , lakes witz DDT and lindane, through penetration to the ground waters and migration with run-off
		Medium priority		
Municipality	1. Briceni (Sugar Plant's Treatment Plant) [1]			
	2. Briceni (Lipcani, Treatment Plant) [2]			
	3. Edinet (Cupcini, Treatment Plant) [3]			
	4. Cahul (Town, Treatment Plant) [12]			
	5. Comrat (Town, Treatment Plant)	are included in the EMIS list for 1999 ??		Nutrient loads, BOD, microbiology can affect Yalpugh lake in Ukraine via small tributaries in Moldova
	6. Taraclia (Town, Treatment Plant)			
Agriculture	1. Edinet (Pig Farm Treatment Plant)	is not included in the EMIS list, because data on emissions should be verified		possible pollution of the Prut River witz BOD, nutrients and microbiology
		Low priority		
Municipality	1. Riscani (Costesti, Treatment Plant) [4]			
	2. Glodeni (Glodeni Town, Treatment Plant) [5]			
	3. Falesti (Town, Treatment Plant) [6]			
	4. Ungeni (Costesti, Treatment Plant) [8]			
	5. Nisporeni (Town Treatment Plant) [9]			
	6. Leova (Town Treatment Plant) [10]			
Industry				

COUNTRY: UKRAINE				
Sector	Hot Spot	Comparison with EMIS List	Description of Transboundary Effects	
			Water Quality	Effects
High priority				
Municipality	1. Chernivtsy - Prut [1]	municipal hot spots are listed as emissinon group; severe pollutions due to severe flooding and bad conditions of dumping sites		nutrients, BOD, bacteriological pollution maz affect all countries bordering with Ukraine and cause deterioration of human heath; recreational resources and ecological functioning
	2. Uzhgorod - Uzh [5]			
	3. Kolomyia - Prut [3]			
Industry	High priority ranking is not applicable under current economic conditions.	industrial and municipal hot spots are listed in EMIS report		phenols and chlorinated compounds, oil products, heavy metals maz affect drinking water supply aquatic life functioning
Agriculture	High priority ranking is not applicable under current economic conditions.			
Medium priority				
Municipality	1. WWTP Mukachevo - [4] Latorytsa			
	2. WWTP Izmail - Danube [2]			
	3. Rakhiv (Cardboard Factory) - Prut			
Industry	1. Velyky Bychkiv (Timber Processing Plant) - Impact downstream aquatic life - Tisza			
	2. Velyky Bychkiv (Timber Processing Plant) - Impact downstream aquatic life - Danube			
Agriculture	Medium priority ranking is not applicable under current economic conditions.			
Low priority				
Municipality	(No Listings)			
Industry	1. Rakhiv (Cardboard Factory) - Uzh / Tisza [1]			
	2. Teresva Timber (Processing Factory) - Prut / Tisza [3]			

Agriculture	1. Put Lenina (Collective Farm) - No Available Data	agricultural hot spots are listed by NR as low priority . These and agriculture as whole need a study; severe pollution during floodings		though listed as low priority, potentially may be a source of heavy diffuse pollution in terms of nutrient and pesticides; may affect down stream countries; impact on down stream cuntries due to washing down soid waste, oil and grease pollution from heavy transnational traffic
	2. Pogranichnik (Collective Farm) - No Available Data			

Annex 3.2 - C

Hot Spots in the Sub-river Basins

Annex 3.2 - C: Hot Spots in the Sub-river Basins

Sub-river Basin	Sector	Priority	No	Name	Country
1. Upper Danube (D)	**Municipal**	*Medium*	1	Upper Laucher Municipalities	D
			2	Mergelstetten	D
			3	Leutkirch	D
			4	Upper Iller Municipalities	D
			5	München I	D
			6	MünchenII	D
			7	Starnberger See Municipalities	D
	Industrial	*Medium*	1	ESSO Ingolstadt	D
2. Inn (D,A)	**Municipal**	*Medium*	1	Chimsee Municipalities	D
	Industrial	*Medium*	1	Biochemie Kundl	A
			2	Hallein PCA Fine Paper	A
			3	WNC-Nitrochemie Aschau	D
3. Austrian Danube (A)	**Municipal**	*Medium*	1	Linz-Asten	A
4. Morava (CZ,SK,A)	**Municipal**	*High*	1	Brno - Svratka	CZ
			2	Zlin - Little Drevnice	CZ
			3	Uherske Hradiste - Morava	CZ
			4	Hodonin - Morava	CZ
		Medium	5	Prerov - Becva	CZ
			6	Breclav - Dyje	CZ
	Industrial	*High*	1	Otrokovice - Morava	CZ
		Medium	2	Tanex Vladislav - Jihlava	*CZ*
	Agriculture	*High*	1	Milotice (pig farm) - Kyjovka	CZ
			2	Gigan Dubnany - Kyjovka	CZ
		Medium	3	Kunovice - Morava	CZ
			4	Vel. Nemcice - Svratka	CZ
5. Váh - Hron (SK,CZ,H)	**Municipal**	*High*	1	Nitra - Nitra	SK
		Medium	2	Banska Bystrica	SK
			3	Topolcany	SK
			4	Severage Trencin	SK
	Industrial	*High*	1	Novaky Chemical Plants - Nitra	SK
		Medium	2	Povazske Chemical Plants Zilina	SK
6. Pann. Central Danube (A,SK,H,HR,YU)	**Municipal**	*High*	1	Györ	H
			2	Budapest North	H
			3	Budapest South	H
			4	Dunaujvaros	H
			5	Novi Sad	YU
			6	Indjija - Pazova	YU
		Medium	7	Wien HKA	A
			8	Sopron	H
			9	Szombathely	H

Sub-river Basin	Sector	Priority	No	Name	Country
			10	Zalaegerszeg	H
			11	Keszthely	H
			12	Balaton Region	H
			13	Veszprem	H
			14	Kaposvar	H
			15	Tatabanya	H
			16	Szekesfehervar	H
	Industrial	*High*	2	Szazhalombatta (oil refinery)	H
			1	Balatonfuzfo (chemical Industry)	H
		Medium	3	Istrochem Bratislava	SK
			4	Szeszip Györ	H
			5	Labatlan Piszke Paper RT	H
			6	Nyergesujfalu Viscosa	H
			7	Budapest Buszesz	H
			8	Budapest Csepel	H
			9	Dunaujvaros Dunaferr	H
			10	Dunaujvaros Dunapack	H
			11	Petfurdo Nitrogen Works	H
	Agricultural	*Medium*	1	Agr. Co-op.Mocsa	H
			2	Agroindustry Környe	H
			3	Dunakekt Budapest Csepel	H
			4	Balaton Fishery Hévitz	H
			5	Dalma Transdanubia	H
			6	Hildpuszta - Hajosvin	H
7. Drava - Mura (A,SLO,HR,H)	**Municipal**	*High*	1	Maribor	SLO
			2	Ptuj	SLO
			3	Murska Sobota	SLO
			4	Lendava	SLO
			5	Ljutomer	SLO
			6	Varazdin	HR
			7	Osijek	HR
		Medium	8	Klagenfurt	A
			9	Graz	A
			10	Nagykanizsa	H
			11	Koprivnica	HR
			12	Pécs	H
			13	Belisce	HR
	Industrial	*High*	1	Paloma pulp & paper plant	SLO
			2	Pomurka Murska Sobota food industry	SLO
			3	Belisce paper industry	HR
			4	IPK Osijek sugar factory	HR
	Agriculture	*High*	1	Farm Jezera - Rakican	SLO
			2	Farm Podgrad	SLO
			3	Farm Nemscak - Isakovci	SLO
		Medium	4	Farm Senkovac (pig farm)	HR

Sub-river Basin	Sector	Priority	No	Name	Country
8. Sava (SLO,HR,BIH,YU)	**Municipal**	*High*	1	Domzale	SLO
			2	Ljubljana	SLO
			3	Celje	SLO
			4	Rogaska Slatina	SLO
			5	Zagreb	HR
			6	Karlovac	HR
			7	Banja Luka	BIH
			8	Tuzla	BIH
			9	Sarajevo	BIH
			10	Sabac	YU
			11	Valjevo- Kolubara	YU
			12	Ostruzmiciki sewer system	YU
			13	Pljevlja - Cehotina	YU
			14	Mojkovac - Tara	YU
			15	Kolasin - Tara	YU
			16	Gusinje - Plavsko Lake	YU
		Medium	17	Kranj	SLO
			18	Skofja Loka	SLO
			19	Krsko	SLO
			20	Brezice	SLO
			21	Crnomelj	SLO
			22	Metlika	SLO
			23	Bjelovar - Cesma	HR
			24	Sisak	HR
			25	Slavonski Brod	HR
			26	Gornji Vakuf - Vrbas	BIH
			27	Sarajevo Visoko regional system	BIH
			28	Sremska Mitrovica	YU
			29	Ruma	YU
			30	Lazarevac - Kolubara	YU
			31	Sjenica - Vapa	YU
			32	Bijelo Polje - Lim	YU
			33	Berane - Lim	YU
	Industrial	*High*	1	Vrhnika leather industry	SLO
			2	ICEC Krsko paper factory	SLO
			3	Pliva Savski Marof	HR
			4	Celpak Prijedor - Una/ Sava	BIH
			5	Incel Banja Luka - Vrbas	BIH
			6	Natron Maglaj	BIH
			7	Koksara Lukavac	BIH
			8	HAK Tuzla	BIH
			9	Sugar factory Zupanja	HR
			10	HI Zarka - Sabac	YU
		Medium	11	Pivovarna Lasko/ Brewery	SLO
			12	Radece papir	SLO
			13	Pik Vrbovec	HR
			14	Gavrilovic Petrinja - Kupa	HR
			15	Ina - Oil Refinery Sisak	HR

Sub-river Basin	Sector	Priority	No	Name	Country
			16	Petrokemija Kutina	HR
			17	Zenica - Bosna	BIH
			18	Sodium factory Lukavac	BIH
	Agricultural	*High*	1	Farm Ihan	SLO
			2	Nova Topola (pigs)	BIH
			3	Luzani (pig farm)	HR
			4	Surcin pig farm	YU
			5	Dragan Markovic (pigs) Obrenovac	YU
		Medium	6	Farm Spreca - Tuzla	BIH
			7	Farm Brcko	BIH
			8	Padinska Skela	YU
9. Tisa (UA,SK,RO,H,YU)	**Municipal**	*High*	1	Kosice - Hornad	SK
			2	Uzhgorod	UA
			3	Oradea	RO
			4	Zalau - Crasna I	RO
			5	Zalau - Crasna II	RO
			6	Deva - Mures	RO
			7	Szeged	H
			8	Timisoara - Bega/ Timis I	RO
			9	Timisoara - Bega/ Timis II	RO
			10	Subotica - Palic & Ludos lakes	YU
			11	Senta - Tisa	YU
			12	Vrbas/ Kula/ Crvenaka - DTD Canal	YU
			13	Zrenjanin - Begej	YU
		Medium	14	Svidnik	SK
			15	Humenne	SK
			16	Michalovce	SK
			17	Mukachevo - Latorita	UA
			18	Eger	H
			19	Miskolc	H
			20	Nyiregyhaza	H
			21	Debrecen	H
			22	Kecskemet	H
			23	Bekescsaba	H
			24	Hodmezovasarh	H
	Industrial	*High*	1	Bukocel Hencovce - Ondava	SK
			2	Kazicbarcika Borsodchem - Sajo	H
			3	Phoenix Baia Mare (mine)	RO
			4	Somes Dej (chemicals)	RO
			5	Sinteza SA Oradea - Crisul Repede	RO
			6	Metal Works Oradea	RO
			7	Petrom Suplac de Barcau (oil)	RO
			8	Manpel - Tg. Mures	RO
			9	Clujana SA Cluj	RO
			10	Azomures Tg. Mures	RO
			11	Sometra Copsa Mica (non-ferrous metal)	RO
			12	Favior Orastie	RO

Sub-river Basin	Sector	Priority	No	Name	Country
			13	Indagrara Arad (food)	RO
			14	Uranium Mining Stei Bihor	RO
			15	Non ferrous Metals Mining	RO
			16	N. Knezevac	YU
		Medium	17	Chemko Strazske	SK
			18	Sajobabony (Waste Management)	H
			19	Tiszaujvaros	H
			20	Szolnok	H
			21	Velyky Bychkiv (Timber Processing Plant)	UA
			22	Terapia Cluj	RO
			23	E.M. Borod-Borod	RO
			24	Sarmei Campia Turzil	RO
			25	Nutrimur Iernut - Mures	RO
			26	Stratus Mob - Blaj	RO
			27	Certej	RO
			28	Siderurgica Huneduvara	RO
			29	Abrud	RO
	Agricultural	*High*	1	DD Carnex-Farmakop Vrbas	YU
			2	DD IM Neoplanta (pig farm) Sirig	YU
			3	PDP Galad (pig farm) Kikinda	YU
		Medium	4	Comsuin Moftin	RO
			5	Avicola Satu Mare	RO
			6	Agrocomsuin Bontida	RO
			7	Zagyvaréka - Conavis	H
			8	Folddéak Agr. Co-op.	H
			9	Orosháza Agr. Co-op.	H
			10	Pobeda Gunaros - Subotica	YU
			11	PD Halas Jozef - Ada	YU
			12	PIK Becej	YU
			13	DP Elan - Srbobran	YU
			14	Comsuin Beregsau - Bega/ Timis	RO
			15	PK Coka	YU
10. Banat - Eastern Serbia (RO,YU)	**Municipal**	*High*	1	Banatski sewer systems Beograd	YU
			2	Central sewer systems Beograd	YU
			3	Batajnicki sewer systems Beograd	YU
			4	Pancevo	YU
			5	Resita - Barzava Bega- Timis I	RO
			6	Resita - Barzava Bega- Timis II	RO
			7	Bor - Borska	YU
			8	Zajecar - V. Timok	YU
		Medium	9	Smederevo	YU
			10	Knjazevac - B. Timok	YU
	Industrial	*High*	1	RTB Bor - Majdanpek	YU
			2	RTB Bor	YU
			3	IHP Prahovo	YU

Sub-river Basin	Sector	Priority	No	Name	Country
	Agricultural	*High*	1	DP Petrovac	YU
		Medium	2	Zajecar	YU
			3	PP Panonija - Secanj	YU
			4	DD Stari tamis - Pancevo	YU
11. Velika Morava (YU,BG)	**Municipal**	*High*	1	Uzice	YU
			2	Cacak - Z. Morava	YU
			3	Krusevac - Z. Morava	YU
			4	Nis - Nisava	YU
			5	Priot - Nisava	YU
			6	Blace - Blatasnica	YU
			7	Novi Pazar	YU
			8	Pristina - Sitnica	YU
			9	Vranje	YU
			10	Leskovac	YU
			11	Rozaje - Ibar	YU
		Medium	12	Gnjilane - Bin. Morava	YU
			13	Lipljan - Sitnica	YU
			14	K. Mitrovica - Ibar	YU
			15	Vladicin Han	YU
			16	Pozega	YU
			17	Kraljevo	YU
			18	Prokuplje	YU
			19	Cuprija	YU
			20	Pozarevac	YU
	Industrial	*High*	1	Vladicin Han, paper mill	YU
			2	TE Obilic	YU
			3	Trepca - Flotacija	YU
			4	Trepca - Topionica	YU
	Agricultural	*High*	1	DP 1. Decembar - pig farm Zitoradja	YU
			2	DP Pik Varvarinsko Polje Varvarin	YU
		Medium	3	DP. IM Farma Svinja - Velika Plana	YU
12. Mizia - Dobrudzha (BG)	**Municipal**	*High*	1	Sofija - Iskar	BG
			2	Vratza - Dabnika Leva	BG
			3	Landfill Pleven	BG
			4	Troyan -Ossam	BG
			5	Lovec - Ossam	BG
			6	Sevlievo - Rossitza	BG
			7	Gorna Oriahovitza & Liaskovets	BG
		Medium	8	Kostinbrod & Bojurishte	BG
			9	Montana - Ogosta	BG
			10	Popovo Russenski Lom River	BG
	Industrial	*High*	1	Chimco Vratza fertilizer plant	BG
			2	Gorna Oriahovitza sugar and alcohol factory	BG
			3	Antibiotic Razgrad pharmaceutics plant - Beli Lom	BG

Sub-river Basin	Sector	Priority	No	Name	Country
		Medium	4	Kremikovtzi (metallurgical plant)	BG
13. Muntenia (RO)	**Municipal**	*High*	1	Craiova - Jiu	RO
			2	Campolung Muscei - Targului/ Arges	RO
			3	Bucharest-Dambovita/ Arges	RO
			4	Braila	RO
			5	Galati	RO
		Medium	6	Rm. Valcea - Olt	RO
			7	Targoviste-Lalomita	RO
	Industrial	*High*	1	Doljchim Craiova (chemicals) - Jiu	RO
			2	Oltchim RM. Valcea	RO
			3	UPS Govora (chemicals)	RO
			4	Arpechim Pitesti (petrochamicals)	RO
			5	Colorom Codlea - Vulcanita	RO
			6	Petrobrazi Ploiesti	RO
			7	Sidercaa Calarasi	RO
			8	Celohart Donanis Braila	RO
		Medium	9	Tr. Severin Romag	RO
			10	Dacia Pitesti	RO
			11	Nitramonia Fagaras	RO
			12	Celohart Zarnesti	RO
			13	Romacril Rasnov - Ghimbasel	RO
			14	Romfosfochim Valea	RO
			15	Petrotel Teleajen	RO
			16	Astra Romana Ploiesti	RO
			17	Tr. Magurele CICH	RO
			18	Giurgiu Verachim	RO
			19	Comcem SA Calarasi	RO
			20	Ukom Slubotzic	RO
			21	Beta Tandarei	RO
			22	Tulcea Alum	RO
	Agricultural	*High*	1	Romsuin test Peris - Vlasia/ Lalomita	RO
			2	Comsuin Ulmeni	RO
		Medium	3	Combil Gh. Doja - Lalomita	RO
			4	Braigal Braila	RO
14. Prut - Siret (UA,RO,MD)	**Municipal**	*High*	1	Kolomyia - Prut	UA
			2	Chernivtsy - Prut	UA
			3	Ungeni	MD
			4	Iasi - Prut	RO
			5	Cantemir	MD
		Medium	6	Briceni (sugar plant)	MD
			7	Edinet	MD
			8	Comrat	MD
			9	Cahul	MD
			10	Taraclia	MD
	Industrial	*High*	1	Pergodur P Neamt (pulp & paper) - Bistrita	RO

Sub-river Basin	Sector	Priority	No	Name	Country
			2	Fibrex Savinesti (chemicals) - Bistrita	RO
			3	Letea Bacau	RO
			4	Antibiotice Iasi (chemical) Prut	RO
			5	Sidex Galati	RO
			6	Vulcanesti dump	MD
		Medium	7	Sofert Bacau - Bistrita/ Siret	RO
			8	Carom Onesti - Trotus/ Siret	RO
			9	Chimcomplex Borzesti	RO
			10	Spirt Ghidiceni - Barlad	RO
	Agricultural	*High*	1	Comtom Tomesti - Bahluet/ Prut	RO
			2	Suiprod Independenta - Birladet/ Siret	RO
		Medium	3	Edinet pig farm	MD
15. Delta - Liman Region (UA,RO,MD)	**Municipal**	*Medium*	1	Izmail	UA
	Industrial	*Medium*	1	Tulcea	RO

Annex 3.2 - D

Tabulation of Workshop Suggestions on Verification of Water Quality Data, Additional monitoring Stations and Proposals for Additional Data

Annex 3.2 – D Tabulation of Workshop Suggestions on Verification of Water Quality Data, Additional monitoring Stations and Proposals for Additional Data

Verification of water quality data	Additional monitoring stations	Proposal for additional data
Time was too short for comparison (H) To be provided within 2 weeks Refer to H - w. B	Definition of transnational monitoring stations 1. define international monitoring	Toxic substances (e.g. heavy metals) especially in sediments
Data for **<u>BiH</u>** are from pre-war period. No monitoring now - stations out of operation (missing equipment)	Additional stations (or suggestion for improvement) 1. Hercegszanto - Batina - Bazdan joint measurements to be done at the same profile	Water temperature (nuclear power plants)
AU data on Water Quality at the FBS has to be corrected in accordance with National Reviews	Tisa river: Tisza-sziget - Martonos (H) (YU) joint measurements	Definition of transnational monitoring parameters
Data for Brazias station (RO1) has to be reviewed (BOD_5 is very high (i.e. 7.9)) ??	Sava river: MS "JAMENA" Border CRO-B&H-YU	set international standards establish TNMN station on each main river entering/leaving the country
Loads for Sava and Tisa River (i.e. BOD, N, P) are underestimated	River Drina: new TMNM MS RADAY	- TOC measurements
1. Set minimal standards for international monitoring (by MLIM group)	TNMN Danube: Ilok - B. Palanya (CRO) (YU) Sava: Jamena (CRO-B&H-YU)	AOX where organic chloride might be concerned
DRAU/DRAVA MUR/MURA missing data for 96, 97 could be delivered from results of bilateral cooperation	New: (YU/RO) - Bega Old: "HETIN" - Bega Canal: ITEBEJ - Timis: J. Tomic - Brzava: Markovicevo	Use data from last TNMN yearbook
SLO: verification to be completed within 2 weeks	YU/RO - Danube: "Kladovo" MS, Turnu-Severin (km 935), "Prahovo" (km 850)	
Slovenia: EMIS REP./ IND. No: 7, 8, 9 shall be combined in one = ICEC KRŠKO _ [7]	Additonal monitoring station in BiH -Janja on the river Drina (border river with YU)	
Slovenia: EMIS REP./ MUN. it is not clear what the criteria for selection were status quo is given instead of future situation	22 / ~50 / 150 please choose	
Border A-SLO Mura stations: A-SK Morava	Additional monitoring stations Sava (SLO), Drava (SLO), March (SK)	

Verification of water quality data	Additional monitoring stations	Proposal for additional data
RO WQ station existing in the NWQ system (RO) and in the transboundary conditions of the rivers may be included in TNMN	- Danube: Gruia/Radueva RO/YU - Siret: Pod Siret RO/UA - Somes: Oar RO/H - Crasna: Berveni RO/H - Barcau: Parhida RO/H - Crisul Repede: Cheresig RO/H - Crisul Negru: Zerind RO/H - Crisul Alb: Varsand RO/H - Mures: Nădlac RO/H - Aranca: Valcani RO/YU - Bega: Otelec RO/YU - Bega Veche: Cenei RO/YU - Timis: Grăniceri RO/YU - Birzava: Partos RO/YU - Caras: Vărădia RO/YU - Nera: Naidas RO/YU - Jiu: Zaval / Podari RO/BG - Olt: Cornet RO/BG - Vedea: Alexandria RO/BG - Ialomita: Slobozia RO/RO	Data and monitoring parameters from transnational and national monitoring systems will be optimised based on EU framework directive
UA Some need to be corrected	Latorytsia / Uzh (SL/UK) - monitoring + assessment Prut-proposal in preparation	To be proposed within the TACIS CBC project for Latorytsia/Uzh rivers on implementation of UN/ECE guidelines proposal for Prut in preparation
BG the correlation between water quality and water quantity cannot be made in many points. Water quality and water quantity should be measured at the same time.	No additional monitoring stations	
MD Water quality data are correct MD (1)	No additional monitoring stations on the Prut river To monitor Yalpugh river upstream Comrat town.	List of national monitoring stations is correct MD (3)

Annex 4 - A

Causal Chain Analysis for the Middle and Lower Danube Countries

TRANSBOUNDARY ANALYSIS

CAUSAL CHAIN ANALYSIS
FOR THE MIDDLE AND LOWER DANUBE BASIN COUNTRIES

April 1999

Prepared by
Zinke Environment Consulting and Mihaela Popovici,
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Executive Summary

This report gives the results of the Transboundary Analysis Workshop, which took place in Hernstein, Austria, from 25 to 31 January 1999. It was organized for all participating countries, signatories of the Danube River Protection Convention or adhering to its principles.

The available information in the national review reports, the results of the National Planning Workshops, as well as the Transboundary Analysis Workshop's analysis and discussion of the draft experts reports on the transboundary analysis, the Aggregated Sub basin Areas, priority wetland restoration and the joint Danube Black Sea Working Group Workshop facilitated the preparation of this Report, all prepared in the frame of the Environmental Danube Programme of the ICPDR, with the assistance of UNDP/GEF.

During the Workshop, three working groups for the Upper, Middle and Lower Basin countries discussed and developed their regional Causal Chain Analyses.

The **Upper Danube** region has been identified as the area that includes Germany, Austria, the Czech Republic and Slovakia, while the **Middle Danube** region incorporates Slovenia, Hungary, Croatia, Bosnia-Herzegovina and Yugoslavia. Germany and Austria are not eligible for UNDP/GEF assistance and did not undertake the same National Planning Workshops as the other Danube Basin countries; in addition, their pollution problems are usually in a magnitude smaller than in most other basin countries. For pragmatic reasons of this report, it was therefore agreed that, in this regional Causal Chain Analysis Report, the Czech Republic and Slovakia will be included into the Middle Danube chapter.

The country-by-country analysis of the Middle Danube indicates that there are several similarities of the state of water supply, sewerage collection and wastewater treatment. Inadequate management of municipal and industrial waste and unsatisfactory environmental protection significantly influences water quality conditions in this part of the Danube Basin. Particular causes and effects of pollution from point and diffuse sources have been analyzed in a sector approach, considering activities in the municipal, industrial and agricultural sectors, for both the upper and middle parts.

Based on the situation analysis and the problem analysis of the three main sectors, the core problem in the middle Danube region was identified for agricultural hot spots as ***"Unsustainable agricultural practices***"; industrial sector core problems were identified for all seven countries as ***"Ecologically unfriendly industry"***, and, for the municipal sector, the core problem is described as ***"Inadequate management of municipal sewage and waste"***.

The **Lower Danube** Region has been identified as the area that includes Romania, Bulgaria, Moldova and Ukraine. Again, improper water resources management and insufficient environmental protection significantly influence water quality conditions also in this part of the Danube Basin. Particular causes and effects of pollution from point and diffuse sources have been analyzed in the agricultural, industrial and urban sectors.

Based on the situation analysis and the problem analysis of the three main sectors, the core problem in the lower Danube region was identified for agricultural hot spots as ***"Missing implementation of sustainable agriculture"***. Industrial sector core problems were identified for all four countries as ***"Pollution prevention and abatement from industry not achieved"***, and, for municipalities, it is the ***"Inefficient management of waste waters and solid waste"***.

1. Introduction into the Middle and Lower Danube Region

1.1. Background

This report is focused on the upper, middle and lower parts of the Danube River basin, which is a territory marked with a great diversity, with densely or sparsely inhabited areas, with plains and mountains.

There are major political, economic and social similarities and differences between the countries located in the three parts of basin. Germany and Austria as highly developed EU member countries are in their economic and environment protection performance very different from the other basin countries. In addition, the accelerated reform measures in the middle region has advantages compared to the delayed reform of the lower Danube region. The comprehensive reform program combined with an active policy to introduce new economic instruments and incentives, and to encourage foreign investments and environmental regulations' enforcement brought the reduction of pollution in several hot spots. The key problem is how to harmonize the requirements and needs of industry and state with global rules of resource management aiming at sustainable development. It is clear that the new policy of water resources management, adopted or under adoption, must necessarily follow the trends generally adopted in Europe and in the world, to provide a better and healthier environment.

The economy of most basin countries is undergoing a major transition from a centralized to a market economy. The scope and timing of environmental improvements is closely linked to the success of this transition. The context of environmental policy will be determined by the profound economic changes.

Table 1 Population, area and GDP data

Country	Population (inhabitants in 1996)	Total area (km^2)	Part (%) located in the Danube basin	GDP (Billion $)		
				1994	1995	1997
Germany	82,100,000	356,778	16			2034
Austria	8,100,000	83,850	96			195,7
Czech Republic	10,300,000	78,866	27			48,9
Slovakia	5,400,000	49,014	90			19,5
Hungary	10,200,000	93,030	100			44,5
Slovenia	2,000,000	20,253	86			17,4
Croatia	4,784,265	56,542	61	14,23	18,08	18,6
Bosnia-Herzegovina	3,798,333	51,129	76			-
Yugoslavia	10,577,200	102,173	87	13.86	14,68	15,69
Bulgaria	8,500,000	110,911	42.3	10,25	12,366	9,9
Romania	22,600,000	238,391	98	27,9	35,533	34,6
Moldova	4,320,000	33,840	35	3,853	3,518	1,9
Ukraine	53,000,000	603,700	5.4	80,92	80,127	***81,7

Sources: National Workshop Reports 1998

* *ENCARTA 1994*

** *World Development Report World Bank 1995*

*** *Internet info (1996)*

The main goal of the Danube Pollution Reduction Program, started at the end of 1997 and carried out simultaneously in 11 riparian countries, is to prepare documents presenting the existing situation at national level, as well as proposals for improving the situation in short, medium and long term. For improving the quality of the environmental factors in the Danube River Basin, the Environmental Program for the Danube River Basin started in 1992, having as main objective the creation of necessary infrastructure to implement the Convention on the Cooperation for the Protection and Sustainable Use of the Danube. The Czech Republic, Croatia, Hungary and Romania have ratified the Sofia Convention while, for example, Bosnia Herzegovina, Slovenia, Bulgaria and Moldova see signing the Convention as one of the ways to eventually lead their country into EU membership, and it is definitely one of the instruments for achieving harmonization of European water quality standards.

All the results obtained both in the GEF Pollution Reduction Program and the Danube Environmental Program are meant to support the activity within the Convention.

The middle (including the Czech Republic and Slovakia) and lower Danube region are affected as a result of three main polluters: *municipalities* with inadequate treatment facilities for waste waters; *industry* with little or no treatment of waste and production waters, and the improper disposal of contaminated solid waste, and finally, the *agricultural sector* with excessive use of pesticides and fertilizers and unsatisfactory agricultural practices.

The *Czech Republic* is mostly an exporter of water pollution. Pollution from the Dyje part of the sub-basin is mostly caught in water reservoirs, from which the Nové Mlýny Reservoir is the most important. The Morava sub-basin represents the part of the Danube Basin within the territory of the Czech Republic which is ecologically very valuable. Although part of the Czech economy is concentrated in the Morava sub-basin; the environmentally most problematic problems stemming from industrial agglomerations in the country are located in other river basins. The lowlands represent the most fertile part of the Czech Republic. Intensive agriculture with large-area and large-capacity ways of production has significant impacts on landscape generally and on water management especially. Excessive use of chemical substances, concentrated livestock farming and inappropriate use of land, have together with extensive forestry caused either pollution of soil and water or extreme soil erosion. After 1990, the intensity of agricultural activities has rapidly decreased in some branches but the content of dangerous substances in soil has retreated very slowly.

Eleven major rivers drain *Slovakia*, out of which nine belong to the Danube river basin. The Danube River Basin area consists of the Morava, Danube and Small Danube sub-basins. Some transboundary effects from Austria are perceived from waters flowing into Slovakia due to a sugar factory Hohenau, and to small Austrian agglomerations (e.g. Wolfsthal and Kittsee). From Slovak side, the enterprises of Slovhodváb Senica –fibre production and ASSI DOMAN are effective. Floods can have also significant transboundary effect. Overall environmental quality in this area is influenced by agricultural activities which have been identified as improper agrotechnical methods, inappropriate handling with wastes from livestock, point pollution sources from storage of organic fertilizers. Industrial activities contribute to pollution through discharges of insufficiently treated waters. Within the communal sphere the insufficient treatment of municipal waste waters, bypassing of rain and wastewater, existence of uncontrolled waste dumps and leakage of nutrients from septic tanks in Žitný Ostrov (Big Danube Island) have significant negative effect on the environment. Agriculture represents also a significant diffuse pollution source.

For *Hungary*, the privilege of being entirely situated in the Danube river basin leads to the highest per capita situation in the world. Water management and environmental protection activities of the upstream countries, from where 96% of the surface water resources (rivers) enter Hungary, affect the water quality conditions of most surface waters in Hungary. Some of the rivers entering from abroad (Hernád, Bodrog, Szamos, Kraszna, Maros) carry high pollution loads, originating from industrial, municipal and agricultural sources in the upper catchment area. Transboundary accidental water pollution incidents are also a cause for temporary water quality deterioration along these rivers.

Due to the high diluting effects of the big rivers in Hungary (Danube, Dráva and Tisza), their quality conditions are influenced by rather unfavorable values of microbiological parameters. In spite of local water quality problems along the Danube, in general, there are no significant differences in the entering and leaving quality of the river waters in Hungary.

The Danube basin covers 81% of the *Slovenian* territory. Here, the water of the Danube tributaries (biggest are Sava, Drava and Mura) is used as drinking water, and for industrial and agricultural purposes. In spite of its small size, Slovenia is geographically very diverse (alpine, highly precipitated, sub-alpine, hilly and plain areas). Special characteristics are the high proportion of forests in land cover (54%) and the karst region with its large underground water system. Together with the industry, several large cities located along the tributaries are responsible for large wastewater discharges flowing out through Croatia, Hungary and further downstream the Danube.

All the major rivers on the territory of *Croatia* (the Sava, Drava, Danube, Mura, Neretva, with the exception of the Kupa River) either spring, or flow away - or both - outside its borders. Many settlements and towns as well as industries are located along the Drava River, the Sava River and the Danube River, which also contributes to the quality of water of the Danube River. The main water bodies of the sub-basin are the Sava River with eight main tributaries (Sutla, Krapina, Lonja, Orljava, Bosut, Kupa, Suncica, Sunja and Una River The other major tributary to the Danube in Croatia, the Drava, is not a national river but also comes from the countries located to the North and West of Croatia. Major tributaries of the Drava River in Croatia are the Mura River, Plitvica, Bednja, Bistra, Kopanjek Zupanjski Kanal, Karasica and Vucica. The Danube is the largest river in Croatia and does not have the importance as a water resource as the Drava and Sava. Major tributaries to the Danube in Croatia are the River Vuka and the Baranjska Karasica. In the Sava River catchment area in the northern part, various thermal mineral springs (Stubicke Toplice, Varazdinske Toplice, Tuheljske Toplice etc.) are found. Many problems connected with the Danube River system are coming from the water from upstream countries. This is especially true for different types of water pollution degradation and other non-controlled situations which could happen in the upstream countries.

An individuality of this region is given by *Bosnia-Herzegovina*, with its institutional and monetary instabilities during the war and pre-war, as well as with the huge economic (transition to market economy) and social (migration of thousands of displaced refugees) consequences of the war. In Bosnia and Herzegovina, belonging to the former socialist countries, the war (lasting from 1992 to the end of 1996) brought a lot of destruction and damage to the country and its people in various aspects. The most serious environmental problems are localized in hot spots where point sources of pollution cause hazards to the health of the local population. In the future, the pollution in hot spot areas might be again intensified after the re-launching of heavy industries. The economic transition has affected water and wastewater management by eliminating some industrial discharges where enterprises have been closed. The analysis of the data provided by some countries indicates that the domestic water consumption and waste generation were reduced after the raising of water prices and tariffs.

The Danube River receives water from 76% of the whole Bosnia - Herzegovina territory, considered as one of Europe's richest areas in available water resources. Most important river is the Sava which flows along the border with Croatia, with its main tributaries Una, Vrbas, Bosna, and Drina. Characteristic for all these tributaries is the big altitude difference between their source in the mountainous region and the mouth in lowlands, as well as large water quantities that makes them fast and strong. The result is an important hydropower potential.

Some of these rivers carry high pollution loads, due to improper water management and insufficient environmental protection, which significantly affect the water quality conditions in the country. Moreover, also a transboundary adverse impact on the river morphological status (river bed and bank erosion) can be identified: since the war no activity on the river bank protection was undertaken. Finally, negative transboundary effects were found, inclu-ding pollution of soil, ground- and surface waters, eutrophication, degradation of structure and composition of biocenoses, and toxic substances in the food-chain. These effects result in a reduced availability of water for different purposes, in a damage of fauna and flora and in health risks. Unfortunately, no water quality monitoring has been set up in Bosnia-Herzegovina in the post-war period. Before the war, there were 58 water quality stations, out of which 53 in the Sava River Basin.

The territory of the *FR Yugoslavia*, with respect to its natural diversity and wealth, is ecologically one of the most important geographical regions in Europe. Yugoslavia has a preserved biodiversity, a great wealth in water bodies – rivers, lakes and seas. On the territory of Yugoslavia there are nine national parks, twelve national reserves (scientific, special and other) and five nature reserves under international protection. The Danube river basin of Yugoslavia is the most developed and most densely populated part of the Federal Republic of Yugoslavia (FRY), comprising the most fertile farmland, major administrative, cultural and educational centers, the largest power-generating and industrial facilities, the main traffic corridors and well known historical landmarks and nature reserves. As another particular case, the state of environment in the FR of Yugoslavia was especially affected in the period between 1992 and 1995 by international embargo and imposed UN sanctions.

The countries of the *lower Danube region* (Bulgaria, Romania, Moldova and Ukraine) are considering, due to their geographical position in the catchment, the Danube problems to be closely linked to their effect upon the Danube Delta, as well as upon the Black Sea; all these elements are seen as included in the same trophic chain, in which the upstream changes have direct implication upon the downstream links. The most serious environmental problems in the lower Danube region are localized in hot spots where point sources of pollution cause hazards to the health of the local population. Pollution in hot spot areas mostly stems from municipalities and heavy industry.

A very special sector of the Danube River in this region is the Danube Delta. Due to its very peculiar features, it deserves a special attention, being declared by the Romanian Government as a Biosphere Reserve and recognized by “The Man and Biosphere Programme” of UNESCO for its universal value. The 45th parallel marking the mid-way line between the North Pole and the Equator actually runs through the reserve.

This report represents a significant contribution to the activities under GEF - UNDP. Together with its predecessors, the “National Reviews ” and “National Planning Workshop” reports it is another step towards the establishing of a regular reporting routine on the state of the environment in the countries of the Danube river basin.

1.2. Methodological Approach

The organization of the Transboundary Analysis Workshop in Austria is part of the planning process to develop the Danube Pollution Reduction Programme in line with the policies of the Danube River Protection Convention. UNDP/GEF gives its technical and financial support to organize a country-driven planning process and to ensure involvement of all stakeholders at national as well as at regional level.

The first step of this process consisted in the elaboration of National Reviews, with particular attention to the collection of viable water quality data, in the analysis of social and economic framework conditions, the definition of financing mechanisms and the identification of national priority projects for pollution reduction. The results of these studies represented the baseline information for participants of the National Planning Workshops. Moreover, they represented the national contribution, in technical, economic and financial terms, for the elaboration of the Danube Pollution Reduction Programme with particular attention to transboundary issues and the development of an investment portfolio.

The achievements of the national workshops contributed to national planning, with particular attention to the development of sector-related strategies and actions for pollution reduction and protection of aquatic ecosystems and resources. At the regional level, the results of the workshop held in Hernstein, Austria, helped to define transboundary issues and to develop regional strategies and actions for the revision of Strategic Action Plan of the ICPDR.

The steps of analysis of the workshop included:

- Validation of data and information on hot spots and water quality and proposal for additional data/parameters and monitoring stations;
- Revision of hot spots and identification of the transboundary effects;
- Causal chain analysis to determine the causes of transboundary effects;
- Identification, characterization and assessment of alternative interventions to reduce pollution which causes transboundary effects;
- Determine effects of pollution reduction measures to Danube and Black Sea Ecosystems.

Identified projects will be taken into account in the elaboration of the Danube Pollution Reduction Programme and in particular in the Investment Portfolio for each group of the countries.

The causal chain analysis serves to determine the causes of transboundary effects, to identify and evaluate alternative interventions to reduce pollution causing transboundary effects. This was achieved by taking into account actions and projects developed in National Workshop Summary Reports, for the municipal, industrial and agricultural and diffuse sources of pollution, including the development of remedial measures in wetlands areas.

The Czech Republic and Slovakia (together with Germany and Austria) formed one of the three working groups in the Hernstein Workshop, while Hungary, Slovenia, Croatia, Bosnia-Herzegovina and Yugoslavia were organized as the second middle Danube region. All seven countries are presented in this Report as one group. The third working group was composed of all Lower Danube countries, i.e. Bulgaria, Romania, Moldova and Ukraine.

2. Sector Strategies in the Middle Danube Region

In the Transboundary Analysis Workshop in Hernstein, Vienna, representatives of Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Bosnia-Herzegovina and Yugoslavia have been searching for more effective alternative interventions to reduce pollution, which causes transboundary effects, and ways to encourage behavioral changes of the polluters.

One of the most important work tasks during the Transboundary Analysis Workshop for the upper and middle Danube region called for the preparation of a regional causal chain analysis, based on common study elements: the preliminary information of the draft report on Transboundary Analysis and the National Planning Workshop Reports of the seven countries involved.

The causal chain analysis was prepared by sectors, within the upper and respectively the middle region, and now the two regions are being integrated from a basin-wide point of view.

The results of the National Planning Workshop Reports were considered when analyzing immediate causes and root causes, for point and diffuse sources, as well as the effects of pollution on Significant Impact Areas, identified during the workshop.

In order to identify alternative interventions, each of the sectors was thoroughly examined:

2.1. Municipalities

2.1.1. Situation Analysis

The objectives of the municipalities sector include

i. use proper waste management practices,
ii. implement environmentally sound waste management by developing funding mechanisms,
iii. consider suitable legislation and monitoring system, as well as
iv. raise public awareness and commitment;
v. eliminate weaknesses in municipal waste water treatment plants,
vi. operate by optimizing technologies and sludge treatment,
vii. introduce improved technical and financial regulations, and
viii. develop human resources and managerial skills. This will also incorporate: operate sewage systems efficiently by expanding the existing network and develop the information system, introducing sound management of the systems and optimize operation activities by introducing modern repair equipment.

The impact of industrial pollution on the efficiency of municipal wastewater treatment plants and sludge treatment is large, especially in the cases where industrial effluents from various industrial plants are discharged into the municipal sewers. Unfortunately, in most of the medium and small industrial units in this region, the sewage systems are mixed – by integrated collection of wastewater from rainfalls, households and industry. The lack of waste water treatment plants for the majority of the localities, the improper operation of the existing ones, and the outdated and insufficient sewage systems led to substantial pollution of the surface and groundwater with nutrients. Another major source of contamination of surface and groundwater from municipalities is the inadequate management of solid waste. The municipalities establish the collection of solid waste but no or few measures are taken in all countries of the upper and middle Danube regions for separation, re-use or recycling of the waste. The hazard of surface and groundwater contamination arises from the lack of bottom insulation and leachate treatment facility, as well as the storage of industrial and hazardous wastes.

Neither in *Germany* nor in *Austria*, municipal “Hot Spots” were identified but several “sources of pollution” (seven in Germany, four in Austria) where the level of pollution emissions has still to be lowered to meet national standards.

In the Czech Republic, all towns and also many small municipalities are already equipped with wastewater treatment plants. The pollution at the border is in fact the total of upstream discharges with respect to the self-cleaning ability and the bearing capacity of rivers. The actual level of pollution in different parameters is the result of the treatment efficiency in existing wastewater treatment plants. Many parameters are influenced also by industrial and/or agricultural sources. The Czech Republic considers the urban traffic to influence in a small extent the transfer of insoluble substances and oil products after rainy periods while the risk of accidents, disasters and pollution discharged from industrial enterprises is high. In the year 1996, out of the total number of accidents in the Czech Republic, 15% were caused by transportation and 7% by wrong operation of gasoline stations. Moreover, the risk of accidents and disasters in border localities exists due to the dense and frequent road and railway transport system near the border with Slovakia and Austria.

79,84% of the population in Slovakia have public water supply systems but only 12,96 % of settlements have complete sewer systems, which are about 53,03 % of the total Slovak population. The lowest level of wastewater collection is in some northern and south-eastern regions less than 30% of the population served by sewerage. The typical sewer system is the separate, sanitary sewer, only larger towns are served by combined sewers. In general, urban drainage systems are defective; infiltration of groundwater causes problems in almost every settlement. The majority of local industrial wastewater is collected together with municipal wastewater and consequently they are treated at municipal treatment plants. Only about 90% of all collected waste water is treated in 204 municipal waste water treatment plants run by waterworks and 77 by municipalities, however, only less than 50 % of all WWTPs meet recent environmental standards. The main reason of insufficient treatment is hydraulic and mass overloading, the next problem the quality of wastewater (impact of industry connected to public sewer systems). The high portion of groundwater infiltration causes dilution of wastewater and decreases its temperature which causes problems at the treatment plants.

Sludge treatment and disposal is a tremendous problem in Slovakia, as well. The current complex situation and the future production of sludge are affected by two dominant factors: the changes in effluent standards and newer tighter sludge disposal regulations. The reduction of organic pollution and nutrients discharged to receivers requires upgrading of the existing treatment plants and building new ones for both phosphorus and nitrogen removal. This assumes a gradual increase of sewage sludge production. Sludge disposal is the main contemporary problem of sludge management. The actual quality of the sludge as well as sewage sludge disposal regulations have resulted in a significant reduction of its agricultural utilization. The main problem is contamination of sludge by heavy metals, which prevents sludge disposal on agricultural land, therefore landfills has become the most frequent method of sludge disposal in Slovakia.

The amount of municipal wastewater discharged into surface waters exceeds 80% of the total amount of wastewater to be treated in *Hungary*. This amount is approximately four times higher than the industrial wastewater to be treated, which is discharged directly into surface water and several thousand times higher than the wastewater discharge originating from agricultural point sources. In addition, the rate of the suitably treated water (about 40%) is the same, both in the case of industrial and municipal wastewater. Evidence shows that 60-70% of the nutrient load (N, P) is the result of population load.

Within the sector, municipal wastewater discharge is the major pollution source. Municipal wastewater discharge consists of wastewater discharged by households, institutions and industrial facilities. Their untreated wastewater discharge in canalized areas causes significant surface water pollution. The majority of sewage is either not purified or if it is, then not adequately. Illegal wastewater release into the river system is not a rare event in Hungary. Municipal solid waste discharges is also a polluting activity. Only 30 % of the landfills are conform to the currently valid, public sanitation and environmental protection regulations. The problem is similar with the unsuitable treatment of septic tanks.

Measurements of the quantity of wastewater generated by different polluting sources and its material composition are not fully controlled by municipalities in *Slovenia.* Polluters do not generally monitor effluents. In regions without public supply, the problem is much more acute, as uncontrolled pollution is a potential threat to water resources.

The majority of the existing WWTPs are oversized in capacity and special attention during coming period should be given to the use of their excess capacity.

In *Bosnia - Herzegovina*, it is important to emphasize that most wastewater treatment plants were destroyed during war. About 57% of the population of Bosnia - Herzegovina live in hot spot areas. Only 50% of the population are connected to public water supply systems, while the rest use alternative water sources. Losses in water supply systems are very big (30-70%) due to damages and their non-maintenance during the war. Only about 35% of the population are connected to sewerage systems (57% of urban population, while the rural population discharges the waste in improper septic tanks). 90% of urban waste waters are discharged directly into the water courses, without previous treatment, due to non-existing wastewater treatment plants or their destruction by war activities. All over Bosnia-Herzegovina, only six city wastewater treatment plants operated before the war (in Sarajevo, Trebinje, Ljubuski, Gradacac, Celinac and Trnovo), while two were about to be put into operation (in Grude and Odzak).

Water quality had been recorded since 1965. It can be assumed that water quality has improved during war because factories have not been working or worked with reduced capacity, meaning pollution was decreased, but no exact data are available. Waste waters and solid waste from urban areas present constant threat to the environment. As the minority of households is connected to central sewerage systems, there are no waste water treatment plants or sanitary landfills, which causes further pollution of water and soil and presents health risk for the population.

As the major part of the population lives in larger cities at tributaries (about 2,356,000 inhabitants: during the war rural population migrated toward cities), this contributes to a significant pollution of the environment either through improperly collected and untreated waste water or improperly disposed solid waste. On the whole territory of Bosnia - Herzegovina, the sewerage system for waste water disposal is inadequate or damaged and there is not a single landfill built properly and in accordance with international norms.

It can be assumed that a certain amount of pollution of the Sava river comes from Croatia/Slovenia, and of the Drina river from the Federal Republic of Yugoslavia (municipal and industrial waste waters), but there are no data on the pollution in- and outflow from Bosnia-Herzegovina.

The waste waters from the largest part (88%) of the settlements within the Danube basin in *Yugoslavia*, mostly the rural type with a population of less than 2,000, either discharged directly into the natural watercourses or into inappropriate septic pits. Settlements with over 15,000 inhabitants, including the largest ones, make only 2.2% of the total number of settlements within the DRB of FRY but they are producing more than 90% of the total municipal pollution load, discharged into the recipients.

60% of all urban inhabitants, living in DRB in FRY, are connected to the public sewer systems. 20 WWTPs are under construction, with the total design capacity of 2,000,000 PE; the degree of their completion varies from 10% to 60%.

Another major source of contamination of surface and ground waters from municipalities of Yugoslavia is inadequate management of their solid wastes. There are almost 200 larger solid waste disposal sites within the area, none being conform with the major criteria for sanitary landfill, with respect to the selection of the site, the construction and the method of use. The great majority, of them are disorganized open dumps and the process of their sanitation and recultivation started few years ago. An additional problem is that approximately 80% of those dumps are located in the immediate vicinity of watercourses and, sometimes, on their very banks. Since there is no liner (plastic or impervious clay) underneath the disposed waste, the leachate penetrates into the alluvial soil and even into groundwater.

2.1.2. Analysis of Transboundary Effects

Transboundary water pollution in the upper and middle parts of the Danube river basin is dominated by the problem of phosphorus and nitrogen levels, in association with flows of nutrients and the exposure to eutrophication. Transboundary concerns strengthen the need to give priority to investments leading to prevent and control irreversible damages of vulnerable ecosystems. The water quality and the waste water and solid waste management in the Danube river basin have a significant impact on inland and coastal wetlands, which are internationally important due to their role as habitats for migratory birds.

The levels of phosphorus and nitrogen, from upstream cities, industries and agricultural run-off, are already high by the time the Danube reaches Slovakia.

Main expected transboundary effects are:

- **Deterioration of water quality**

  Apart from larger cities (i.e. Zagreb, Ljubljana, Karlovac, Sisak, Novi Sad, Belgrade) where also no waste water treatment is provided for, there are several other small locations with untreated or inadequately treated municipal waste waters, along the rivers (i.e. Yugoslavia: Apatin, Backa Palanka, Pancevo, Smederevo, Kovin, Golubac, Donji Milanovac, Kladovo, and Negotin). Slovakia receives the polluted waters from the eastern part of the Bodrog river basin, which is in the Ukraine. Occasionally, some accidental pollution occurs (oil spills). Most rivers of Slovakia originate here and from the source to the border section, they receive the waste waters from many industrial and municipal sources. Hungary is a receiving country, located south of Slovakia. Hungary has a similar character of alluvial zones used for drinking water supply in the northern part of the country, so the risk of endangering their drinking water supplies is evident. The pollution produced in Slovenia is somehow transported to Croatia if adequate treatment of wastewater is not achieved. Another contributing factor is the absence of a treatment plant in Rogaška Slatina, Slovenia. The content of phosphorus and nitrogen is already increased at the entering point in Croatia, before adding the contribution of pollution sources within the country. The main transboundary effect on the upper Danube region is considered to be related to the flows of nutrients and the danger of eutrophication: Breclav and Hodonin are considered hot spots for the Czech Republic due to the their strongly affected downstream environment.

- **Deterioration of drinking water**

  The pollution leaked from solid waste disposal sites can affect the whole range of water use sectors, including water intakes for drinking purposes, industrial use, irrigation, recreation. The main source of water supply in Croatia is groundwater which is supplied by Drava and Sava rivers. Outflows of untreated (polluted) water directly into the main watercourses in Slovenia (Sava, Drava, Mura River) causes problems for the water supply in Croatia due to increased concentrations of nutrients. Increased concentrations of phosphorus and nitrogen result in latent eutrophication of the main watercourses (Sava, Drava, Mura River), boundary rivers (Mura, Ledava, Sotla and Kolpa River) and, eventually, (critical) eutrophication is observed in the Black Sea. Therefore, the entire food chain is affected in the Black Sea, problems to aquatic life caused by quantities of toxic materials (pesticides, etc.) occur and the biological balance is ruined. Hungary transfers polluted water to the neighboring (downstream) countries through three major rivers (Danube, Tisza, and Dráva). Beyond this permanent pollution, there are accidental ones (e.g. oil spill or algae bloom caused by unfavorable meteorological situations). The proportion of Slovak population connected to public water supply is the lowest in the upper and middle region, and 25% of the delivered water fails to meet drinking water standards. Moreover, only 42% of the collected waste waters are treated and the water quality of rivers is very inferior.

- **Concentration of pollutants in water and in sediments**

  This effect is partly caused also by river transport of upstream pollution. Mainly heavy metals influence the quality of sediments. In the Czech Republic, a relatively low dilution capacity, a large number of industrial toxic effluents and agricultural loads affect river water quality. Visible pollution in the Sava river sub-basin, on the territory of Bosnia Herzegovina, appears in form of solid matter (plastics, wood) – a potential risk of endangering water by leached hazardous pollutants. The potential risk in the Czech Republic comes from old landfills which are not well protected. The hazardous pollutants which usually are not removed by the self-cleaning processes in rivers can be transported far away from the source and affect the quality of transboundary waters.

- **Effects on biodiversity**

  The deterioration of the water quality by pollution, especially by introduction of nutrients (N and P), accelerates the eutrophication process; as a result biodiversity in the ecosystem can be reduced. Introduction of nutrients and other polluting substances with inadequately treated municipal waste waters and improper disposal of municipal solid waste in the DRB in FRY is only part of the general problem. The effects of the upstream pollution should be taken into account also, although it is difficult to differ the two by simple measuring of N and P contents in the Danube water on the borderlines, due to the space and time differences. It is estimated that the total emission of nitrogen and phosphorus in the DRB in FRY is about 43,000 t/year and 14,000 t/year, respectively.

  Many disturbed areas exist along the Morava river in the Czech Republic even in locations declared as protected landscape areas or national parks. The landfills and dumps represent the typical sources of such kind of disturbances. Loss or changes of biodiversity in protected area represent a major concern in the Czech Republic. Limitation of movement of migrating water species is often found in rivers, e.g. in impounded and regulated river sections throughout the basin. Near the Czech-Slovak-Austrian border, an important European bio-center is located as well as several wetlands protected according to the Ramsar Convention. The biodiversity of this area is extremely valuable and must be well protected. For Hungary, the existence of the Lake Balaton brings many benefits in terms of recreation and tourism, but there are also several concerns in relation to the significant land run-of and overloading due to the masses of tourists.

2.1.3. Problem Analysis

The core problem for middle Danube region in the Transboundary Analysis Workshop and National Workshop Reports was defined as being the

"Inadequate management of municipal sewage and waste".

There are many reasons why current water services, including wastewater and solid waste systems will have to change. Policy makers in the examined countries often ignore the environmental costs of exploiting the water resources. These costs may affect the abstraction volumes, by reducing river flows, affect tourism and recreational activities, or reduce the dilution of waste effluents and either increase their adverse effects or force the end user to install more expensive wastewater treatment procedures to compensate these effects.

The identified ***immediate causes***, integrated from the middle basin-wide viewpoint, including effects on the user downstream, in wetlands, in the Danube Delta and Black Sea ecosystems, are:

- **Absence or insufficient waste water treatment plants**

  This refers to the insufficiency of wastewater treatment plants, the lack of appropriate financial and accounting mechanisms, to the direct discharge of wastewater into the receivers, due to unsatisfactory budgets to cover the operational costs for waste water treatment plants; to incomplete sludge treatment; to the inadequate location of waste water treatment plants.

  - *Improper / bad operaton of waste water treatment plants*

  This is due to lack of measurement and control systems between the steps of treatment technology applied and poor maintenance of waste waters treatment plants.

  - *Incomplete sewage collection systems*,

  including inadequate individual sewage system as well as inappropriate construction and use of sewerage systems represents another transboundary effect mentioned by participating countries.

- **Improper landfills for solid waste disposal**

  Inappropriate management of land fills together with inadequate legal financing conditions, insufficient involvement of responsible bodies, inappropriate equipment for solid waste treatment, lack of spaces for garbage collection, inadequate disposal of hazardous waste, in addition to the existing low level of public participation reflect the characteristics of the countries of the Middle Danube part.

  Bad or lack of monitoring and enforcement:

  The lack of enforcement of environmental regulations and standards, the insufficiency of environmental awareness in addition to the large absence of proper monitoring contribute to the increase of pollution in the middle Danube countries.

The ***root causes*** of transboundary water quality problems for the Middle Danube region include:

- **Economic recession/ collapse**

  Economic recession and restructuring during the transition period in the last decade have led to a strong reduction of industrial production, consequently of pollution The consequences of economic recession, the use of subsidies that encouraged the excessive use of water, the lack of integration of environmental considerations into the economic policies for ensuring both economic and environmental benefits („win-win" policies) and the absence of market forces to control pollution wherever possible represent the main issues to be mentioned when a long-run sustainability of environmental improvements is not achieved.

- **Lack of legislation**

  - *Inappropriate physical and technical planning*

  have caused severe distortions in the water pollution control and abatement programs. The absence of a comprehensive approach in the planning of pollution control investments and the lack of a strong regulatory/legal framework to define and enforce pollution control policies and management through the implementation of the Polluter-Pays-Principle represent main problem areas.

  - *Lack of funds for constructing and operating waste water treatment plants*

  accompanied by the absence of an appropriate system of cost recovery and user fees that would require water users and polluters to pay adequately for the use of water resource and the cost of treatment and sewage.

  - *Insufficient institutional capacity*

  able to carry on the responsibilities of pollution control and environmental regulations' implementation contributes at the same extent to the depreciation of water quality in the middle Danube region.

- **Low public ecological awareness**

  is relevant to safety measures, including improved institutional, technological, managerial systems and equipment, environmental responsibilities, health hazards due to pollution or integration of environmental consideration into the economic growth policies. It is important to build up the framework to collect and exchange information about the trends in water quality and polluted effluents to facilitate public participation and involvement in the making decision process.

2.1.4. Environmental Effects of Pollution on Signification Impact Areas

Improper disposal of waste water and solid waste has negative impacts upon environment, so that there is a pronounced pollution of soil, water, protected well fields, potable water sources, and finally water courses. All this has a negative impact upon development of flora and fauna as well as upon human health.

The ***immediate environmental effects*** identified for the municipalities are:

- **Increase of nutrients and pollutants in waters (groundwater and surface waters)**

  Small and medium size industries, located within the settlements, discharge their waste waters into the municipal sewers, usually without any pre-treatment, introducing toxics into the wastewater. The direct discharge of untreated water from municipal sewage systems into the surface water courses creates a high load of nutrients (most of the municipalities in the region, especially in Bosnia-Herzegovina). The result is the degradation of the aquatic ecosystems, which affects the biodiversity in the rivers. Moreover, the untreated waste dump drainage water discharged into the surface water course affects the whole aquatic ecosystems, producing a high health risk.

- **Bacteriological pollution**

  Due to pollution with pesticide residuals, nutrient loads and bacteriological contamination from agriculture as well as bacteriological contamination from municipalities the adverse effects are considerable.

- **Soil pollution**

  Soil pollution has harmful effects upon flora and fauna as well as upon the human health in the regions. Contaminated soil composition, climatic conditions and seasonal variations can significantly affect natural treatment performances.

The ***ultimate effects*** were defined by:

- **Limited water use: drinking water, irrigation, recreation, fisheries, etc.**
  Increased levels of nutrients in waste water, the uncertainty in those levels, high concentrations of nitrate, ammonia, iron, and magnesium have raised serious-concerns and direct problems for various water source users.
- **Decrease of biodiversity**
  In spite of a lower density of population in some parts of the regions, the transition to market economy accompanied by a high level of pollution contributed to the decrease of biodiversity in several sensitive wetland areas. The biodiversity has been influenced due to inappropriate locations for solid waste landfills, polluted effluents from wastewater pre-treatment plants, and finally due to inefficient management of the wastewater of the municipalities. The changes in the hydrological regime and rapid soil erosion characterise impacts in the aquatic environment and in wet habitats as a result of inappropriate activities in municipalities and rural areas.
- **Increased health risk**
  The hazards for human health are very high in some parts of the region due to the specific pollutants. The polluted watercourses crossing the settlements have an unfavorable impact over the hygiene and sanitation of municipalities. Human health is affected due to existing poor drinking water quality. Morbidity and mortality rates are high and the life expectancy at birth can be very low.
- **Reduced development potential**
  Polluted areas are not attractive for business investors and housing planners. The cleaning of such sites is very costly. The water services are underpriced by the use of subsidies that actually reduce the cost of pollution and by the current market prices that ignore the damages produced by pollution emissions. The sub-optimal performance in the water resources' management and pollution abatement and control, in various water sub-sectors, including municipalities of the middle Danube region, results in environmental degradation, cleaning high costs, and weakened benefits.
- **Deterioration of landscape**
  The changes in the quality of water are reflected in the structure of biocenosis, thus also in the bio- and landscape diversity. The high concentration of pollutants lead to eutrophication or disruption of ecosystems, including disappearing of plants and animals. The pollution of surface water affects also the recreation potential of the rivers and the riparian areas.

  For a Czech municipal hot spot, the **Brno waste water treatment plant**, a specific causal chain analysis chart was developed during the Hernstein workshop. The result is given in the Annex.

2.2. Industry

2.2.1. Situation Analysis

Industry is the main human activity impacting the environment in the *Czech Republic*. The mechanical-engineering and chemical production complemented by the processing of local resources in food, leather and woodworking industry and in the manufacturing of building materials is typical for the Morava River sub-basin. Metallurgy, chemistry and nuclear power engineering was implemented mostly in the socialist period, while textile industry (leading branch in the past) has rather retreated. Industrial waste waters and solid wastes perform an important part of wastes in the sub-basin. Mining of coal, uranium, lignite, oil and gas, and quarrying of building materials have disturbed some parts of the basin at local level. The water management companies built tens of water reservoirs and regulated rivers and streams which changed the water regime of the whole basin.

Neither in *Germany* nor in *Austria*, "Industrial Hot Spots" as in other basin parts were identified. The national water authorities agreed to name two "Sources of Pollution" for both countries.

Industrial activities in *Slovakia* contribute to pollution through discharges of insufficiently treated industrial waters. The quality of the Morava River is influenced by industrial activities – Hirocem Cement works in Rohožník, Slovhodváb Senica –fibber production, food production - Cannery Stupava, Záhorská Ves and Moravský Ján, heavy industry – ZVL Skalica, oil extraction, building of new oil pipelines – Ropovod Družba and extraction of gravel and sand. Concentration of industry in greater Bratislava is very high – Slovnaft (oil refinery), Istrochem (chemistry), BAZ, Technical Glass, Matador, Kablo, Gumon, Benzina, ASSI DOMAN Štúrovo-pulp/paper production, glass and food processing industry, airport Bratislava etc. Industrial activities are represented with chemical, heavy and food processing industries. Natural conditions allowed building of a cascade of water reservoirs which are used also for electricity production. In these reservoirs, the sedimentation regime is changed.

Navigation in the Váh River can be source of pollution by oil spills. In the Vah River, the industrial pollution originates from chemical industry – SCP Ružomberok (pulp/paper production), Považské chemické závody Žilina, Rubbery Púchov, Duslo Šaľa, Chemolak Smolenice; from food industry - Starch factory, Sugary Sládkovičovo, BIOPO Leopoldov. Heavy industry significantly contributes to environmental pollution through Oravské ferozliatinové závody široká-Istebné (metallurgy), ZŤS Martin, Dubnica n/Váhom (heavy machinery), dump site of metallurgy plant Sereď.

The Nitra River occupies the first place among the very polluted waters. Main source of pollution is the outflow of Handlovka (waste water from industrial mine complex Handlová - Prievidza), NCHZ Nováky (chemistry), ENO Zemianske Kostoľany (powerplant), Tannery Bošany, Sugary Šurany, TATRA Bánovce nad Bebravou, Tatra Nábytok Pravenec (furniture production), Rubbery Dolné Vestenice. In the Hron River sub-basin, the environmental quality is influenced mainly by industrial activities, like processing of aluminum, ore mines, food and chemical industry. In the Hron River sub-basin the pollution by industrial activities comes from heavy industry – SNP Enterprise Žiar nad Hronom (alluminia factory), Železiarne Podbrezová (iron work); chemical industry – Petrochema Dubová. Furthermore, there are the paper mill Harmanec, Sugary Pohronský Ruskov, Biotika Slovenská Ľupča (pharmacy), Bučina Zvolen (wood processing), SEP Zvolen (thermal power plant), Spa Sliač and Kováčová and Ore mines Hodruša. Significant effects have oil accidents in the transboundary river Uh which flows to Slovakia from Ukraine, with several accidents in past. Transboundary effects are expected fromVSŽ Košice – steel production, where the effluents flow into Sokoliansky creek. Industrial activities are represented with extraction of raw materials and production of color metal.

Production of municipal wastes and waste waters is also one of the negative activities leading to water pollution. Industrial pollution comes mainly from mine activities and ore processing – Rudňany-Slovinky (mines), Kovohuty Krompachy, VSŽ Košice (steel processing) - as well from the cities Sabinov and Prešov (food processing). The Bodrog River sub-basin belongs to the most polluted rivers, resulting from discharges of municipal and industrial waste waters. There is a significant pollution from industrial sources (Bukocel Hencovce – wood processing, Chemko Strážske – chemistry) which may influence groundwaters.

In *Hungary*, the most polluting industry are Balatonfüzfõ - Nitrokémia, chemical industry; Tiszaújváros chemical industry (TVK); Borsod Chem RT – Kazincbarcika; Százhalombatta, oil industry (MOL). Moreover, the nuclear power station in Paks was mentioned because of its huge freshwater intake from the Danube which is used for cooling purposes.

Industry is typically connected to municipal sewerage in *Slovenia*, or has its own direct outlets to recipients The overall treatment performance on municipal waste water treatment plant is rather low, as secondary (biological) and tertiary treatments are not extensively developed.

Important industrial complexes of *Croatia* are usually equipped with pre-treatment facilities, but municipal wastewater treatment plants – which should be the site of the final treatment – are not yet fully developed. The Kutina-based chemical industry, which produces fertilizers, Pliva pharmaceutical industry based in Zagreb, oil refineries located in Zagreb and Sisak, Podravka food processing industry based in Koprivnica, and sugar refineries in Zupanja and Osijek are typical hot-spots.

In *Bosnia-Herzegovina,* the use of dirty and obsolete technologies, the discharge of waste water without pre-treatment, inadequate management of enterprises and inadequate disposal of solid hazardous substances, have been identified as the main causes of pollution of water through re-launching of obsolete industrial technologies. Water quality had been recorded from 1965. It is assumed that water quality has improved during war because factory pollution was decreased, but no exact data are available.

All kind of industries can be found in the Sava River sub-basin – food, textile, leather, chemical, wood, metal processing, mining etc. In the post-war period, only 15-20% of factories have restarted their production. Most of them do not have waste water treatment plants. Even before the war, only 27 out of total 122 industrial waste water treatment facilities operated with satisfactory results. A certain amount of pollution in the Sava river comes from Croatia/Slovenia, and in the Drina river from the FR Yugoslavia.

The abundant natural resources (soil, forests and water) contributed to a fast economic and social development but the intensive exploitation of mines, forests and especially water resources gradually led to the degradation of environment. The specific characteristic of the post-war period is a reduction of pollution, both of surface and ground waters, after the industrial plants totally stopped working, directly or indirectly due to war impact. The current period of reconstruction and relaunching of economy will slowly secure the overall development and prosperity of the state but it could also result in a “restored” pollution toll.

In *Yugoslavia*, the state very much supported industrial development in the 1950s. Inappropriate legal framework, underpriced resources, lack of environmental knowledge and awareness led to serious environmental consequences in areas such as Subotica, Sabac, Pancevo, Smederevo, Kragujevac and others. The present economic transition with restructuring and privatisation aims at reduced environmental impacts. In addition comes economic depression, UN sanctions against FYR and decreased technological discipline which all are marked by the year 1991.

Main industrial polluters in the Yugoslav part of the DRB are mining, petrochemistry, fertiliser and household chemical industry. Most of the 120 industrial WWTP provide only inadequate treatment; only 20 larger industry plants along the Danube and its tributaries have full treatment. Ten WWTP are under construction and another ten are designed.

In view of the significant damage done to the natural environment, the governments of the middle Danube region are committed to a development policy that better integrates environmental considerations. Such a policy enables the conservation of natural resources, the avoidance of irreversible damage to the environment and the achievement of long term economic growth on a sustainable basis.

One of the most important elements being considered by policy makers in these countries is the introduction of a “win-win” approach for the introduction of clean technologies and production measures. The attempts to introduce the application of an integrated preventive environmental strategy to processes, products and services in order to improve efficiency and to diminish risks to health and the environment can be seen as a major difference in the attitude of the governments of upper and middle Danube as compared to the lower region.

2.2.2. Analysis of Transboundary Effects

The Sava is a river of class II that serves as a border between the Croatia and Bosnia - Herzegovina. Upstream from the boundary territory, there are various hot spots in Croatia and even in Slovenia with the Sava as recipient. Pollution coming from industries like Sisak Foundry, Chemical Industry Kutina or nuclear power plant Krško, degrade the water quality even before it enters Bosnia - Herzegovina. During its flow through the border zone, the Sava receives the tributaries Una, Vrbas, Bosna and Drina. Apart from Drina, which is also a – relatively clean - border river with Yugoslavia, the other tributaries, throughout their courses, flow through Bosnia - Herzegovina, bringing into Sava specific pollution loads, which more or less affect the quality of the Sava.

The levels of phosphorus and nitrogen, from upstream cities, industries and agricultural run-off, are already high by the time the Danube reaches Slovakia. The discharges of saline waters from mines in the Czech Republic and Slovakia or the insufficient waste water treatment of the chemical and pulp & paper industries bring several implications to the water quality of this region.

The pollution from the Morava sub-basin can impact neighboring countries (Slovakia, Austria). Impacts on the Black Sea are measurable only as a part of an accumulative pollution from the whole Danube River Basin. Some effects have not only national but also transboundary effects. Slovakia receives the polluted surface waters from the eastern part of the Bodrog River Basin in the Ukraine. The water quality is deteriorated and induces the limited uses of water for industry, irrigation, recreation etc. The consequence of accidental pollution is also a potential danger to the environment over the border.

The Kutina-based chemical industry which produces fertilizers, the Pliva pharmaceutical industry and the oil refineries located in Zagreb and Sisak, the Podravka food processing industry based in Koprivnica, and sugar refineries in Zupanja and Osijek are typical hot-spots of Croatia. For the Czech Republic, the most significant industrial pollutants are textiles, tannery, chemical, paper-making, wood making, machine-tool, metallurgical, electrical and food-stuff industry, pulp mills and sugar factories all having lasting, i.e. transboundary pollution effects.

Summarizing the transboundary effects for the Czech Republic, Slovakia, Slovenia, Hungary, Bosnia Herzegovina, Yugoslavia and Croatia it can be defined that the following transboundary effects have to be considered:

- **Surface and groundwater pollution with toxics**
  Leather industry, located mainly in the upper streams of Vrbas and Bosna Rivers, produces strong toxic effects upon the living world of water streams. Only one of the five tanneries discharging large quantities of chrome compounds, has a waste water treatment plant. In the region of Tuzla, there are Chlor-alcaline Complex II, Polyurethane chemistry plants, Polyurethane chemistry plants and the lye factory in Lukavac where no wastewater treatment was ever even considered, except for occasional neutralisation. The presence of significant levels of chlorinated carbohydrates and increased values of pH as well as suspended substances in waste water discharged from the lye factory have totally destroyed the living organisms in the water courses of Spreca and Jala, two Bosna tributaries, which under present conditions, when industry is not working, shows the signs of recovery. Moreover in the Tuzla region, the electrolyse plants use mercury electrodes, so that occasionally mercury might appear in waste water, then to be further carried into the watercourses. Similar electrolytic plants exist with the Elektrobosna factory in Jajce and Incel factory in Banja Luka on the Vrbas river. Finally, organic substances - bensene, toluene, phenols and ammonium exist in the TPK Tuzla and in the coke plant Lukavac. During the production of coke, large quantities of waste water are produced which are then treated biologically, with satisfactory results. Organic

substances and lignosulphonates from pulp production processes as well as viscose plants produce significant quantities of very polluted waste water, in Prijedor, on Sana river, a tributary of Una, on Vrbas river in Banja Luka or from the pulp & paper factory Natron in Maglaj.

The danger of transboundary pollution exists in all those cases where production is renewed like under pre-war conditions, including locations like the pulp & paper factories in Prijedor and Banja Luka, the industrial complex in the region of Tuzla, including Lukavac, the Elektrobosna factory in Jajce and, finally, the tanneries. In the Czech Republic, contamination by heavy metals comes from smaller metallurgical plants and tanneries; nutrients (N, P) and some heavy metals (above all mercury has a very significant position among the polluters in the area). Moreover, there exist potential hazards in the Morava River Basin, particularly specific organic substances (oil products, PCB, PAH, AOX etc.).

- **Water use affected by accidents**

  Taking into account the large number of accidental pollution events which produce many water supply interruptions and environmental and health effects, the prevention and control of accidental pollution and hazardous phenomena is crucial. Industrial accidents are one of possible hazards of water pollution if they occur near the border. Transport accidents with a leakage of oil or other dangerous substances can impact on pollution downstream of e.g. the Morava River.

- **Effect on biodiversity**

  The presence of hazardous wastes has long-term consequences for the morbidity and mortality of humans as well as for the regional flora and fauna. In spite of the broad variety of landscapes and the efforts to protect the habitats, the rich biodiversity of the Danube river basin in the middle Danube region is suffering: many species are endangered or are already threatened, with extinction.

- **Deterioration of the ecological equilibrium**

  A major problem is given by the water pollution generated from waste disposal sites: some are even located inside urban localities, most have an important landscape impact. Many disposal sites, without any specific facilities, located on the river banks or in plains/depressions produce acute pollution of receiving water bodies. Industry is responsible for most of the direct and indirect discharges that are inadequately treated and that contribute to the deterioration of the whole ecosystem equilibrium.

- **Pollution of environmental factors**

  Liquid and solid waste services represent a critical part of maintaining a high level of urban and rural environmental and water quality; the large quantities of industrial wastes are producing serious adverse impact on the various environmental factors. A particular spill of pollutants into rivers and lakes can cause cumulative changes in the water quality, resulting in serious damages to ecosystems and high economic losses.

- **Deterioration of the water quality due to repeated discharges**

  Uncollected industrial waste threatens public health and impedes surface drainage. The consequences of untreated or partly treated waste water from industry pose constant risks to human and environmental health. Moreover the performance of most treatment facilities in the region is far below design specification due to inadequate capacity, lack of maintenance, or shortage of spare parts.

2.2.3. Problem Analysis

The industrial sector core problem was identified for all seven countries as

”Ecologically unfriendly industry”.

The main objectives of the industry sector strategy are

i. adopt ecologically friendly industrial practices, through appropriate sustainable practices,
ii. introduce environmental management in enterprises and implement modern manufacturing technologies and cleaner production measures,
iii. develop a public relations strategy for stakeholders involvement,
iv. establish programs to reduce the use of hazardous materials and prevent the risk of accidents.

The economic restructuring and the process of privatization are of substantial importance for the activities to be undertaken for overcoming the environmental consequences of the industrial activity.

The identified ***immediate causes***, integrated from both upper and middle Danube basin-wide viewpoint, included the following:

- **Old technologies**

  Obsolete and worn-out capital stock, high-energy intensity is the most outstanding characteristics of the upper and middle Danube region industries. The lack of a national waste minimization and recycling strategy, the existence of obsolete technologies and equipment in some of the analyzed countries hampered the initiatives to achieve “clean production” and to diminish risks to health and the environment. However, recently the governmental bodies and industrial sector recognized the importance of clean technology as a fundamental means for reducing pollution and a practical tool for pollution prevention. They are considering policy instruments to support clean technology programs (grants, eco-labelling systems, loans for R&D).

- **Improper management of industrial plants**

  The absence of self-monitoring, based on internal control systems, and the lack of interest of the beneficiaries in enforcing the environmental regulations and compliance to legislation is reported by the examined countries. Use of hazardous but cheaper raw materials brings many negative effects for the environment but momentary benefits for the poor environmental performers. Many companies in the middle Danube region still profit from not complying with standards at the expenses of those, which changed their industrial behaviour.

- **Polluter is not paying**

  The price structure of the water service does usually not take the environmental costs into account. The “Polluter-Pays-Principle” is not fully and efficiently implemented.

- **Bad design or operation of industrial plant**

  There are often discrepancies between designing, constructing and operating industry plants. The design plan and operation rules should stipulate precise and enforceable measures, self-monitoring of production to ensure that the standards are being adhered to.

- **Absence of appropriate infrastructure and system for collecting used oil in transport**

  The governments of these countries were unable to ensure the appropriate infrastructure for ensuring an efficient (oil) collection system and have frequently failed to devote sufficient attention to providing practical means of ensuring compliance with the norms.

- **Weak pollution control**

  The small portion of re-used water within the industrial processes or recovered and recycled materials and waste products do not bring any economic benefit for the enterprises. Lack of regulations enforcement and monitoring includes poor monitoring of responsible agencies and inefficient self-monitoring. Command-and-control systems of regulation have been the most commonly used instruments for the management of pollution in all countries of the middle Danube region. The lack of controls enforced at pollution sources, according to the prescribed conditions of discharge (although ambient pollutant concentration standards frequently form the basis for determining discharge limits) facilitated the violation of environmental regulations.
- **Inadequate industrial waste management**

  The lack of appropriate methods for the transport, treatment and disposal of liquid and solid wastes coming from industrial activities, in the urban and especially in the rural areas in the region mainly produced contamination of surface and ground water used for various uses.
- **Lack of emergency and planning measures**

  Another problem is the absence of accidental pollution enforcement programs which could prevent the rapid water quality deterioration due to industrial pollution incidents which induced the timely closure of drinking water supply sources or additional warning measures to be taken on transboundary rivers.
- **Absence of individual waste water treatment plants**

  The water quality in several locations was influenced by the lack of pre-treatment and separated facilities for the different industrial process units.
- **Old infrastructure for industrial production**

  Governments/authorities and industry management failed to devote sufficient and timely incentives to support upgrading with practical and up-to-date infrastructure to ensure environmental compliance and profitable production.
- **Inadequate behaviour of tourists**

  The lack of ecological awareness and education of many tourists within protected areas or along water bodies contribute to the increase of adverse effects of water pollution.

The identified ***root causes*** included:

- **Effect of war**

  War that lasted from 1992 to the end of 1996 brought a lot of destruction and damage not only locally but also in the whole region.
- **Economic collapse**

  The need to enlarge the production rather than modernizing the existing capital stock resulted in several negative implications: low productivity, higher production costs, several breakdowns of the industrial capacities, equipment failure, reduced quality and led to the loss of competitiveness of the economic enterprises.
- **Absence of adequate legislation**

  The absence of economic instruments for pollution control designed to internalize the external damage costs of industrial pollution made impossible the use of economic incentives that change the industry's behavior, production technology, pollution control or management practices.

  The inefficient environmental management is mainly due to the absence of a policy framework and of implementation mechanism for environmental enhancement which require continuous assessments and adjustments.

- **Absence of public awareness**

  In some parts of the region, the lack of environmental awareness of population brings conflictual situations in terms of lack of understanding of which decisions are needed to secure a clean production and a healthy environment.

- **Free trade**

  External debts and free trade are sometimes harmful to the environment, especially when the negative externalities and varying national standards (environmental norms, GDP, subsidies etc.) are not taken into account. In some occasions there are conflicts between the proliferation of diverse national policies towards environmental and water quality and the need to maintain competitiveness in the world markets.

- **Transition period**

  Specific for a transition period is the gradual introduction of new legal norms or economic instruments which are to ensure that best practices and technologies are being applied.

- **Non-proper development policy/strategy**

  Policy of the governments may fail if they are not incorporating environmental considerations into economic policies to achieve financial sustainability of industries. The pollution sources impose externalities on the society. The development policy is often not based on real cost-benefit analysis. The existing policies do not recognize environmental consequences of a proposed production in the decision making, ignoring that the prevention of adverse effects is usually less costly than restoring a damage.

2.2.4. The Immediate and Ultimate Environmental Effects on Signification Impact Areas

The immediate and ultimate environmental effects were reviewed with the aim to consolidate the basic information on the Significant Impact Areas and water quality, considering available information and inputs from the Transboundary Analysis Workshop participants.

The ***immediate environmental effects*** identified for the middle Danube industry sector are:

- **Erosion**

  Migrating through environmental media, pollutants may have adverse environmental effects. Erosion of soils as a result of industrial activities cause an aggravation of water pollution through carried sediments and an alteration of the river beds. Erosion processes caused by industrial processes, transportation, military and hydraulic structures, both direct and in combination with natural processes (winds, floods, native river bed changes, deforestation) represent significant issues. The mine exploitation, as well as sand and gravel extraction in the river basins, in combination with mineralising mining waters discharged into rivers can cause powerful erosion processes.

- **Deterioration of the quality of human/social environment (smell)**

  Both the adverse effects of industrial production on the quality of life, on the quality of natural environment or on tourism activities in the region as well the linkage between the health and welfare of a household in a rural or urban area and the efficient provision of the sanitation services are evident in the countries of these regions.

- **Soil pollution**

  Accidental soil pollution is directly related to unsustainable industrial practices as a whole and to industrial accidents in particular. The absence of emergency plans for chemical hazard instructions at industrial facilities impede the readiness to face counter adverse effects of accidents caused by hazardous substances. Contamination of soils from the industrial sector comprises diffuse pollution caused by uncontrolled use of protective means as well as by presence of ashes, sulfur and NO_x compounds, generated by thermo power plants, cement factories and other industries. Other type of pollution is *concentrated pollution*, caused by flue gases (heavy metals) and defrosting salts used on roads, or generated by flooding of polluted rivers. Third type is local pollution caused either by accidents or by incidental situations, disasters etc. in which harmful and hazardous substances from utilities, sewerage, landfills and dump sites are spilled or uncontrollably discharged into the soil. Among the significant water and soil industrial pollutants are heavy metals and sulfur compounds, acid rains, radio-nuclides, waste water sludge and industrial waste. Damages done to the soil were recorded e.g. in Bosnia-Herzegovina during war activities including the construction of fortification facilities (trenches, bunkers, etc), destruction of land by explosive devices, movement of troops, artillery and armored vehicles over the land, planting of land mines, destruction and cutting of forests, etc.

- **Reduced attractiveness for tourists**

  The increase of damages to the ecosystem, the biodiversity destruction, the reduced level of lifestyle and the lack in modern recreational facilities explain the reduced number of tourist visiting the upper part and to a larger extend the middle Danube region for the last decades.

- **Pollution from navigation**

  Accidental oil pollution is directly related to the unsustainable navigation practices. The absence of emergency preparedness for chemical hazard instructions and the lack of ecological awareness contribute to adverse effects caused by these hazardous substances.

The ***ultimate effects*** were defined by:

- **Deterioration of the landscape**

  Landscape degradation, *reduction of biodiversity* and destruction of ecosystems are environmental effects observed as a result of both improper location of industrial sites and non-sustainable industrial practices. *Deforestation* and erosion processes produced by industrial activities, transportation, military and hydraulic structures, both direct and in combination with natural processes (winds, floods, native river bed changes) represent significant ultimate effects of pollution

- **Health risks**

  The pollution consequences are reflected in the reduction of life expectancy, genetic changes, and increased health costs. Health risk is a direct environmental effect of deteriorating the water quality and the water regime. Although hazards of infectious diseases from drinking water is imperceptible, other risks can play their role: various kinds of allergic reactions from bathing, consequences of long-term exposure to water of low quality (especially high content of nitrates and other) etc. Also odor belongs to this category.

- **Impairment of water uses**

  Technical and technology constraints lead to excessive water use and the result of this can result in a reduction of water resources.

  For a Slovak industrial hot spot, the **Novaky chemical plant**, a specific causal chain analysis chart was developed during the Hernstein workshop. The result is given in the Annex.

2.3. Agriculture, Land Use and Forestry

2.3.1. Situation Analysis

When analyzing the role of the agricultural sector regarding the pollution of the Danube River and its tributaries, it was decided by the participants of the workshops to include the following sub-sectors*: land use and management, crop production, animal husbandry, fish farming and forestry*. Therefore, the agricultural sector strategies were identified in the reports for agriculture (Slovenia and Yugoslavia), Agricultural, Forestry and Land Management for the Czech Republic, Agriculture and Forestry for Hungary, Agricultural and Land management for Bosnia-Herzegovina and Croatia, and Agricultural and Soil Management for Slovakia. These five areas of activities led to water pollution due to inadequate agricultural practices. All of them are aimed at food and wood production and are based on the use of land and water resources for both state and private forms of ownership.

Application of fertilizers in these territories did yet not contribute to a significant pollution of soil and water, in other words the pollution caused by the fertilizers is still at low level (Czech Republic, Bosnia Herzegovina, Hungary, etc). Mineral fertilizers are used to provide 14 essential elements needed for plant nutrition (macro and microelements) which the plants absorb from the soil. The major part of them are low mobility compounds, with the exception of nitrogen compounds which are very mobile in water solutions and, if present in such a form in excess, may pollute the ground waters. Fact is that the standards for the use of fertilizers used up to now were very low and therefore the pollution of soil and water was insignificant. The control of the use of fertilizers in agriculture was conducted only partially, through systematic control of the fertility of the land.

Although the agricultural farms also comprised cattle breeding and therefore had available significant quantities of rotted manure, this manure was rarely used for dressing, mineral fertilizers were mainly used instead. This led to an acidification of land and significant decrease in the humification of soils. Low norms of land dressing were mostly applied, amounting to 80 kg/ha of pure dressing, with nitrogen fertilizers predominating. The studies relating to the impact of fertilizers, performed up to now have shown that the pollution of the ground waters is very low (almost zero), yet, however, more attention should be given to the survey of leachate (seepage waste water from farms) which are directly discharged into the recipient waters, i.e. they drain directly into the water of the Danube Basin.

Larger farms of milk cows and fattened heifers and hogs are mainly found in the lowlands of Bosnia-Herzegovina (Lijevče, Odžak, Modriča, Posavina, Semberija, Spreča, Sokolac, Sarajevo, etc). These are mainly standard farms of indoor shed type, in which the wastewater is not treated but directly discharged into watercourses, causing pollution. The manure is mainly rotting and as of lately it is increasingly used for dressing, therefore not presenting serious problems. The greatest problem is the very big pig-breeding farm of Nova Topola in Lijevče polje which uses the wet system of rotting and disposal of the liquid waste into pools (“lagoons”) which are potentially the greatest danger concerning the pollution of water in this area. Large animal farms also exist in Morava river basin in Czech Republic, in Croatia and in the Vojvodina (FR YU).

The inadequate land management and inappropriate agricultural practices, the deficient use and application of pesticides, uncontrolled use of fertilizers in lowland, discharge of liquid waste from farms without treatment and accelerated run-off generating erosion have been identified as main causes of pollution coming from agricultural practices and land management.

Agriculture has a long tradition in the *Czech Republic* in the river basin of Morava. Fertile areas along the central and downstream reaches of rivers rank among the most important agricultural regions within the Czech Republic. Among the key production territories belong above all wide plains and valleys along the Morava, Dyje and smaller rivers. Agriculture contributes considerably to the pollution by nutrients, organic substances and other contaminants. Agriculture is pursued on 54% of the river basin area, which is above the average for the whole country. The arable land represents nearly 80% of agricultural land.

Nitrogen, phosphorus and pesticide, loaded into the surface water, leaves *Hungary* via the main rivers (Danube, Dráva and Tisza). The nitrate pollution of the groundwater may have also transboundary impact via moving sub-surface waters to the neighboring countries (Croatia, Serbia, and Romania).

The agriculture sector in *Slovenia* covers different activities, including crop production, livestock and fish farming. In 1995, agricultural areas covered about 39 % of the surface area. The problem is critical in agricultural regions without public water supply system (for example in the north-eastern part of Slovenia). Uncontrolled pollution from agricultural sources is an existing or potential threat to water resources (surface and ground water).

The main problems derived from agricultural activities in Slovenia are due to inappropriate use of fertilizers and pesticides causing alterations in the nitrogen balance and increase in residuals of pesticides in soil and water. Agricultural activities cause serious environmental problems in the Slovenian part of the Danube river basin due to inappropriate land and water resources management, inadequate use of pesticides and fertilizers, inappropriate fish farm management; inadequate treatment of animal farm wastes.

These activities have further led to dispersed pollution and eutrophication of surface and ground waters, decline of wetland areas and insufficiency of water resources due to extensive water abstraction for irrigation purposes in addition to other human uses.

Agriculture is one of important pollution source in *Croatia*, which influence groundwater quality, with intensive agriculture in cereal production and corn, sunflower, sugar-beet and tobacco production in Vukovar, Zupanja, Vinkovci, Slavonski Brod, and Karlovac. This region is also known for its quality wood, such as oak and ash, and for the wood processing industry (“Oriolik” - Slavonski Brod, DIP - Nova Gradiska). One of the most important resources for the country as a whole is oil and gas well field in the area Djeletovci.

Also, too little attention is given to education and general training of farmers and to them being trained in properly using the available resources and machines, particularly in applying ecology-oriented technologies in agriculture.

Although there is a certain number of laws governing the sector of agriculture and forestry, these laws were mainly taken over from the previous systems and therefore need to be revised and adopted to the process of transition towards market economy. It is necessary to bring the relevant regulations and prescribe the standards, which should be harmonized with the international ISO standards. They should allow for the transition from the previous to the market economy.

Out of the total land resources in *Bosnia-Herzegovina* (51,129 km^2), agricultural land covers 49.4% (29% are owned by the state sector, the private sector possesses 71%) and forests cover 46.3%. Mountainous areas and high-mountain regions predominate, covering about 80% of the area of Bosnia - Herzegovina. The terrain is highly sloped, sometimes steeper than 15^0. The stretches, which are either flat or moderately sloped are mostly found in river valleys and karstic fields, covering about 16% of the land surface.

The lowlands on the north of the Sava River Basin represent the most fertile part of Bosnia-Herzegovina. Excessive use of fertilisers and pesticides caused pollution of soil and water. Inappropriate land use, together with extensive wood cutting, led to soil erosion. The stockbreeding farms usually do not have waste water treatment facilities and discharge their waste directly to watercourses. In the Danube basin area, the land engineering measures for regulation and protection of land were undertaken in Bosnia-Herzegovina, and the system of main and minor infiltration drains built, primarily in the lower courses of Una, Vrbas, Bosna, Spreča and Drina river, and to a highest degree in the immediate zone of Sava river (Lijevče, Posavina and Semberija).

The irrigation system is very scarcely applied in these territories – only 10.2% of the potential capacities are used. Presently, due to the fact that the land is damaged and mined, 30% of the previously irrigated land is not being irrigated.

The most significant aspects of deterioration of soil in these territories comprise contamination, degradation, destruction and damages caused by war.

Contamination of soil from agricultural activities comprises diffuse pollution caused by uncontrolled use of protective means and fertilizers in agriculture, as well as by concentrated pollution caused by defrosting salts used on roads, or generated by flooding of polluted rivers.

Degradation of soil here implies increasing of soil density and degeneration of its texture and other characteristics, caused by improper cultivation of wet soil during its being prepared for sowing by means of heavy machinery (very frequent case in these parts). Milder forms of erosion also lead to water-induced degradation of soil due to improper cultivation of land on slopes steeper than 15^0 or improper exploitation of forests.

Before the war, the level of pesticide usage per unit surface area was 2.5 kg per ha on private farms, up to 5-6 kg per ha on socially owned farms, which was much lower in comparison to European countries in Bosnia-Herzegovina. The consumption of pesticides in BIH before the war amounted to 2,100 to 2,500 tons per year. The most used pesticides were insecticides, then fungicides and then, a list of all herbicides, while the other groups, like for example limicides, were used in the quantity of only 10 tons per year.

The cultivation and protection of crops is mainly performed on intensively farmed agricultural lands in the lowlands. There is no established system for monitoring the situation concerning the residue of protective means in soil, water and plants, and there are no data regarding the pesticide contamination of Danube basin waters. There are also no reliable data about the types and quantities of pesticides presently being applied in these territories.

In *Yugoslavia* agriculture and agro-industrial production hold an important position in the economic structure of the country. Agricultural land covers 63,190 km² or 61,4% of the FR Yugoslavia; some 10% of the population is engaged in agriculture as their only activity. Private property (83%) dominates over state property (17%); private estates smaller than 2 ha are managed by 40% of households. This prevented the large-scale introduction of intensive agriculture. Their various activities (farming, fruit growing, vine growing and cattle-breeding) are different in mountains and plains – e.g. plowed fields and gardens dominate in valley areas (27,240 km²) whereas meadows and pastures are typical for mountain areas (21,780 km²).

The consumption of mineral fertilisers and even pesticides is today at about one third of the quantity of the mid ‘80ies. For example the total nitrogen consumption was in 1988 at 147 kg/ha and went down in 1997 to 52 kg/ha. Larger cattle and pig farms, with high negative impact on the environment, are mainly located in the north of the country and along the Danube around Belgrade.

2.3.2. Analysis of Transboundary Effects

The transboundary effects might primarily reflect on groundwaters, causing pollution and thereby presenting a threat to health of people, who mainly use this water for drinking (frequent case in Posavina and Semberija in Bosnia-Herzegovina). This also affects the water used for irrigation of agricultural crops, this further entailing pollution of soil and plants, and, consequently, human and animal organisms.

The following transboundary effects have been considered for the countries included in the upper and middle Danube regions:

- **Effects on groundwater**
  The pollution of surface and infiltration of ground waters has a direct negative impact upon the health of human beings and animals using these waters, especially in areas with permeable soil and gravelly geological substrate. (e.g. Pounje, Posavlje, Semberija, Podrinje in Bosnia-Herzegovina; Zitny Ostrov in Slovakia, Szigetköz in Hungary; karst areas in Slovenia and Croatia).
- **Reduced capacity of irrigation**
  The pollution of water also decreases the possibility of its being used for irrigation without previous treatment. Although the water resources of the Danube basin are considerable, they are still only scarcely used for irrigation, this having a significant negative impact on the yield of quality crops.
- **Reduction in biodiversity**
  The reduction of water pollution, which was the result of reduced industrial activities has improved the quality of the living world in water and, consequently, of biodiversity; therefore the recovery of industry would again make the situation worse and reduce the biodiversity of waters of the Danube basin.
- **Effects on agro-phytocenoses**
  The pollution of waters, their mud-silting and the increased erosion of soil will boost the negative impact on agrophytocenoses, which will be considerably changed due to the soil deterioration and this, will in turn also affect the structure of agricultural production .
- **Tourism activities affected**
  Due to the pollution of the Mura (Slovenia) or Sava rivers (Bosnia-Herzegovina) it will not be possible to develop tourism, especially fishing and fish breeding. This reduces the possibilities for developing recreational tourism on the Sava river, which in turn affects the utilisation of agricultural potentials.
- **Pollution of surface water**
  The pollution of e.g. the Sava and its tributaries has direct impact upon the pollution of the Danube, which may affect the sub-basin downstream from the Drina estuary and considerably, affect the riparian zone of Sava and Danube river.
- **Negative impact on flora and fauna (biodiversity)**
  Flora and fauna in river basins will also be affected, because of the misbalance in biocenosis. The pollution of water (e.g. eutrophication) will inevitably lead to a disbalance in the plant and animal world, both in water and in riparian zones.
- **Increased sedimentation in water reservoirs**
  Due to stronger effects of erosion processes, enhanced by cutting of forests, the waters of the Danube basin will sooner be sediment-filled and mud-silted, this in turn leading to increased sludge extraction and deposition problems as well as to reduced other reservoir uses (flood protection, power production, irrigation).
- **Material damages in agriculture**
  The negative impact, i.e. the damage done to agriculture may be seen as direct damages arising from erosion of soil and flooding of farming land, i.e. destruction of material goods, and as indirect ones, arising from the decrease in the crop yield and therefore, decrease in the income, due to pollution of waters and impossibility to use them for irrigation. This negative impact will also reflect in the pollution and destruction of the land itself.

- **Negative impact on stability of water levels**

  These impacts primarily reflect in the changes of the natural stability of water flow dynamics over the year, which may be caused by erosion of soil and cutting of forests, due to which surplus quantities of water may appear during spring and fall and shortage of water may appear during the summer season.

- **Risk of soil contamination**

  The pollution of water opens the possibility that the soil also be polluted in the catchment area (accidental spills, wrong application of agro-chemicals, floods), this leading to pollution of groundwater, which certainly may have a wider impact downstream in the valleys of rivers (Sava, Danube).

2.3.3. Problem Analysis

Based on the situation analysis and the problem analysis of the agricultural sector, the core problem in the upper and middle Danube regions was identified as

***"Unsustainable agriculture practices"*.**

The identified ***immediate causes of point and diffuse sources discharges***, integrated from the basinwide viewpoint, included effects on the user located downstream; on wetlands, on Danube Delta and Black Sea ecosystems:

- **Lack of good agricultural practices**

  Inadequate use of pesticides and fertilisers, inappropriate fish farm management, inadequate irrigation management, inadequate practice in some livestock farms and inadequate treatment and disposal of manure make the whole picture of bad agricultural practices. Agricultural activities caused pollution due to the disposal in several unsuitable locations of huge quantities of manure and animal waste from large livestock industries. Even some of the farms were provided with purifying installations, many of the facilities were not put into operation or their operation activity was ineffective.

- **Deforestation**

  The pressure of an increased demand for forest products, both for consumption and exports, and the pressure on forest land for alternative (cropland and pasture) land uses, as well as population, gross domestic product and other government policies influenced the degree of non-sustainable land management practices in the regions.

The ***root causes of water quality*** problems identified during the workshop, for a large number of hot spots, for the upper and middle Danube regions in the agricultural sector included:

- **Unclear land ownership**

  The lack of incorporating in the agricultural policies with the recent consequences of changing land use pattern, especially in the context of transferring arable and forested lands to private owners can impact water quality. The change from a conventional farming / industrial agriculture to a sustainable agriculture can bring benefits.

- **Cost coverage of water consumption**

  The current environmental policy does not take into account the environmental and social costs of water. However, there are recent efforts to adopt agricultural policy - such as water and soil conservation and practices, or as modern irrigation methods - to meet environmental objectives, by maintaining the basic natural processes and by introducing the beneficiary-pays-principle and full-cost water pricing policy.

- **Effects of war**

  The war in some part of the Danube caused distinctive and very specific environmental problems, destruction of public, urban and economic systems, displacement of population and lack of compliance and enforcement of environmental regulations. This also affected the land use (e.g. fallow land).

- **Transition period**

  During the transition to a market economy, the adjustment strategies of the examined countries in the upper and middle Danube regions include privatisation which is most advanced in the agricultural sector where ownership rights were restored or changed for much of the cultivable land. Unfortunately, the interface between the agricultural sector, the chemical and water industries covers a wide range of issues which were yet not properly addressed e.g. by new farmers: abstraction limits, rural water supplies, resources development, river basin water transfers, water quality issues, pesticides/fertiliser limits, sludge disposal, and pollution control associated with livestock densities and farm waste disposal.

- **Free world agricultural market**

  The free world agricultural market interventions in all components of the agricultural sector, including food production, processing and distribution tended to intensify inefficiency while undertaking to meet physical production targets. The accelerated and profitable export of fertilisers, tractors, and food items impeded achievement of the country's agricultural goals, deprived farming population of proper income, and affecting the quality of environment.

- **Lack of farmer advice services**

  The limited knowledge and ignorance of the farmers in using chemicals without considering the equilibrium between the nutrients and the caring capacity of soils that should be maintained has been mentioned as causing adverse effects to water quality. Excessive land use due to a reduced level of knowledge of farmers had several negative implications on the biodiversity and the natural habitats. Inadequate agricultural practices performed by poorly educated farmers produced unexpected effects elsewhere in the soil, plant, water and atmospheric systems.

- **Lack of regulations and incentives concerning environmental friendly agricultural practices (including waste)**

  The Governments' weakness in promoting agriculture preservation and conservation policies and regulations or in introducing innovative economic instruments together with the absence of best management practices correlated with the weak control of water pollution, drainage and salinity in both the upper and the middle Danube regions. The absence of developing new institutions and technologies that respond to farmers' needs for higher quality services is also regarded to highly influence the quality of water resources.

- **Increased meat consumption by humans**

  The increase of meat consumption affects the level of production (of crops or livestock, for fodder or human food), human health problems, the amount of waste, manure etc.

- **Unfavourable irrigation practices**

  Due to improper irrigation practices, the yields were reduced and the sensitive crops were damaged due to the same practices which ignored the salts or the specific ion toxicity in soil or water.

- **Unfavourable economic environment and market conditions.**
  The policy failure of Governments in the region to choose, design and promote new incentives, as part of environmental policy, to ensure that farmers can meet environmental challenges (conservation of natural resources, conservation and management of existing natural habitat) is considered as being a major cause. A full price liberalisation for agricultural products, a fair competition from the input suppliers and machinery services agents, rapid technology transfer into the agricultural sector, and open access to the international markets are needed to clean up the sector.

2.3.4. Immediate and Ultimate Effects of Pollution on Significant Impact Areas

The immediate and ultimate environmental effects were reviewed with the aim to consolidate the base information on the Significant Impact Areas and water quality, considering available information and inputs from the Transboundary Analysis Workshop participants.

The ***immediate environmental effects*** identified for the agricultural sector are:

- **Ground and surface water pollution**
  The accidental spilling, the intentionally used chemicals, the use of herbicides to control weeds in irrigation canals and draining channels or the run-off from treated agricultural land contribute to the worsening of groundwater. The chemical usage in agricultural activities modified the animal life of the water and mud in many stretches of the waterbodies.
- **Deforestation**
  Special problems have been recorded with the removal of forests for intensification along mountain slopes, in low plains and in floodplains. Results were water and wind erosion, as well as loss of flood retention capacities and habitats for wetland species.
- **Biodiversity reduction**
  The uncontrolled or degraded land use and unsustainable, high intensity agricultural practices had consequences for the rural landscape and wildlife in the region developing a chain of consequences having adverse effects on sensitive species.
- **Residual agricultural chemicals in the soil**
  Soil are the receivers of natural and man-made pollution coming from agricultural practices. Incautious disposal of agrochemicals and wastes which were dumped in landfills, close to water courses, were leaching into polluted soils. The excessive use of pesticides and fertilizers and poor agricultural practices are responsible for the deterioration of soils in the upper and middle Danube region. This effect can have a cumulative effects of past and remaining pollution.
- **Change of soil structure**
  In many location, sediments tend to fill in depressions, channels/ditches and caused costly dredging and maintenance problems, reducing water infiltration rate of an already slowly permeable and contaminated soil. Pollution irreversibly affected the soil structures.
- **Erosion**
  The absence of windbreaks, the intensive cultivation and the existing soil-reduced resistance to erosion produced adverse effects on soil structure, agricultural productivity, upon environment and its wildlife in the upper and middle Danube region.

- **Drainage of wetlands**

  These pieces of lands are characterized by dominating water regime, contributing to runoff and water supply, and by their role in reducing the adverse impact activities on the riverine hydrosystems. The risk to their disappearance is accentuated by pollution, by drainage for agriculture, by increasing farmable land or by regulating water systems.

The *ultimate* environmental effects included:

- **Deterioration of landscape**

  Unobstructed land use developed a chain of repercussions having adverse effects on biodiversity, with the risk that, under extreme environmental conditions, the superimposed impacts lead, in several locations in the region, to the *degradation of arable land,* eutrophication of natural and artificial lakes, to the *loss of biodiversity*.

- **Decreased life standard**

  The present farming system, known as "conventional farming", produced both progressive social and economic results, and serious human health risks and environmental damages. The unsustainable approach of the past decades when the size and production of the farms were the only dimensions of prosperity, resulted in large quantities of subsidized fertilizers and pesticides which were more and more polluting soils and waters, and thus, e.g. *increased flood hazard, decreasing productivity* and solid incomes, the *water use* for drinking and recreational possibilities.

For a **agricultural practises in Germany and Austria**, a specific causal chain analysis chart was developed during the Hernstein workshop. The result is given in the Annex.

3. Sector Strategies in the Lower Danube Region

If development is to become sustainable in the lower Danube region, polluters, consumers, and public agencies all need to change their attitude and switch away from the activities that degrade the environment and contribute to conserve ecosystems for the future.

In the Transboundary Analysis Workshop in Hernstein, Vienna, representatives of Romania, Bulgaria, Moldova and Ukraine have been searching for more effective alternative interventions to reduce pollution, which causes transboundary effects and ways to encourage behavioral changes of the polluters.

The most important part of the work during the Transboundary Analysis Workshop for the lower Danube region called for the preparation of causal chain analysis, based on common study elements: preliminary information of the draft report on transboundary analysis and national planning workshop reports of the four countries involved. Pollution sources that were evaluated were of high priority hot spots and diffuse sources that represent targets for the proposed intervention in the region. In the debate about pollution processes and the dynamics of nutrients from the basinwide perspective the problems involving the Black Sea were considered.

The causal chain analysis was prepared by sectors and regions. Therefore, during the Transboundary Analysis Workshop, the participants of the lower Danube region examined and decided if the possible proposed interventions are related to the greatest transboundary effects.

The results of the National Planning Workshop Reports were considered when analyzing immediate causes and root causes, for point and diffuse sources, as well as the effects of pollution on significant impact areas identified during the workshop.

This exercise had the goal (i) to achieve linkages between the causes and effects of pollution, (ii) to ensure the decrease of the uncertainty in the decision-making, and (iii) to improve the level of knowledge in selecting the most effective interventions.

In order to identify sector alternative interventions, each of the sectors was thoroughly examined:

3.1. Municipalities

3.1.1. Situation Analysis

In the last decades the untreated or partially treated waste water from municipalities have become a significant source of surface and ground water pollution due to an increased migration out of the rural areas and, consequently, a higher concentration of population in urban areas.

The lack of Municipal Waste Water Treatment Plants (MWWTP) for the majority of the settlements, the improper operation of the existing ones and the outdated and insufficient sewage systems led to substantial pollution of the surface and ground water with nutrients. The sewage systems are mixed - they collect wastewater from rainfalls, households and industry. The latter has to be locally treated in order to meet the requirements for discharging the wastewater into the municipal sewage network. For a significant part of the enterprises this is not the case. This fact obstructs the effective work of the municipal WWTP in the Danube river basin. For settlements with over 10,000 inhabitants, 85-100 % are connected to the municipal sewage system, while in smaller towns and villages this percentage is lower and a considerable part of the households' waste water is directly discharged into the rivers or in inappropriate underground septic tanks. Problems with ground water pollution arise from the overloading of the network, and from a lack of connecting sewers with the WWTP. A further problem is the improper maintenance of the sewage system, due to a lack of modern equipment and funding resources.

Another major source of contamination of surface and ground water from municipalities is the inadequate management of solid waste. The municipality organizes the collection of solid waste but no measures are taken in all the countries of the lower Danube region for separation, re-use or recycling of the waste. The hazard of surface and ground water contamination arises from the lack of bottom insulation and leachate treatment facility, as well as the storage of industrial and hazardous wastes.

The objectives of the sector include: implement environmentally sound waste management by developing funding mechanisms, introducing proper waste management practices, consider appropriate legislation and monitoring system, as well as raising public awareness and commitment; eliminate weaknesses in MWWTP operation by optimizing technologies and sludge treatment, introducing improved technical and financial regulations, and developing human resources and managerial skills; operate sewage systems efficiently by expanding the existing network and developing the information system, introducing sound management of the systems and optimizing operation activities by introducing modern repair equipment.

3.1.2. Analysis of Transboundary Effects

According to the data available, the share of the *Bulgarian* tributaries in the overall river Danube water quantity and quality is insignificant. In almost all tributaries' estuaries, the water quality is covering the requirements for category II (good for recreation and fisheries) i.e. it is better than the water quality of the main stream of Danube entering the Bulgarian territory. Exceptions are the estuaries of Yantra River and Roussenski Lom. But neither in those cases there is a possibility for transboundary migration of pollutants.

Surface and ground water pollution from solid waste disposal is without transboundary effect, with the exception of cases of non-compliance with the regulation for trade or illegal export, transport accidents and improper handling of hazardous solid waste, which could lead consequently to ground water pollution.

The water quality is affected after the confluence of the Prut River with the Jijia River, which is suffering an extremely high load of pollutants because of municipal activities in the city of Iasi (*Romania-high priority hot spot*). The effluents of wastewater treatment plant of the town Cernauti (Moldova-*high priority hot spot)* also contribute to the deterioration of water quality on Prut river, on the territory of Moldova. Resita and Timisoara, two large municipalities of Romania, discharge significant COD-Cr, BOD5 and heavy metals loads in Barzava, respectively Timis rivers, few km upstream of Romanian/Yugoslavian border.

The following transboundary effects have been considered by the lower Danube region

- **Biodiversity degradation** in the Danube Delta and the Black Sea.

  Water pollution determined the decrease of aquatic life and diminished the availability of water resources. Various types of aquatic ecosystem degradation, including eutrophication have led to reduced biodiversity in the region. The high diversity of wetland ecosystems in the region is threatened, being dramatically affected due to many of the destructive upstream impacts associated with direct impact of urbanization. The Black Sea wetlands provide important hydrological and biophysical functions, including nutrient removal, flood control, groundwater recharge, as well as many occasions for recreation and tourism.

- **Eutrophication**

  Wastes from human activities can accelerate the aging process of lakes, as with water pollution due to nitrates and phosphates, which greatly stimulate the growth of algae. Decomposition of dead algae reduces the water's dissolved oxygen content, adversely affecting fish and other aquatic life forms. Eutrophication may cause deleterious effects in water treatment of downstream users for drinking purposes (Moldova). Apart of disappearance of fish species, eutrophication can also produce shortening of food chain (Danube Delta-Romania).

- **Jeopardizing human health**

  Untreated or unsatisfactory treated sewage and municipal wastewater contribute significantly to the load of organic materials and nutrients, and extension of diseases. The contamination of fish represents another potential threat to human health in the countries of the lower Danube region. The limited reserve of safe drinking water is already endangering public health and constraining economic development. Human health of downstream users is to be also threatened in the case of accidental pollution. Many accidental water pollution events were identified in the lower Danube river basin which contributed to rapid water quality deterioration (Chernivtsy waste water treatment plant in Ukraine). Therefore, especially in case of transboundary impacts, the basin-wide fast information system on emergencies caused by transboundary pollution incidents needs to be properly implemented for effective control, damage prevention, and improved protection of population.

3.1.3. Problem Analysis

The core problem for Lower Danube region out of Transboundary Analysis Workshop and National Workshop Reports was defined as being the

"Inefficient management of the waste waters and solid waste".

There are many reasons why current water services, including wastewater and solid waste systems will have to change. Policy makers in the examined countries often ignore the environmental costs of exploiting the water resource. These costs may impact the abstraction volumes, by reducing river flow, affect the tourism and recreational activities, or reduce the dilution of waste effluents and either increase their adverse effects or coerce the end user to install more expensive waste water treatment procedures to compensate these effects.

The identified ***immediate causes***, integrated from the lower basin-wide viewpoint, included effects on the user located downstream, on wetlands, on Danube Delta and Black Sea ecosystems:

- **Absent or inadequate waste water treatment**

  Insufficient budget to cover operational costs for waste waters treatment plants; inadequate sludge treatment; inadequate location of waste waters treatment plants, latrines and septic tanks; poor operation and maintenance of waste waters treatment plants, including by passing treatment to avoid costs.

- **Absent or deteriorated sewerage system (+ storm waters)**

  Insufficient wastewater management in the Lower Danube region refers to direct discharge of wastewater into the receivers, due to various motives (lack of wastewater treatment plants**,** inappropriate legislation, lack of appropriate financial and accounting mechanisms, caused mainly by the centralized economies, non–reliability of funding; unsuitable planning of needs, inappropriate distribution of funds, natural disasters; inadequate individual sewage system as well as malfunction of wastewater treatment plants, including inadequate construction and use of sewerage systems.

  According to the national particularities of the countries included in the Lower Danube region, the inefficient pre-treatment of toxic and specific waters due to outdated equipment and inappropriate or old technologies- incorrect construction of some objects in the specific internal sewerage system and lack of measurement and control systems between the steps of treatment technology applied, together with unsatisfactory civic and ecological education and inappropriate legislation are the main considerations to be taken into account in defining the immediate causes.

- **Poor solid waste management**

  Inadequate solid waste management together with inadequate legal financing conditions, inappropriate management of land fills, insufficient involvement of responsible bodies, inappropriate equipment for solid waste treatment, lack of spaces for garbage collection, inadequate disposal of hazardous waste, in addition to the existing low level of public participation reflect the singularities of the countries of the Lower Danube part.

- **Weakness of the permitting and inspection activities**

  The insufficiency of environmental awareness in addition to the lack of enforcement of environmental regulations and standards largely contribute to the increase of pollution in the lower Danube countries.

The ***root causes*** of transboundary water quality problems for the Lower Danube region include:

- **Low public awareness, education, tradition**

  Public awareness and education related to environmental responsibilities, health hazards due to pollution or sustainable development goals have become a major concern for policy makers in the analysed countries.

- **Incomplete legislation, regulations, standards**

  Present policies and practices have caused severe distortions in the water pollution control and abatement programs. The absence of a comprehensive approach in the planning of pollution control investments and the lack of a strong regulatory/legal framework to define and enforce pollution control policies and management represent the main problem areas.

- **Lack of legal frame for self-financing the activities of the sewerage and waste water treatment plants**

  The water services strategies do not recognise the consumers' sovereignty and the full-cost pricing policies to allow recovering capital, operation and maintenance costs are not implemented in the examined countries. The absence of an appropriate system of cost recovery and user fees would require water users and polluters to pay adequately for the use of water resources.

- **Absence of a national strategy for water management**

  The lack of appropriate policies and strategies to conserve or sustainable use water resources impede the introduction of activities and interventions that are beneficial to pollution reduction. The investment choices are not justified within the context of a cost-effective strategy that balances economic costs and benefits, social and environmental values, and long-term sustainability. Despite the progress that has been achieved, the countries still need a more complex and legal regulatory framework to facilitate sustainable economic growth and protect the ecosystems.

  \- *Lack of incentives*

  As the environmental regulations are not enforced there is little incentive for firms and individuals to comply with. The historical use of command and control approaches for water resources management and environmental protection in the transition economies of the lower Danube countries has been proven to be very costly. The economic incentive mechanism needs to be set up in the field of water services provided by the municipalities of the region including allowances and penalties.

  \- *Lack of master plans at the river basin level for water management*

  Comprehensive planning is missing in most of the local watershed basins in the region. The lack of master plans does not provide an opportunity to develop a process for planning or establishing of water quality standards, effluent standards, water and sewer service pricing, and priorities for water project construction within the river basin.

- *Insufficient involvement of local authorities*

Development and adoption of integrated river basin master plans, with participation of local communities will facilitate the long-term water planning for each basin or group of basins.

3.1.4. Environmental Effects of Pollution on Signification Impact Areas

The ***immediate environmental effects*** identified for the municipalities are:

- **Deterioration of water quality in recipient water bodies and groundwater**

  Discharged into the surface watercourses, the untreated waste dump drainage water affects as well the aquatic ecosystems and the recreation potential and, thus, creates a health risk.

  Polluted surface and ground water have only limited use for either industry, irrigation or other uses.

- **Worsening of drinking water quality**

  The negative impact of settlements over water quality in all lower Danube regions reflects directly on ground water pollution. Pollution from waste dumps leachates (Dump for pesticides at Vulcanesti in Moldova) and untreated drainage water is highly toxic and even with low concentrations affects negatively the ground water used for drinking water supply. Consequently, it creates a high health risk.

- **Migration of toxic into environment**

  The pollutant migration into the environment has consequences in the watercourses downstream, as well as in the soil, in particular when it is used for irrigation. The highly toxic untreated waste dump drainage water affects the air and the untreated sewage water emanates bad odors.

- **Release of nutrient to water bodies**

  The direct discharge of untreated water from municipal sewage systems into the surface water courses creates a high load of nutrients (most of the municipalities in the region). Result is the degradation of the aquatic ecosystems, which affects the river's biodiversity.

The ***ultimate effects*** were defined by:

- **Quality of life is affected (health risk increased by water pollution)**

  The specific pollutants have negative consequences on the species and may enter into the food chain without knowing the hazards for human health. The polluted watercourses crossing the settlements have an unfavorable impact over the hygiene and sanitation of municipalities. Human health is affected due to existent poor drinking water quality. Morbidity and mortality rates are high and the life expectancy at birth is very low.

- **Deterioration of recreation capacities of water bodies**

  The pollution of surface water affects the recreation potential of the rivers and the riparian areas. Furthermore, practicing water sports in polluted waters leads to a serious health risk

- **Non-sustainability in socio-economic development**

  The water services are underpriced by the use of subsidies that actually reduce the cost of pollution and by the current market prices that ignore the damages produced by pollution emissions. The sub-optimal performance in the water resources management and pollution abatement and control, in various water sub-sectors, including municipalities of the lower Danube region results in high costs, declining services, environmental degradation and weakened benefits that all lead to the unsustainable development of the region.

- **Increase of treatment costs for drinking water**

  Poor water quality needs more expensive treatment and the water suppliers may be reluctant to pay the same price for raw water regardless of its quality. Despite the latest efforts of the countries of lower Danube region relatively large financial resources were invested in water pollution control, on sewage treatment plants in large cities and in drinking water treatment facilities. The absence of an appropriated system of cost recovery and user charges impedes the consumers as beneficiaries to pay for the water services.

- **Water resources quality and aquatic environment are affected (eutrophication of water ecosystems, damages of biodiversity).**

  Mainly, this effect is caused by solid waste landfills, effluents from wastewater pre-treatment plants and finally due to inefficient management of the wastewater of the municipalities. Accelerated soil erosion and more frequent landslides, as well as the deterioration of hydrological and hydro-geologic regimes characterize changes arisen in the geologic environment as a result of inappropriate activities in localities. These lead to a general deterioration of the environment and a reduction of biodiversity.

3.2. Industry

3.2.1. Situation Analysis

Romania is rich in natural resources: oil (in 1938 it was the second biggest producer in Europe and the seventh in the world), methane gas (the fifth biggest world producer in 1975), coal, nonferrous ores, gold, silver, salt etc. *Moldova*'s economy is characterized by an emphasis on agriculture and agro-industry, a lack of mineral resources, few heavily polluting industries, an underdeveloped technical infrastructure, with the industrial sector contributing about 50% to the Moldova GDP, despite the fact that its share has decreased in the last years. Moreover, industrial productions collapsed because of a sharp decline in heavy industry and because technologically advanced industries were orientated towards production for military activities. Agro-industry remains the main source of industrial output in *Moldova*, with wine and sugar production, canning, tobacco and meat processing being the most important activities. There is also some textile industry, light machinery and cement works. The mining sector is represented mainly by the extraction of construction materials. The part of the country belonging to the Danube basin is even less industrialized because it is a predominantly rural area. However, during the last years, new industrial activities started in the south of this area, with potentially major impacts on the environment in general and on the Danube River in particular: the exploitation of oil and gas, and the construction of an oil terminal on the Moldovian stretch of the Danube.

The structure of industrial production in all four analyzed countries, developed under the centrally planned economy was heavily distorted by a rigid pricing system, subsidies to producers and consumers, monopoly and strict administrative regulation. The economic transition, stimulated in part by the price liberalization and economic reforms after the break-up of the USSR, should result in a new production and trade structure for the *Moldova's* economy.

The major industrial branches in *Romania* are machine building, food industry, metallurgy, chemistry, light industry, wood processing. The diversity of three perspectives: economic, socio-cultural, and environmental needs and concerns suggests that there is no universally "right" or "wrong" policy path to achieve environmentally sustainable development in the Romania as in any other country in the Danube river basin. The policies of growth with no regard to environmental costs are of the past for the governments of Romania, Bulgaria, Moldova and Ukraine.

Since 1994, a large part of the industries of *Bulgaria* have worked either with reduced production capacity or completely ceased their operation activities. Thus, water quality has improved correspondingly but not due to the application of up-to-date low water use or waste-less technologies. The general lack of sustainability of industrial practices due to the heavy economic frame caused by the transition leads also to unfavorable environmental consequences

For *Ukraine*, the particularity of the development in the last 50 years was the rich natural and human resources in the former USSR which were available at low expenses, combined with the absence of market competition conditions under declarative environmental legislation. As a result, the potential of technogenic and environmental disasters is essentially higher than in the western part of Europe.

With respect to this sector, water pollution in the Ukrainian part of the DRB comes mainly from manufacturing wastewater discharge. In industrial areas, this wastewater is often discharged into the municipal sewage system. This peculiarity (in combination with the absence of economic mechanisms for water supply adjusting) stipulates the principal difference in designing, construction and operation of water supply, sewerage and water cleaning equipment. Nowadays, the management of such systems and their effectiveness as a whole become more and more problematic. The radical reconstruction of economy and the collapse of manufacturing cause such situation.

In view of the significant damage done to the natural environment, the governments of the lower Danube region are committed to a development policy that integrates environmental considerations. Such a policy enables the conservation of natural resources, the avoidance of irreversible damage to the environment and the achievement of long term economic growth on a sustainable basis. Sector industrial policies have been set up together with program of rationalization of the production system and investments in the new macroeconomic environment. The introduction of policies that force producers to compete in open markets leads to restructuring away from heavy industries and towards less polluting lighter industries and services. Favorable impacts on the environment come from price liberalization and removal of subsidies, privatization, competitive markets, reform of taxation, interest and exchange rates.

Policies on water quality protection take account of wider pollution control, water resources management and health and social planning. The impacts of the policy changes can be seen in the down-sizing of operations in a number of enterprises in this region and outright closures for reasons of unacceptably high inefficiencies, low competitiveness and pollution impacts.

Economic growth and human development activities have resulted in an increasing deterioration of water quality to the extent that they pose serious threats to health in many parts of the lower Danube region.

In many localities, in the urban and especially in the rural areas in the region, contamination of surface and ground water used for abstraction was mainly produced by the lack of appropriate methods for the transport, treatment and disposal of liquid and solid wastes coming from industrial activities. The most important polluting industries are: ore mining activities; chemical and petrochemical industries; pulp and paper; metal works and machinery; food industry; textile industry. The tailing deposits generate particularly serious problems to the environment due to both the risk they create as regards the stability of the settling ponds and to the direct adverse impact on the soil (land occupation, soil degradation), water (surface and underground water pollution) and air. There are no incineration facilities for pesticides, medicine drugs or for other expired chemical products. Chemical pollution coming from specific industries that still dump their wastes on land and water represents a major concern for Romania, Bulgaria, Moldova and Ukraine.

Some of the industries are already provided with facilities for pre-treatment of their wastewater. Generally speaking, the biodegradable pollution is not a problem for population, but so far for some specific types of wastewater no effective treatment technologies are available. In addition a problem with the so called "conventional clean" industrial discharges has been identified. A number of important industries are permitted to discharge processed water without polluting elements (conventional clean water) directly in the open water bodies. Recent monitoring activities indicate the most of these wastewater streams contain substantial pollution loads. Another important activity leading to water pollution is represented by wastes generated by large-scale industrial activities that are disposed of in specific deposits that are inadequately operated.

In the river basins most of the pollution are coming from landfills related to the following operations: mining deposits of sterile and sludge from mining activities; deposits of lime sludge from inorganic chemical industry; organic chemical industry with their deposits of organic solid residuals; deposits of pulp coming from paper production or deposits of fly ash and sludge from the energy production.

Industrial discharges, leachate from abandoned waste dumps and waste transport systems all contribute to the load of toxic micro-pollutants reaching the Black Sea from the Danube and its tributaries.

The industrial disposal sites are special arranged for the certain kinds of waste as: ashes and slag from the power plants, chemical and petrochemical wastes, dump heaps from mining fields, etc. In the mixed waste disposal sites are accepted both domestic and industrial residues (excepting those toxic or dangerous) including, usually, sludge from the waste water treatment plants, wastes coming from construction, wood waste, etc. The liquid wastes are disposed in the wastewater treatment plants that are generally performing only physical/chemical steps. Most of the large industrial units have their own disposal plants, both for liquid and solids wastes. This situation facilitates the identification of the waste sources in all four studied countries and the development of the imposed pollution prevention measures.

Reducing the industrial discharges and eliminating the diffuse sources of pollution during solid and liquid transport activities is a major task for all the water users. An important concern is given to the fact that, by many presently used waste-removal and disposal methods large toxic substances simply return to the environment. Moreover, the shortage of adequate liquid and solid waste disposal measures in many rural areas impairs the well being and quality of life for many people in the region.

3.2.2. Analysis of Transboundary Effects

According to the data available, the share of the *Bulgarian* tributaries in the overall river Danube water quantity and quality is insignificant. The only exception, directly related to water pollution, is the water transport along the river. In the last years the traffic increased but the amounts of ballast, waste water and wastes submitted by the ships to the port authorities for treatment in the specialized installations decreased. Obviously, the control of the port authorities is insufficient and most probably some of the vessels pollute the Danube, discharging illegally their wastewater directly into the river. This is a typical example of a negative transboundary impact caused by international navigation.

The Prut River is the last major tributary to the Danube. Its catchment area is almost equally divided between Ukraine, Romania, and Moldova. Industrial activities in these countries inevitably result in transboundary effects. Such problems in *Moldova* originating from *Ukraine* are caused by communal and industrial pollution from point sources on the Ukrainian territory (the towns Yaremcha, Kolomya and especially Chernivtsi). Wastewater treatment plants in these towns are not functioning properly because of overloading, old equipment and a lack of resources for repairs and maintenance. The main industrial activities in this area are timber processing, mechanical engineering, metal processing, oil and chemical industry. The industrial enterprises are usually connected to municipal treatment plants.

Concerns are expressed in *Moldova* regarding the presence of phenols and heavy metals from *Ukrainian* sources in the Prut River. Mercury, chromium, coppers and zinc can be particularly mentioned, possibly relating to the electroplating facilities in Chernivtsi. Their concentrations in water do not seem to cause serious problems in the upper stretch but they can appear because of the accumulation of micro-pollutants in sediments in the Costesti-Stinca reservoir (*Romania*) a hundred kilometers after the Prut enters Moldova.

Transboundary problems in Moldova originating from Romania are due to the Jijia River, draining the north-western part of the catchment area within Romania and collecting industrial, agricultural and municipal effluents, including those from Iasi and Botosani. The effect of adding this pollution load via Jijia is a deterioration of the water quality in the Prut River for many kilometres downstream, although there is some improvement towards its confluence with the Danube. On the other side, the transboundary problems in Romania originating from Moldova are due to non-point sources of pollution in the Moldovan part of the Prut catchment area. The industrial impact on water pollution in this region is considered to be small.

In general terms, the effect of the Prut inflow is a deterioration of the water quality in the Danube. There is an increase in BOD, total N and total P concentrations in the Danube and a substantial increase in suspended solids concentrations. Apart from transboundary problems related to the Prut River, one should consider the impact of pollution originating in Moldova on Ukraine via the Yalpug and Cahul rivers.

The transboundary effects play an important role, especially for the downstream countries, as it is *Romania.* In the European context, taking into consideration the geographical position, it might be concluded that Romania is the *main final receiver* (by the Danube River Delta and the Black Sea territorial waters) of pollutants coming from the Danube River riparian countries taking up also the main part of its own pollution impact.

Untreated or partly treated wastewater from industry pose constant risk to Romania as a downstream water user. Moreover the performance of most treatment facilities in Romania is far below design specification due to inadequate capacity and lack of maintenance, shortage of spare parts and equipment. The quality of both Somes and Cris rivers is influenced by the existing pollution sources located in its Romanian basin including its tributaries, and also from some of transboundary sources situated in *Hungary.* The main loads on the Somes River Basin resulting from the Romanian activities are heavy metals. To this load other riparian countries activity impact is added and the total load is reflected downstream on the Danube River entering Romanian territory. The quality of the Mures is influenced by the existing pollution sources located in its Romanian basin including its tributaries and also from a few numbers of transboundary sources situated in Hungary.

The quality of the Prut is influenced by the existing pollution sources located on its tributaries, Jijia and Bahlui, and also from a number of transboundary sources, such as Iaremcha, Kolomyia and Chernivtsi (*Ukraine*). The influence on the water quality of Prut is due to the presence of heavy metals from Ukrainian sources. The increases at Chemivitsi and Tarasivtsi indicate that there are heavy metals in the effluent from Chemivitsi wastewater treatment plant and additionally from the downstream discharges, which may be from sewer overflows or from industries. The 13 electroplating factories in Chemivitsi are likely source of heavy metals and agricultural processing and canning plants are a possible source of zinc, copper and nickel. Much of the nitrate and phosphate load is probably derived from agricultural run-off, but some may also come from wastewater treatment plants from *Romania* and *Moldova.*

Summarizing the transboundary effects for Romania, Bulgaria, Moldova and Ukraine we may define:

- **Water use affected by accidents**

  Taking into account the large number of accidental pollution events which produced many water supply interruptions and environmental and health effects, the prevention and control of accidental pollution and hazardous phenomena
- **Effect on biodiversity**

  The presence of hazardous wastes has longer-term consequences for the morbidity and mortality of human as well as for the regional flora and fauna. In spite of the broad variety of landscape and efforts to protect the habitats, the rich biodiversity of Danube river basin on the lower Danube region is suffering: many species are endangered or are already threatened, with extinction.
- **Deterioration of ecological equilibrium**

  A major problem is represented by the water pollution generated by the *waste disposal sites:* some are located inside the urban localities, having an important landscape adverse impact. Many disposal sites, without any specific facilities, located on the riverbanks produce acute pollution of receiving bodies. Industry is responsible of most of the direct and indirect discharges inadequately treated that contribute to the deterioration of the whole equilibrium of the ecosystem.
- **Pollution of environmental factors**

  Liquid and solid waste services represent a critical part of maintaining a high level of urban and rural environmental and water quality; the large quantities of industrial wastes are producing serious adverse impact on the whole environmental factors. A particular spill of pollutants into rivers and lakes can cause cumulative changes in the water quality that can produce serious damages to ecosystems and high economic losses caused by pollution.
- **Deterioration of water quality due to repeated discharges**

  Uncollected industrial waste threatens public health and impedes surface drainage. The consequences of untreated or partly treated wastewater from industry pose constant risk to human and environmental health. Moreover the performance of most treatment facilities in the region is far below design specification due to inadequate capacity and lack of maintenance, shortage of spare parts.

3.2.3. Problem Analysis

Industrial sector core problems was identified for all four countries as

"Pollution prevention and abatement from industry not achieved".

Industry practices caused in the past a lot of environmental damages. The economic restructuring and the process of privatization are of substantial importance for the activities to be undertaken for overcoming the environmental consequences of the industrial activity. To achieve the sector objective, it is necessary to reduce the impact of past pollution on the environment by preparing an inventory of polluted sites, undertaking measures for improving management, ensuring funds for liquidation of past pollution and updating designs for closure of industries. Moreover, implementing appropriate measures to limit the discharge of industrial waste water by introducing of efficient treatment technologies, by constructing treatment facilities, updating manufacturing technologies and improving maintenance and operation of treatment facilities the pollution is diminished. Other objective of the industry sector strategy is to adopt sustainable industrial practices through appropriate public relations strategy for stakeholders involvement, establishing programs for reduction the use of hazardous materials and prevention of the risk of accidents, introducing the environmental management in enterprises and implementation of modern manufacturing technologies.

The identified ***immediate causes***, integrated from the lower Danube basin-wide viewpoint, included effects on the user located downstream; on wetlands, on Danube Delta and Black Sea ecosystems.

- **Lack of clean production (lack of water re-use; inadequate management of liquid and solid)**

  The lack of appropriate methods for the transport, treatment and disposal of liquid and solid wastes coming from industrial activities, in the urban and especially in the rural areas in the region mainly produced contamination of surface and ground water used for abstraction. Water reuse within the industrial processes, materials recovery and the recycling of materials and products are important management tools in industrial pollution prevention and control. Economic benefits associated with these objectives include conservation of materials from primary sources, reduced environmental impact and rationalisation of landfill areas for industrial wastes. Unfortunately, the lack of a national waste minimisation and recycling strategy in all the analysed countries hampered the initiatives to achieve "clean production".

  The Governments of the region did not show much interest in exploring the prospects for effluent reuse, particularly from sewage treatment plants, to conserve water supplies and to reduce the environmental impacts of effluent discharges to the environment. Moreover, the price structure tends to mitigate against the widespread implementation of effluent recovery schemes. However, recently the governmental bodies and industrial sector recognized the importance of clean technology as a fundamental means of reducing pollution and a practical tool for pollution prevention and are considering policy instruments to support clean technology programmes (grants, eco-labelling systems, loans for R&D).

- **Lack of regulation enforcement and monitoring (poor monitoring of regulating agencies; inefficient self-monitoring of the water quality of treatment processes)**

  Command-and-control systems of regulation have been the most commonly used instrument for the management of pollution in all countries of the lower Danube region. The lack of controls enforced at pollution source, according to the prescribed conditions of discharge, (although ambient pollutant concentration standards frequently form the basis for determining discharge limits) facilitated the violation of environmental regulations.

  The absence of self-monitoring, based on internal control system, the backbone of industry's compliance is a common question for the region. Another problem is the rapid water quality deterioration caused by industrial pollution incidents which induced the closure of drinking water supply sources or additional warning measures to be taken on transboundary rivers.

  Inspectors were not properly trained or equipped, beneficiaries took little interest in enforcement of the legislation and in the cases where inspection were carried out, they were not done systematically and there was no coordination with inspectors monitoring. There is often a lag between developing and implementing effective permitting systems, that stipulate precise and enforceable pollution standards, and monitoring or inspecting the permitted facilities to ensure that the standards are being adhered to. The need to establishing effective enforcement systems for violators and the requirement to take actions against violators represent major concern for the policy makers.

- **International violation of environmental regulations**

  A series of cases involving chemical wastes brought to light the deficiency in the system of monitoring and ensured that the enforcement of environmental regulations and compliance with international agreements became a political issue of the first order.

- **Use of hazardous but cheaper raw materials**

  The use of toxic less expensive raw materials is specific for many of the poor environmental performers. Many of companies in the lower Danube region still profit from not complying at the expenses of those which do changed their industrial behaviour. The Governments of these countries were unable to ensure that the policies and laws it enact are equally complied with, and have frequently failed to devote sufficient attention to providing practical institutional and market means of ensuring compliance and enforcement.

The identified ***root causes*** included:

- **Economic collapse**
- **Old technologies applied in most of the existing industries**

  Obsolete and worn-out capital stock, high-energy intensity is the most outstanding characteristics of the lower Danube region industries. Priority given to new investments rather than modernizing of the existing capital stock resulted in the growing obsolescence of the capital stock and technologies, with several negative implications: low productivity, higher production costs, several breakdowns of the industrial capacities, equipment failure, quality reduced, leading to loss of competitiveness of the economic enterprises.

  Another problem difficult to solve is the absence of economic instruments, which, for example, may cover the costs of management incurred by disposal authorities, to ensure that best practices and technologies can be implemented. To some extent, the recent introduced newer pricing regimes in the examined countries have also encouraged discharges to carry out abatement measures themselves, rather than pay the cost of having waste treated and/or disposed of by waste management authorities.

- **Inefficient environmental management**

  There is often a lag between elaborating and implementing effective permitting systems that specify explicit and enforceable pollution standards, and monitoring or inspection the regulated industrial units to secure that the standards are being complied to. The inefficient environmental management is mainly due to the absence of a policy framework and implementation mechanism for environmental enhancement, which request continuos assessments and adjustments.

- **Inefficient legal framework**

  The absence of economic instruments for pollution control designed to internalize the external damage costs of industrial pollution made impossible the use of economic incentives that induce discharges to change their behavior, production technology, pollution controls or management practices (e.g. *waste disposal*).

- **Subsidiary water costs.**

  The efficiency ratios of the lower Danube region industrial sector are generally low and falling, justified by the use of old and deteriorating capital stock, little operational efficiency and low level of capacity utilisation. Moreover, the water tariffs are supposed to cover only operation and maintenance, the state has provided investment funds. There are several attempts to introduce full-cost water pricing policy in the countries of the lower Danube region which requires that water prices should be sufficient to cover full economic cost of supply and that, in the long term, there should be no subsidies.

3.2.4. The Immediate and Ultimate Environmental Effects on Signification Impact Areas

The immediate and ultimate environmental effects were reviewed with the aim to consolidate the base information on the significant impact areas and water quality, considering available information and inputs from the Transboundary Analysis Workshop participants.

The ***immediate environmental effects*** identified for the industrial sector are:

- **Pollution of surface and groundwater**

  All the industrial processes, which use water ultimately, generate wastewater, resulting in pollution of nearby aquatic ecosystems. Therefore, even for the countries located in the lower Danube region, pollution of waterways was caused by single determinant or by combination of different types of industrial discharges such as oxygen-demanding wastes, disease causing agents, synthetic organic compounds, plant nutrients, inorganic chemicals and minerals, sediments, thermal discharges and oil.

- **Pollution of soil and air which comes directly or indirectly from polluted waters**

  The pollutant migration in the environment has consequences in all environmental media. The environmental effects of significant pollution from industry might be quantified for each of the environmental media, including water, soils and subsoil and air. Salination of soils as a result of watering is a result of inadequate irrigation activities, as well as a consequence of the general water pollution, especially by high-mineralized mining waters. The water intake for irrigation, as well as amelioration processes cause an aggravation of water pollution, an alteration of the surface and ground water level, salting of soils and a loss of biodiversity.

- **Leakage of heavy metals**

  Accidental pollution is directly related to the unsustainable industrial practices as a whole and to the industrial accidents in particular. The absence of emergency preparedness for chemical hazards instructions at the industrial facilities impede the readiness to face the adverse effects of accident caused by hazardous substances.

  The necessary preventive and protective steps, require to be taken before, during and after the accident, designed to provide the measures for minimization of effects due to release or escape of toxic, spillage of hazardous substances in storage, processing and transportation, need to be worked out in operational terms by most of the industrial companies in the analyzed perimeter.

The ***ultimate effects*** were defined by:

- **Depletion of natural resources (reduction of species biodiversity; genetic mutation of aquatic species)**

  Technical and technology constraints lead to excessive water use and the result of this is reduction of water resources. The results of environmental pollution are disturbances in the biodiversity as well as in the overall functioning of the ecosystems. Landscape degradation and destruction of ecosystems are environmental effects observed as a result of both improper closures of industrial sites and unsustainable industrial practices. Overloading of environment bearing capacities, by decreasing its supporting dimensions in terms of natural resources use represents one of the most significant environmental consequences of industrial pollution in the region.

- **Deforestation**

  Deforestation and erosion processes caused/accelerated by industrial, transportation, military and hydraulic structures, both direct and in combination with natural processes (winds, floods, native river bed changes) represent significant ultimate effects of pollution on significant impact areas in the lower Danube region. The deposit exploitation, as well as sand and gravel extraction in the river basins, in combination with mineralising mining waters discharged into rivers causes powerful erosion processes. These processes can not only aggravate the situation in the Danube River bed, but even lead to processes in watersheds such as karst phenomena or reservoirs sedimentation.

- **Reducing of tourist potential**

  The environmental destruction, the significantly disrupting of well being of local communities, the reduced level of lifestyle and security of access to local resources give illustration to the reduced number of tourist visiting the lower Danube region for the last decades. Tourism represented an important source of income for the local people of some areas. The number of visitors decreased drastically, but the great potential for developing ecotourism in the lower Danube region together the improvements of the infrastructure to the modern standards will ensure a normal development of this activity.

- **Population migration**

  The deterioration of the biodiversity and of the whole ecosystem, the reduction of available water and soil resources impacts the socio-economic development of the region and contributes to the movement of population. The existence of real and potential health hazards in the work and living environment in various industrial facilities, the lack of adequate resources to better identify, evaluate and control the potential safety and health hazards, the absence of personnel trained in the science of occupational health and safety, the lack of monitoring equipment to quantify the potential stress agents and of funding to implement the controls necessary to alleviate exposures represented serious threats to the welfare of the population living in contaminated areas which sometimes decided to migrate to less polluted zones.

- **Quality of life affected**

  Pollution from industrial activities reflects directly on the food chain and potable water supply, which creates health risk for the population as well as for the hired workforce in the industries. ` There is a little attention to occupational health. In hazardous environments, working conditions are subjecting to be reviewed. These practices continue due, in part, to the lack of knowledge and environmental awareness, existence of incentives paid to workers for hazardous occupations, lack of instruments to measure working exposure and lack of proper legal framework. The consequences are reflected into the reduction of birth rate, reduction of life expectancy, genetic changes, etc.

3.3. Agriculture, Land Use and Forestry

Analyzing the role of the agricultural sector regarding the pollution of the Danube River and its tributaries, it was decided by the participants of the workshops to include the following sub-sectors: land use, crop production, animal husbandry, fish farming and forestry. Therefore, the agricultural sector strategies were identified in the reports for agriculture (Ukraine), Agriculture and Forestry (Bulgaria, Moldova) and Agricultural and Land use for Romania. These five areas of activities lead to water pollution due to their inadequate agricultural practices. All of them are aimed at food and wood production and are based on the use of land and water resources for both state and private forms of ownership.

3.3.1. Situation Analysis

For all four countries of the lower Danube region, agriculture is today the most important economic branch, due to the natural conditions providing a very special agricultural potential, having an ancient and well-known tradition in this field. Unfortunately, the present farming system, known as "conventional farming", produced both progressive social and economic results and serious environmental damages (upon its vital resources mainly: water and soil, and, consequently, upon bio-diversity as genetic basis), and upon human health as well.

Moreover, if we consider the potential synergetic effects (we must note also the fact that in several sectors, agriculture is both polluted and polluting), quite little known, it is enough for appreciating the present situation as unfavorable, but as very dangerous also. There are several evidences for the irrational and uncontrolled use of land resources, with considerable anthropogenic pressure that require an essential improvement of the land management system.

The main polluters in agricultural sector in Romania, Bulgaria, Moldova and Ukraine are coming from: large animal husbandry units, crop and fruit-tree farms, mechanical companies, agricultural land and forest owners, irrespectively of their ownership type.

Since the beginning of the 90s, as a result of the economic transition, a significant reduction in total agricultural production has been observed. For example, today, in some regions (*Ukraine*), cattle livestock is only about 20% of the total livestock in 1990 in spite of a general increase of pasture area and in 1998, the decline in total cattle livestock is 16% in comparison with the same period of 1997. The utilization of the irrigation system for *Bulgaria* as a whole has diminished to only 10%. The private sector in agriculture for all four countries is still very weak and faces serious obstacles due to unfavorable legislative, financial and organizational conditions. In spite of the lack of experiences and relevant financial support, the output of private farms is becoming steadily more important. In the first half of 1998, positive trends become visible in the sector.

With regards to the *Ukrainian* part of the DRB, it is relevant to emphasize that agriculture and forestry are among the most important kinds of human activity in the region. As any other activity, it requires natural resources and produces specific waste. 57%, 61%, and 35% of population in Prut River basin, Tisa River basin and Low Danube respectively are rural and involved in agricultural activity. In *Bulgaria*, the land reform is not completed. There is still no clarity concerning the ownership of the land, no steps have been taken for the development of the control of non-point pollution and moreover the utilization of the irrigation systems for the country as a whole has diminished to 10%, which is considered as critical. The extremely unfavorable ratio of fertilizers does not allow utilization of nitrogen, introduced into the soil by the plants, and leads to its entering into other elements of the ecosystem causing pollution of soil and waters.

In *Moldova*, there are more severe impacts on agriculture than on any other sector of the national economy. The financial situation of the overwhelming majority of farms is alarming, with an average profitability in agriculture being estimated in 1996 at 10,3%. About 50% of all collective farms (co-operatives) are presently bankrupt. Furthermore, the systems of purchase, storage, transportation and the marketing of output are disorganized which leads to substantial losses. There is a shortage, or total absence, of funds for the purchase of agricultural machinery, fertilizers, seeds and pesticides. The latter forces agricultural producers to arrange barter deal on terms that are far from being fair or favorable.

The recently developed private agricultural sector is very fragile, without sufficient support and innumerable obstacles.

Practically, all the agricultural area in *Romania* is included in the Danube river basin. Consequently to the reforms that started in 1990, mainly to the Land Law (no. 18/1991), the share of different ownership types in agriculture and forestry shifted dramatically to private ownership, which resulted, on one hand, in substantial positive economical changes, benefiting to the new owners, and on the other hand in stopping or even a decreasing pollution of natural resources: water and soil. This paradox is explained by the decrease of fertilizers and pesticides quantities used in agriculture (as a consequence of their excessive prices as compared to the financial power of the new farmers), as well as by quite frequent subsistence farming.

Disposal of animal waste on platforms or drying beds with inappropriate or no treatment (mainly in the pig farms, where also large volumes of waste water result) lead to the impossibility of reintroducing it in the natural energy cycle (through fertilization in field) and result in disposing beyond the safety capacities or - more seriously - in the drainage channels, and from here to the emissary.

3.3.2. Analysis of Transboundary Effects

The following transboundary effects have been considered for the countries included in the lower Danube region:

- **Affecting bio-diversity in the Danube and the Danube Delta**

  Inadequate farming practices in the Danube flood plains and Delta as well as in inland rivers flood plains, together with the inappropriate management of animal husbandry, units result in transport of important polluters into Danube River and hence, in the Danube Delta (mainly NPK compounds and pesticides residues).

  This transport is considerably intensified (sediments/alluvia included) by the increased flowing coefficient in the surface waters, due to excessive woodcutting. Once arrived in the Danube River and Delta, these substances are aggressive to water quality and bio-diversity implicitly. These effects might have transboundary character if we take into account the vicinity of Yugoslavia, Bulgaria, Moldova Republic, Ukraine and Hungary. Moreover, the Danube flood plains and Delta represent also a permanent regeneration (spawning) space for several marine fish species (such as sturgeons and mackerels) which might be disturbed. Degradation of biodiversity caused by the inadequate management of forests and animal breeding within the private sector is also mentioned in the Moldovian national planning workshop report.

- **Affecting the water quality parameters**

  Affecting the water quality the way it is described above is harmful not only because it is reducing bio-diversity, but mainly because it is reducing the using potential of the water (water supplies, tourism and leisure).

  The Prut, Tisa and Danube rivers should be mentioned here for their transboundary effects in Moldova Republic, Hungary, Yugoslavia, Bulgaria and Ukraine.

  The comparison of samples from the two frontier points of the Danube River on the Bulgarian border (Novo Selo, km. 833.6) and Silistra (km. 375) indicates no significant differences in the examined characteristics of the Danube water. This shows that the contribution of the Bulgarian tributaries is insignificant and that the basic quality of Danube River water is determined from upstream of the Bulgarian section. Given the geographic characteristics of the Bulgarian part of the Danube River basin, there are no transboundary effects caused by contamination of the local rivers. As pointed out above, there are three parallel streams in the section of the Danube River - one close to the Bulgarian bank, the second in the middle of the river (main course) and the third close to *Romanian* bank. All surveys conducted during many years have shown that these streams do not mix as a whole. Thus, there is no impact of the *Bulgarian* side to the *Romanian* one and vice versa. In the discharging points of *Bulgarian* rivers into Danube River some polluting effects have been observed. The pollution along the Danube River course itself has only local effects and a practically insignificant impact. Erosion problems at the *Bulgarian* bank of the Danube River are caused by the manifold negative impacts, of which the biggest is due to the operating of the “Iron Gate” I and II. Only a few small rivers of the Nishava catchment area spring from the Bulgarian territory and after that leave to Yugoslavia. Timok is the opposite case - its catchment area is almost exclusively in the Yugoslavian territory and only in the end it becomes a borderline river between the two countries.

Agricultural activities also result in transboundary effects of high importance for the whole region of the Danube River Basin. One of the consequences is the process of eutrophication in the Black Sea and the Danube Delta.

- **Changes in flow regime**

The changes occurring in the flowing capacities resulted from various activities, such as:

- embankment works in Danube floodplains and Delta;
- drainage works in Danube floodplains and Delta;
- irrigation works in Danube floodplains and Delta;
- important hydraulic structures (dams, barrages) on inland rivers and Danube;
- massive deforestation.

The cumulated effect of all these activities is leading to important changes in the flowing capacity regime, having as main features:

- an increased gap between minimum and maximum flowing capacities, and hence either non-compliance of minimum admissible regime for down-stream users, even restricting the sanitary regime on inland rivers;
- extreme overflows, resulting in non-compliance with international conventions related to high water levels.

The transportation of suspended solids, as a transboundary effect from Ukraine, was reported by Bulgarian report.

Mostly affected by this highly non-beneficial balance is the Danube Delta, which is a young area (still under formation), extremely sensitive to any distortions caused by hydrological and soil balances sensibly different from the natural evolution.

As a result of the Romanian Danube River Basin and Delta position, practically the whole polluting effect induced by the preceding countries in the basin is a potential downstream transboundary effect.

3.3.3. Problem Analysis

Based on the situation analysis and the problem analysis of the agricultural sector, the core problem in the lower Danube region was identified as

"Missing implementation of sustainable agriculture".

It is considered to be the designated main sector for the future prosperity and wealth of the whole region. Good traditions exist, but due to a lack of understanding of environmental problems, serious environmental damages were caused by it. To develop it in the future so that the population can rely on its economic benefits, serious measures need to be undertaken to adopt adequate plant growing *practices* by raising skills and knowledge for applying best agricultural practices, implementing measures for finalizing the agrarian reform, updating the equipment for application of fertilizers and pesticides and ensuring funds for appropriate agricultural activities. Moreover, it is necessary to implement appropriate irrigation practices by improving the regulatory framework, developing a financial policy for irrigation, and rehabilitating irrigation systems for private use and ensuring qualified personnel. The adverse negative impact of animal breeding can be avoided by improving the treatment of breeding farms waste water, proper composting of farm manure and sludge, enforcing the legislation on animal breeding and making funds available in order to stimulate ecological animal breeding. Finally, introducing environmentally sound forest and wetland management methods, natural forests can be preserved and protected, and wetlands restored.

The identified ***immediate causes of point and diffuse sources discharges***, integrated from the basinwide viewpoint, included effects on the user located downstream; on wetlands, on Danube Delta and Black Sea ecosystems:

- **Changes in ownership pattern**

  The lack of incorporating in the agricultural policies of the consequences of changing land use pattern, especially in the context of transfer of arable and forestry lands to the private owners impacts water quality represent a major concern for policy makers.

- **Inadequate plant growing practices**

  The ignorance of the farmers in using chemicals without considering the equilibrium between the nutrients and the caring capacity of soils that should be maintained has been mentioned as causing adverse effects to water quality.

- **Deforestation**

  The pressure of an increased demand for forest products, both for consumption and exports and pressure on forest land for alternative (cropland and pasture) land uses, as well as population, gross domestic product, external debt, government policies influenced the degree of waste pollution in the region.

- **Inadequate agricultural practises**

  The Governments failure in promoting agriculture preservation and conservation policies in the countryside and reconciling with modern agricultural practices together with the absence of best management practices correlated with control of water pollution, drainage and salinity control are main direct causes of water pollution in the lower Danube region.

  The current environmental policy is not take into account the general diffuse nature of the pollution from agricultural sector as well as the often considerable time lag in the movement of pollutants to ground water. However, there are recent efforts to adopt agricultural policy-such as water and soil conservation and practices as modernised irrigation to meet environmental objectives, by maintaining the basic natural processes.

- **Inadequate agricultural machinery use**

  Most of the agricultural assets are old and obsolete. The participants recognised the need for a broad upgrading of the technological basis for production, both at the farm level and in the processing and input supplies industries.

- **Inappropriate management of animal waste**

  Agricultural activities caused pollution due to the disposal in several unsuitable locations of huge quantities of manure and animal waste from large livestock industries. Even some of the farms were provided with purifying installations, most of them were not put into operation or their operation activity was ineffective.

The ***root causes of water quality*** problems identified during the workshop, for a large number of hot spots, for the lower Danube region in the agricultural sector included:

- **Poorly implemented agrarian reform**

  The adjustment strategies of the examined countries in the lower Danube region include privatisation, which is most advanced in agricultural sector, where the ownership rights were restored for much of the cultivable land. Unfortunately, the interface between agricultural sector and water industry covers a wide range of issues which were not properly implemented: abstraction limits, rural water supplies, resources development, river basin water transfers, water quality issues, pesticides use, nitrates limits, sludge disposal, and pollution control associated with livestock and highly polluting farm wastes.

- **Low skills of farmers**

  Excessive land use due to a reduced level of knowledge of farmers had several negative implications on the biodiversity and the natural habitats. Changes in agricultural practices performed by poor educated farmers produced unexpected effects elsewhere in the soil, plant, water and atmosphere systems.

- **Poor institutional structure**

  Historically, the intervention of the Governments in all components of the agricultural sector, including food production, processing and distribution tended to intensify inefficiency while undertaking to meet physical production targets. The accelerated exportation of fertilisers, tractors, and food items impeded achievement of the country's agricultural goals, depriving farming population of proper income, and affecting the environment. There is an important argument for institutional strengthening of government policy making and farmer support agencies in the whole lower Danube region.

- **Insufficiently developed legislation**

  Even the new adopted decentralisation and privatisation laws are progressively implemented, the possibility for a rapid explosion in productivity and growth of agricultural sector is still depending by adoption of various laws to reform the agricultural sector, for agricultural innovations, expanding markets for specialised products or change in behaviour to function positively and environmentally in a new climate for a sustainable agriculture.

- **Ignorance of eco-farming methods**

  The absence of guidance of agricultural sector privatization in terms of environmental effects, by developing new institutions and technologies that respond to farmers needs for higher quality services is regarded to highly influence the quality of water resources. One example can be given by mentioning the large quantities of fertile topsoil that have been lost because of erosion due to specific land uses. Moreover drainage works being build all over the lower Danube region are causing very often depletion of wetlands.

- **Inadequate irrigation practices**

  The intensification of agricultural practices and livestock production is major non-point pollution sources of surface and groundwater. The contradiction between the low quantities of fertilisers used and the relatively poor crops as compared to the amount of fertilisers used could justify the pollution with nitrates. As a result of fertiliser use, the water quality is being affected by the eutrophication with dramatic impacts on the aquatic ecosystems. Moreover, the due to improper irrigation practices, the yields were reduced and the sensitive crops were damaged due to the same practices which ignored the salts or the specific ion toxicity in soil or water

- **Unfavourable economic environment and market conditions.**

  The policy failure of the Government in the region to choose, design and promote new incentives schemes, as part of environmental policy, to ensure farmers can meet environmental challenges: conservation of natural resources, conservation and management of existing natural habitat is considered as being a major cause. A full price liberalisation for agricultural products, a fair competition from the input suppliers and machinery services agents, rapid technology transfer into the agricultural sector, and open access to the international markets are needed to clean up the sector.

3.3.4. Immediate and Ultimate Effects of Pollution on Significant Impact Areas

The immediate and ultimate environmental effects were reviewed with the aim to consolidate the base information on the significant impact areas and water quality, considering available information and inputs from the Transboundary Analysis Workshop participants.

The ***immediate environmental effects*** identified for the agricultural sector are:

- **Ground water pollution**

  Chemicals intentionally applied to water, herbicides to control weeds in irrigation canals and draining channels, run-off from treated agricultural land or accidental spillage, and unintentional over-spraying onto ditches and ponds near to the edge of field crops contribute to the worsening of groundwater. The chemical usage in agricultural activities modified the animal life of the water and mud in many of stretches of the water bodies.

- **Siltation of water bodies**

  In several areas in the region with irrigated agriculture, many salinity problems occurred in association with or strongly influenced by a shallow water table. As a result, higher salinity water required appreciable extra water for leaching, which made long-term irrigated agriculture nearly impracticable to be completed without sufficient drainage and an irrational water use. In several locations, with higher salinity water, sodium and chloride toxicity were also evident.

- **Surface water pollution with pesticides and nutrients**

  Surface water is the final receiver of natural and man-made pollution coming from agricultural practices. The excessive use of pesticides and fertilizers and poor agricultural practices is the main polluters responsible for the deterioration of surface water in the lower Danube region. This effect is again a consequence of simultaneous pollution, obviously in direct relationship with water resources quality, and hence, bio-diversity degradation on one hand, and decrease of the using potential of water sources.

- **Pollution and salinization of soils**

  Incautious disposal of agrochemical and wastes, which were dumped in landfills, close to water, courses, where leaches polluted soil. There is an urgent need throughout the lower Danube region to reduce or eliminate discharge of polluted effluents and to develop methods for dealing safely with contaminated soils. More commonly, sediments tend to fill channels and ditches and caused costly dredging and maintenance problems, reducing water infiltration rate of an already slowly permeable and contaminated soil.

- **Water and wind erosion**

  All four countries have reported a pronounced bank erosion. The habitat destruction, not only by forest exploitation, but also by agriculture has a great impact upon environment and its wild life in the lower Danube region. The intensive cultivation produced adverse effects on soil structure, giving the soil-reduced resistance to erosion by wind or water. Moreover, the absence of windbreaks encouraged soil erosion.

  We may identify land regression (a 7-12 hectares loss yearly). in the Danube Delta and a strong erosion in the lower Danube River basin. This phenomenon is the result of reduction of the transported alluvia quantity, due to the silting both the reservoirs performed in the Danube River catchment and the Danube Delta itself. For instance, the transported alluvia quantity by the Danube River was reduced by 50% after the construction of the Iron Gates reservoirs. Even in the Delta there is a complex process of erosion and silting, resulting in increases of the river Delta and regression of the marine Delta, as a consequence also of erosion in the sea shore due to the sea dikes.

The *ultimate* environmental effects included:

- **Human health deterioration**

  The negative effects of uncontrolled soil and groundwater pollution influenced the human health in the region. The deterioration of ecosystems and land, health hazards due to pollution, the pressure on land and limited financial resources in the lower Danube region have become responsible for intensifying migration of the population to the middle or upper parts of the Danube, looking for an increased social and environmental stability.

- **Genetic mutation**

  In several areas there is a potential risk from diseases due the toxicity problems, where certain constituents (ions) in the soils or water were taken up by the plants and accumulated in concentrations high enough to cause crop damage, reduced yields and genetic mutation.

- **Pollution of crops and aquatic biological resources**

  The water quality uptake, crop sensitivity and climate influenced the degree of the damages in terms of reduced yields, according to the evidences. The problems related to the land use and responsible for the pollution of aquatic biological resources include lack of reliable information on land use practices, the use of agricultural practices which did not meet environmental and socio-economic requirements, and accidental pollution. Changes in the hydrological regime as a result of existing hydraulic works also contributed to the deterioration of biological resources. The flowing coefficient has increased as a result of deforestation, leading at its turn to an increase of surface flows, as well as, in a lesser extent, to micro-climatic changes, including a reduction of lake areas in wet areas. These changes practically break certain already known cycles, as well as increase the gap between minimum and maximum, while they decrease the occurrence coefficients. All these aspects are sensibly aggressing the water and soil resources, both in terms of accessibility and in quality.

- **Unsustainable socio-economic development**

  The lack of appropriate use of water demand management did not encourage a cost-effective mix of supply and conservation resources measures in the agricultural sector. The current incentives pricing did not provide motivation to use water efficiently. Moreover, the unsustainable approach of the past decades when the size and production of the farms were the only dimensions of prosperity during last decades resulted in large quantities of cheap fertilisers and pesticides used and polluted soil and water bodies. Finally, the decline of historical markets has reduced the price of products and the return of the land to the private owners, who could not permit costly agrochemical.

- **Landscape degradation (loss of biodiversity; eutrophication of water ecosystems; desert extending)**

  The agricultural practices had consequences for the rural landscape and wildlife in the region, where the scenery looks less distinctive and varied. Uncontrolled or degraded land use developed a chain of repercussions having adverse effects on biodiversity, with the risk that, under extreme environmental conditions, the superimposed impacts lead, in several locations in the region, to the desertification. Eutrophication of natural and artificial lakes is considered to be one of the most important surface water pollution. It is a direct result of inadequate water and soil resources, as well as an immediate cause of water resources degradation.

Annex

Annex 1 Causal Chain Analysis - Upper Danube

- **Municipality**
- **Industry**
- **Agriculture***

Annex 2 Causal Chain Analysis - Middle Danube**

- **Municipality**
- **Industry**
- **Agriculture**

Annex 3 Causal Chain Analysis - Lower Danube

- **Municipality**
- **Industry**
- **Agriculture**

Annex 4 Problem Hierarchy - Middle Danube Countries

- **Municipality**
- **Industry**
- **Agriculture**

Annex 5 Problem Hierarchy Lower Danube Countries

- **Municipality**
- **Industry**
- **Agriculture**

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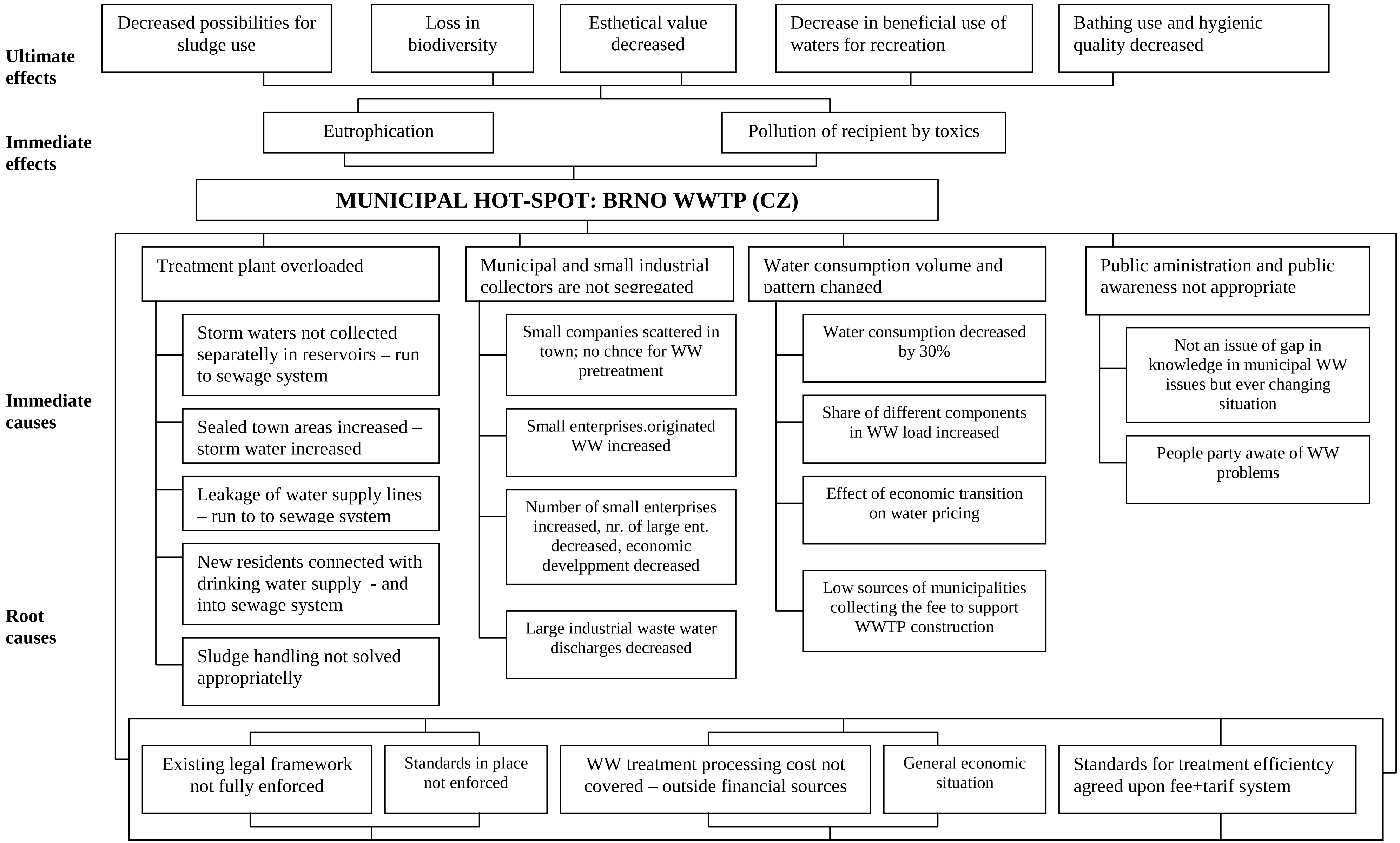
* Upper Danube here: Germany, Austria, Czech Republic, Slovakia

** Middle Danube here: Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Bosnia-Herzegovina, Yugoslavia

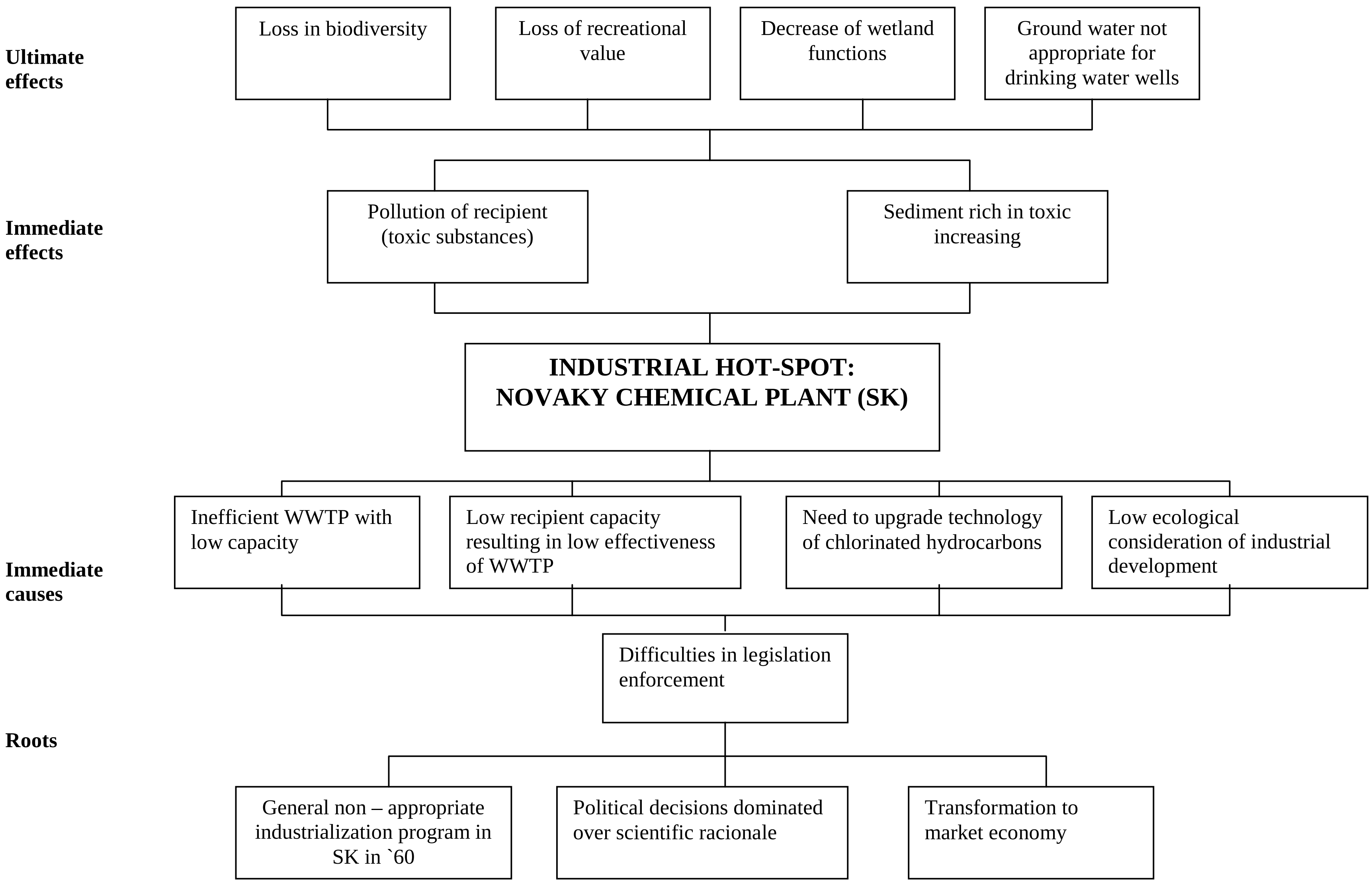
UPPER DANUBE **ANNEX 1**

CAUSAL CHAIN ANALYSIS OF ONE MUNCIPAL HOT SPOT



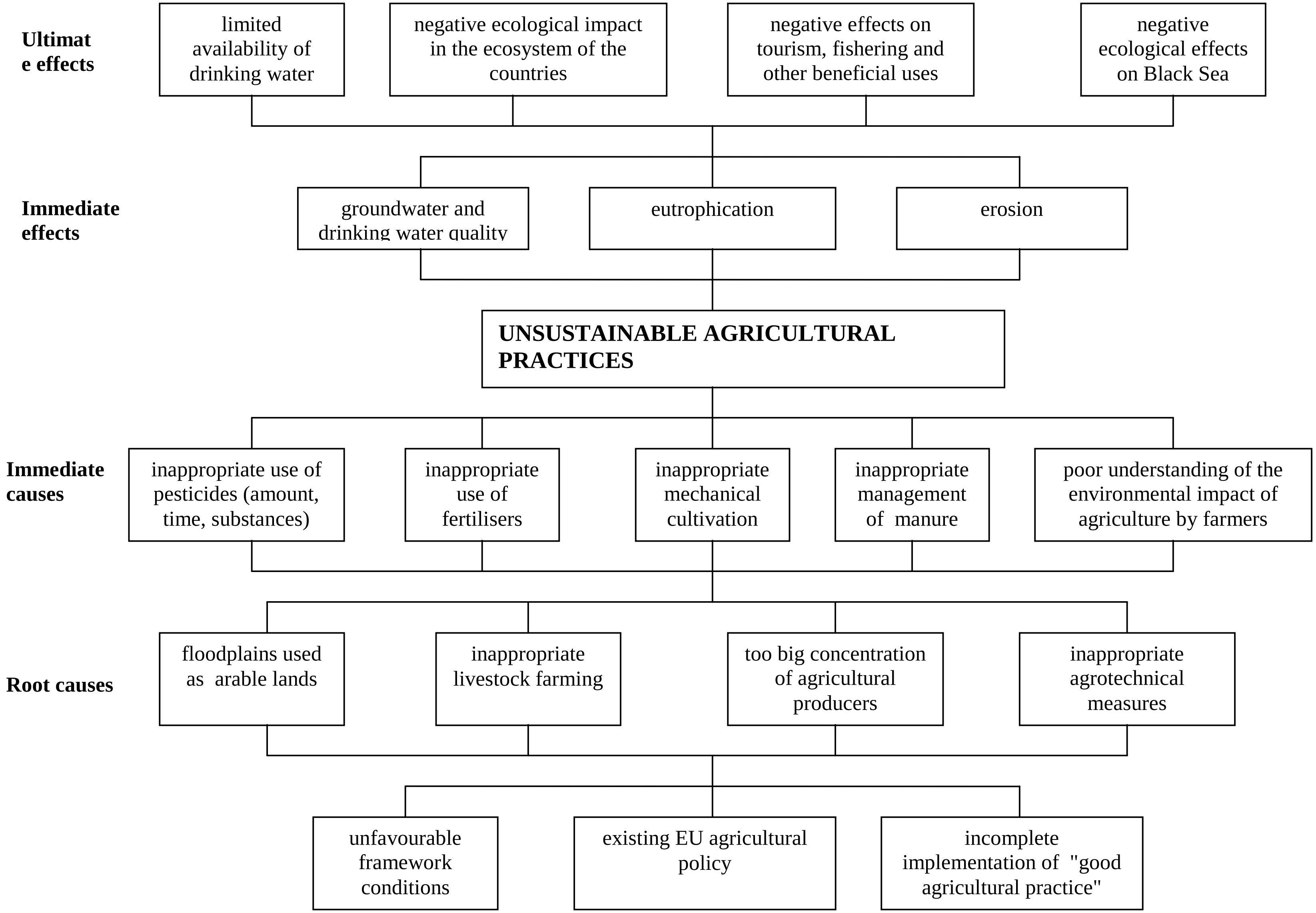
UPPER DANUBE **ANNEX 1**

CAUSAL CHAIN ANALYSIS OF ONE INDUSTRIAL HOT SPOT



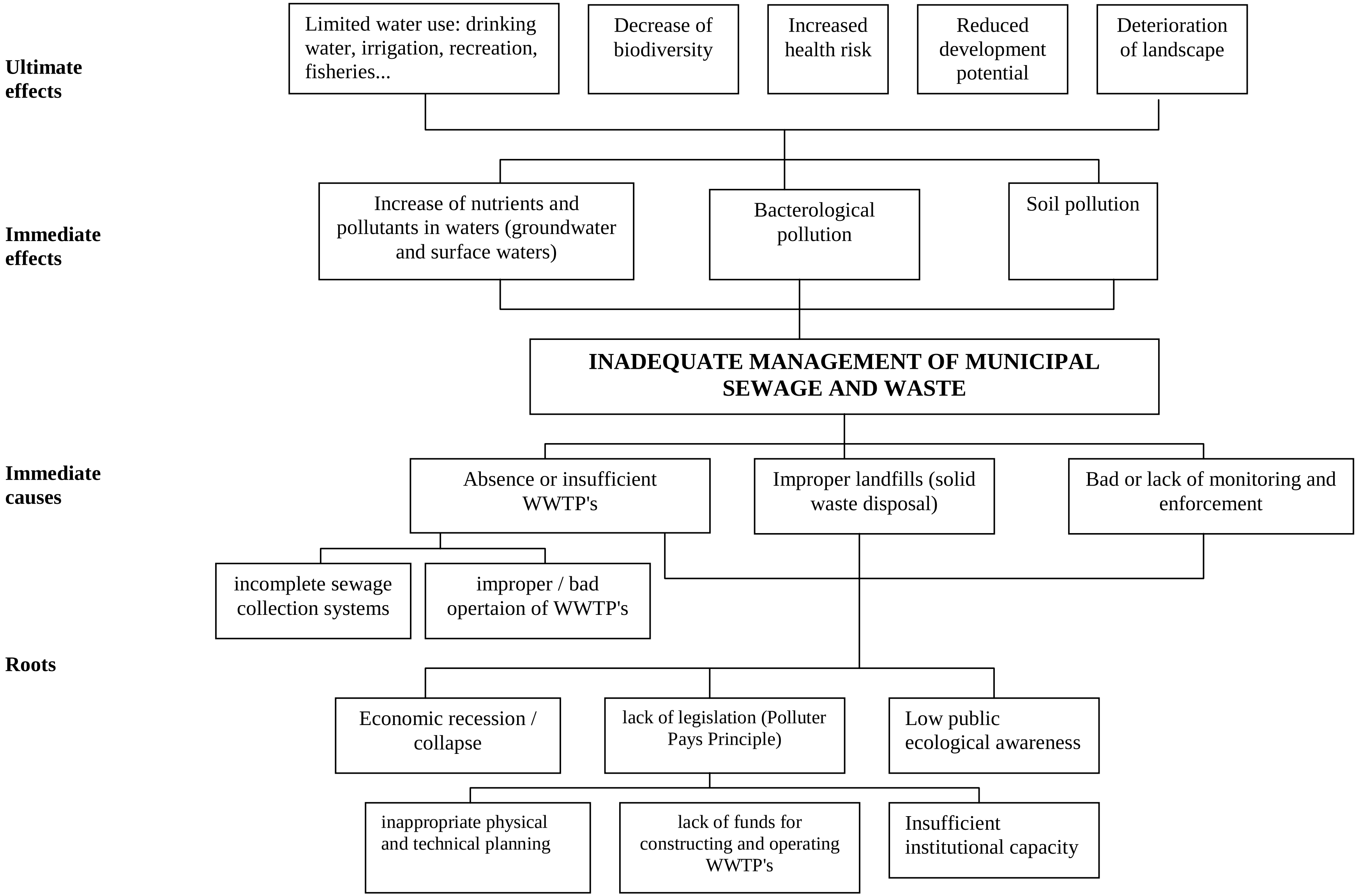
UPPER DANUBE **ANNEX 1**

CAUSAL CHAIN ANALYSIS OF AGRICULTURAL HOT SPOTS



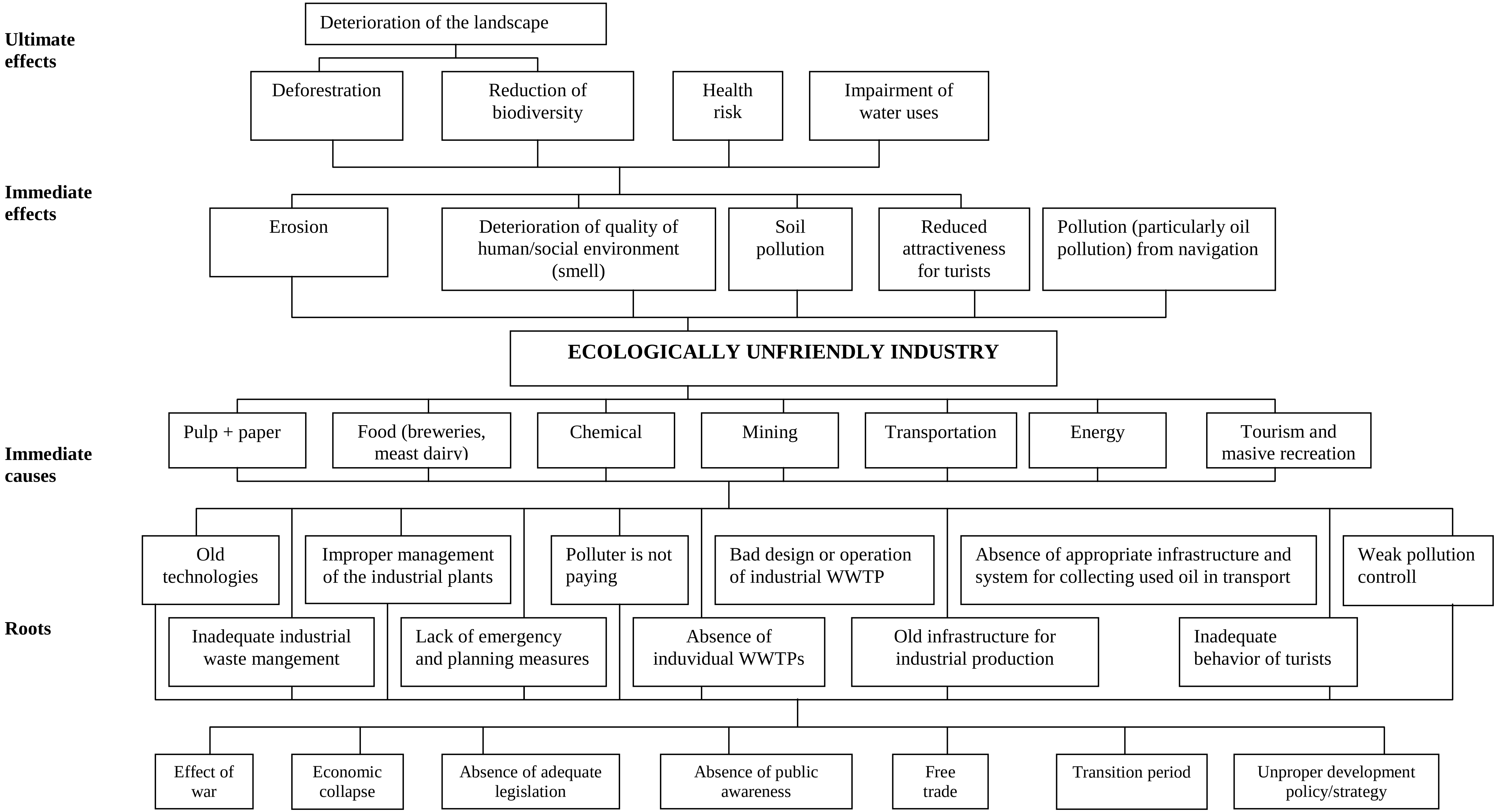
MIDDLE DANUBE **ANNEX 2**

CAUSAL CHAIN ANALYSIS OF MUNICIPAL HOT SPOTS



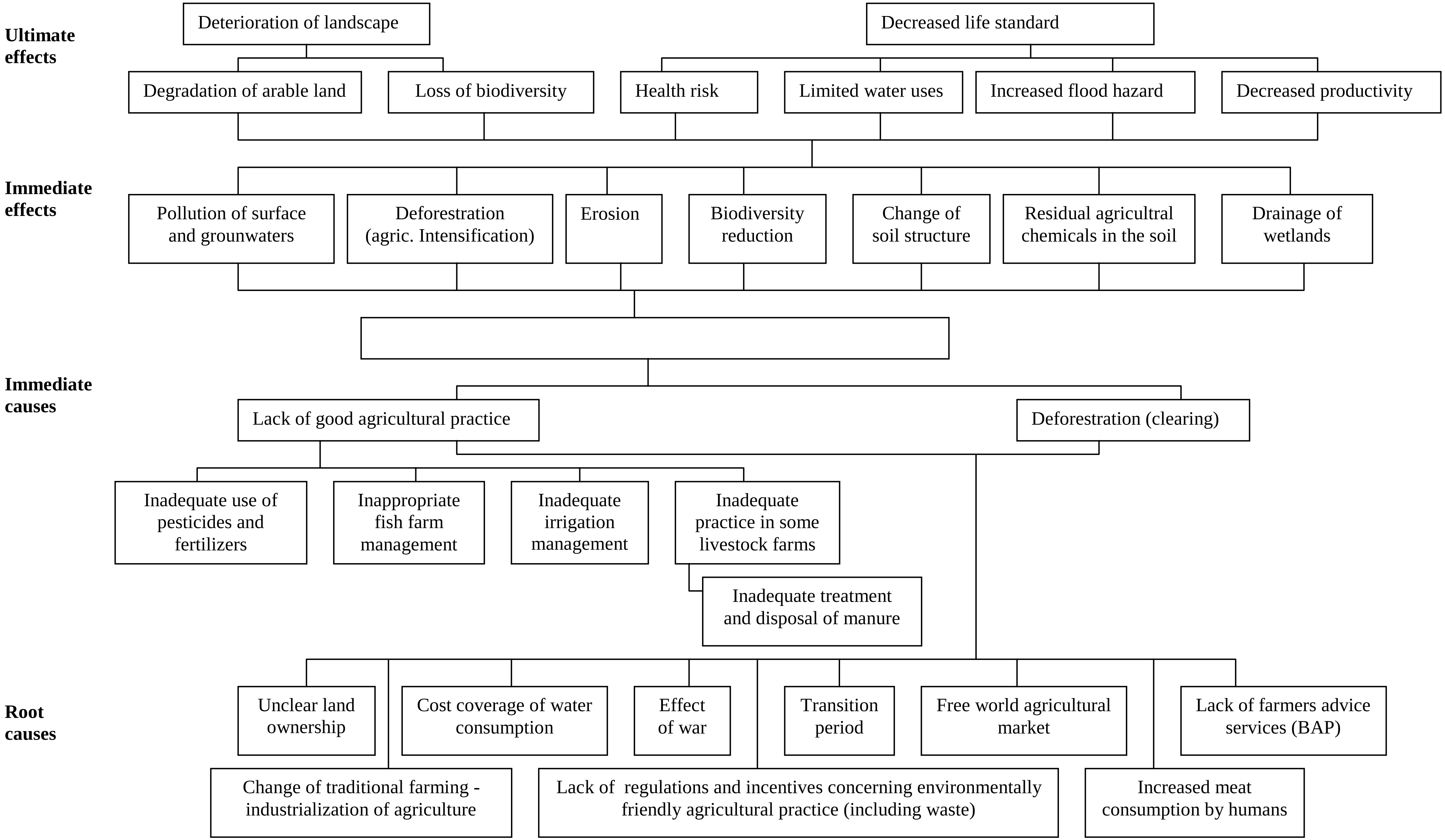
ANNEX 2

MIDDLE DANUBE
CAUSAL CHAIN ANALYSIS OF INDUSTRIAL HOT SPOTS



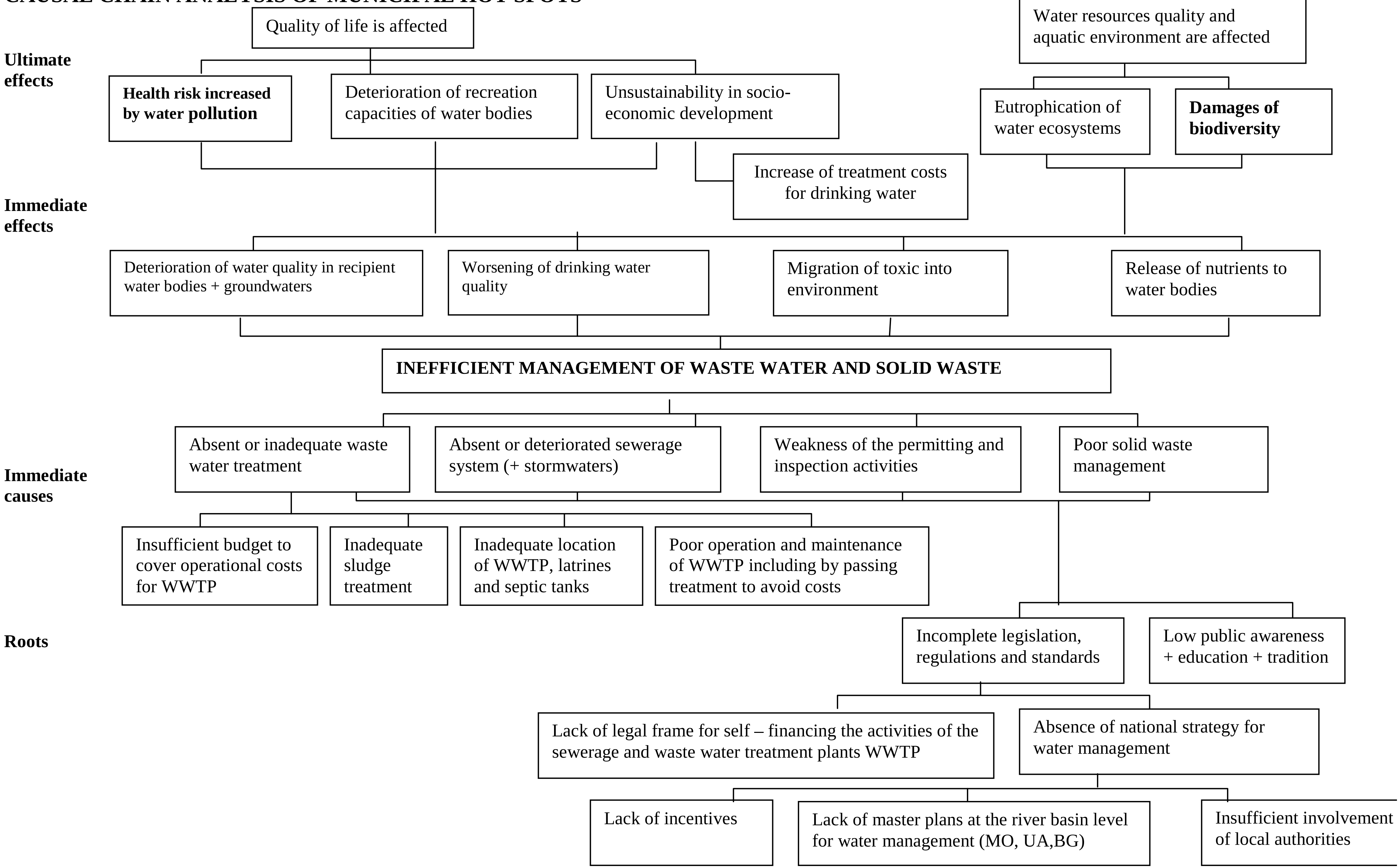
MIDDLE DANUBE **ANNEX 2**

CAUSAL CHAIN ANALYSIS OF AGRICULTURAL HOT SPOTS



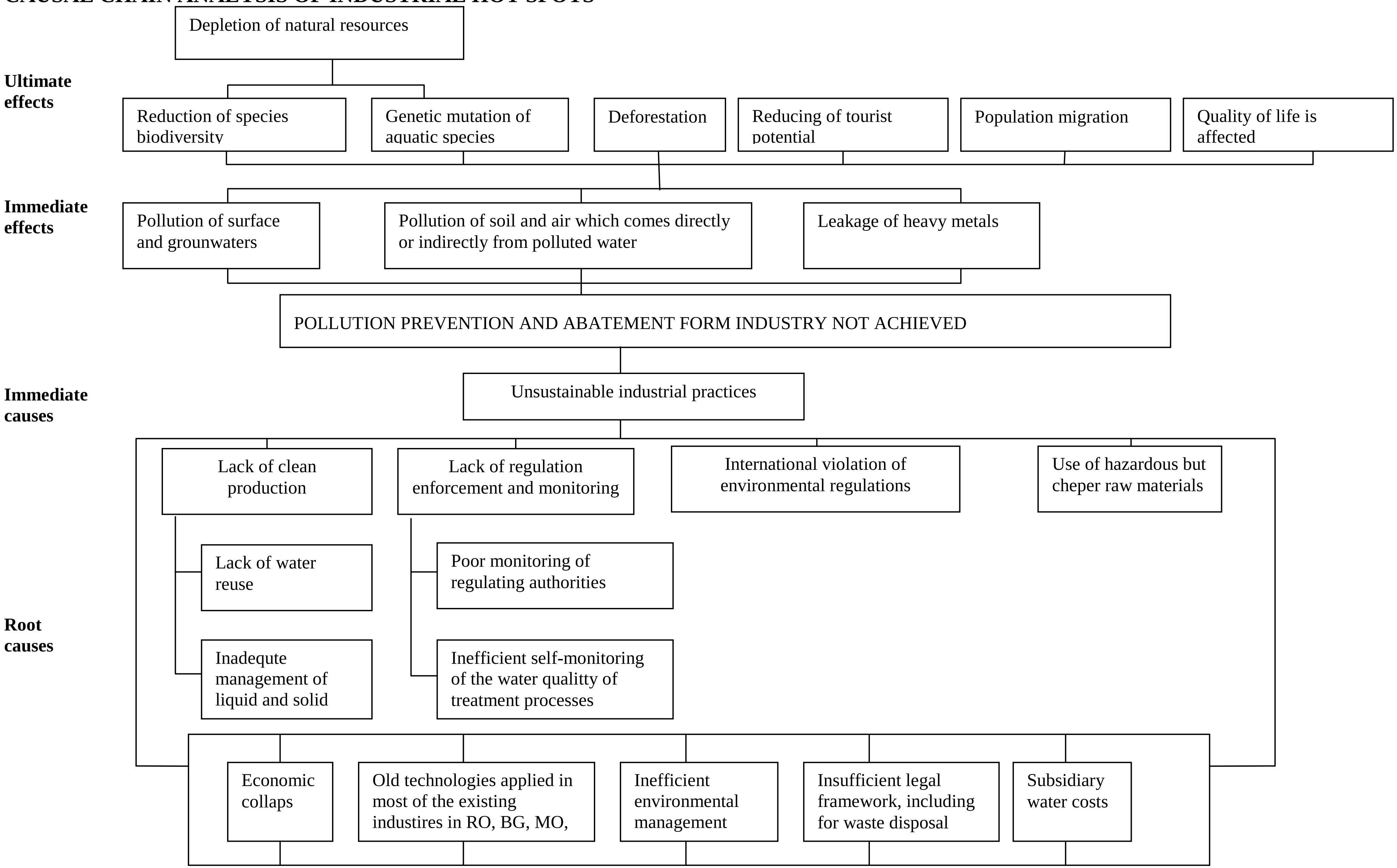
ANNEX 3

LOWER DANUBE
CAUSAL CHAIN ANALYSIS OF MUNICIPAL HOT SPOTS



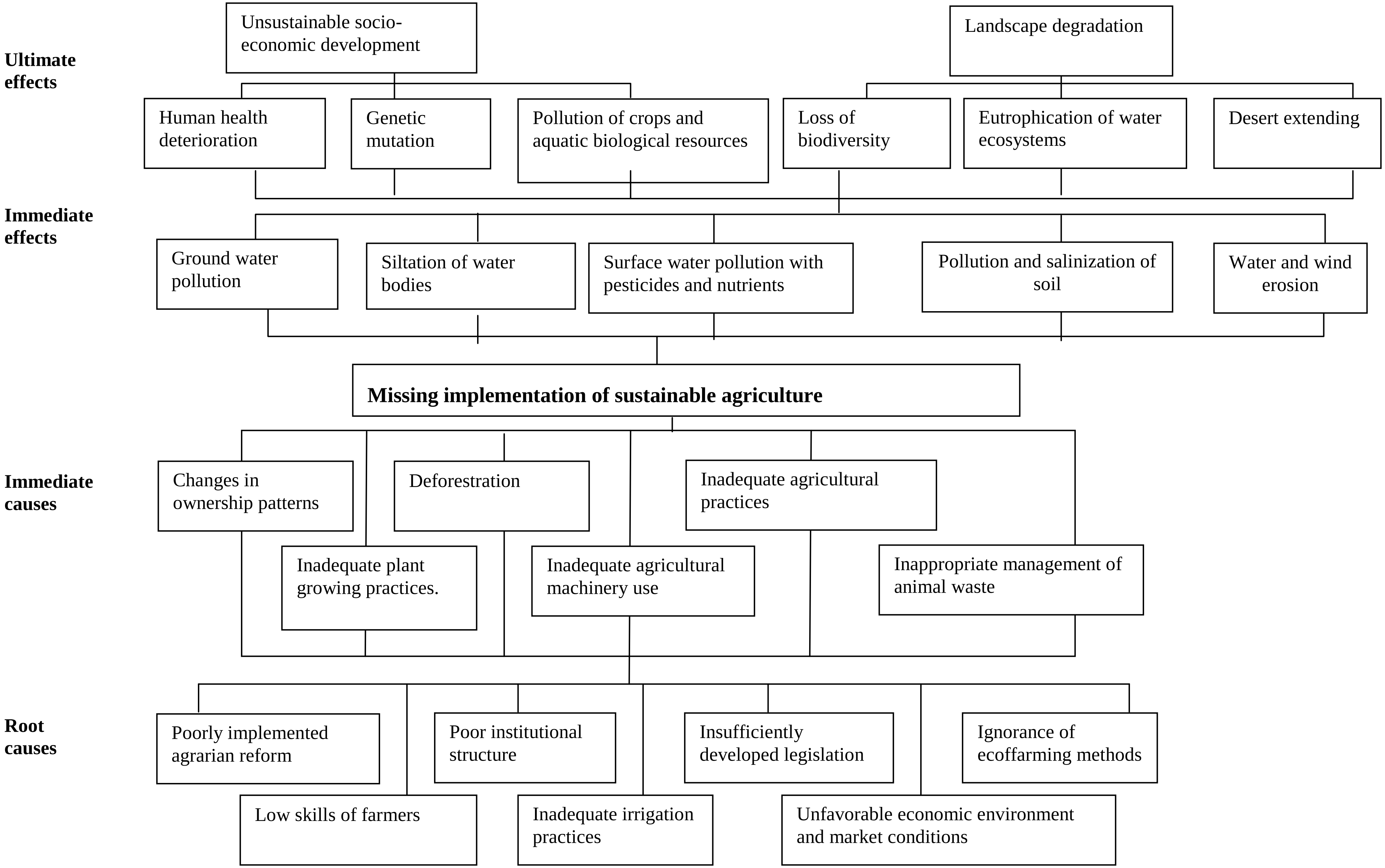
LOWER DANUBE **ANNEX 3**

CAUSAL CHAIN ANALYSIS OF INDUSTRIAL HOT SPOTS



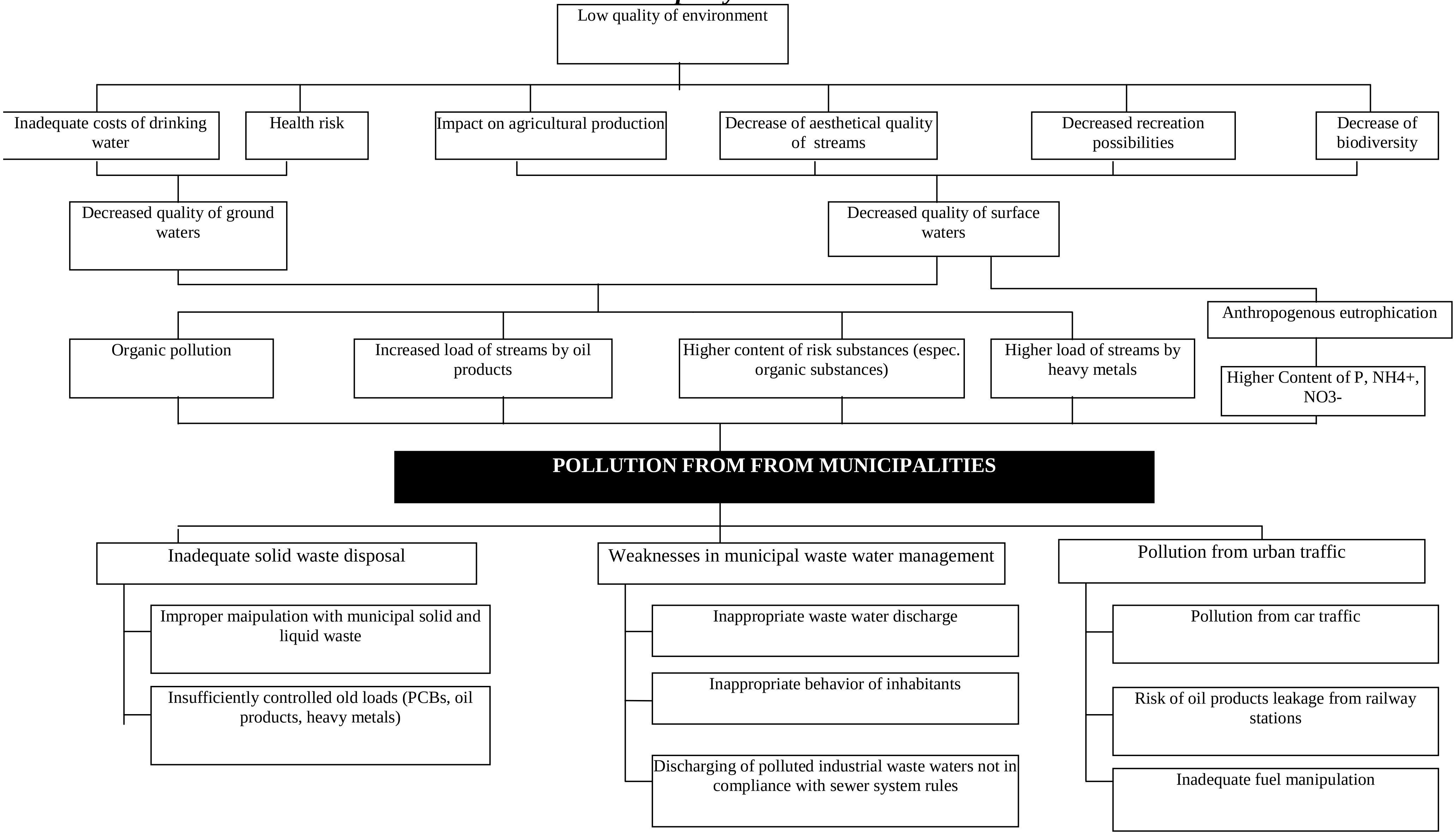
LOWER DANUBE **ANNEX 3**

CAUSAL CHAIN ANALYSIS OF AGRICULTURAL HOT SPOTS



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

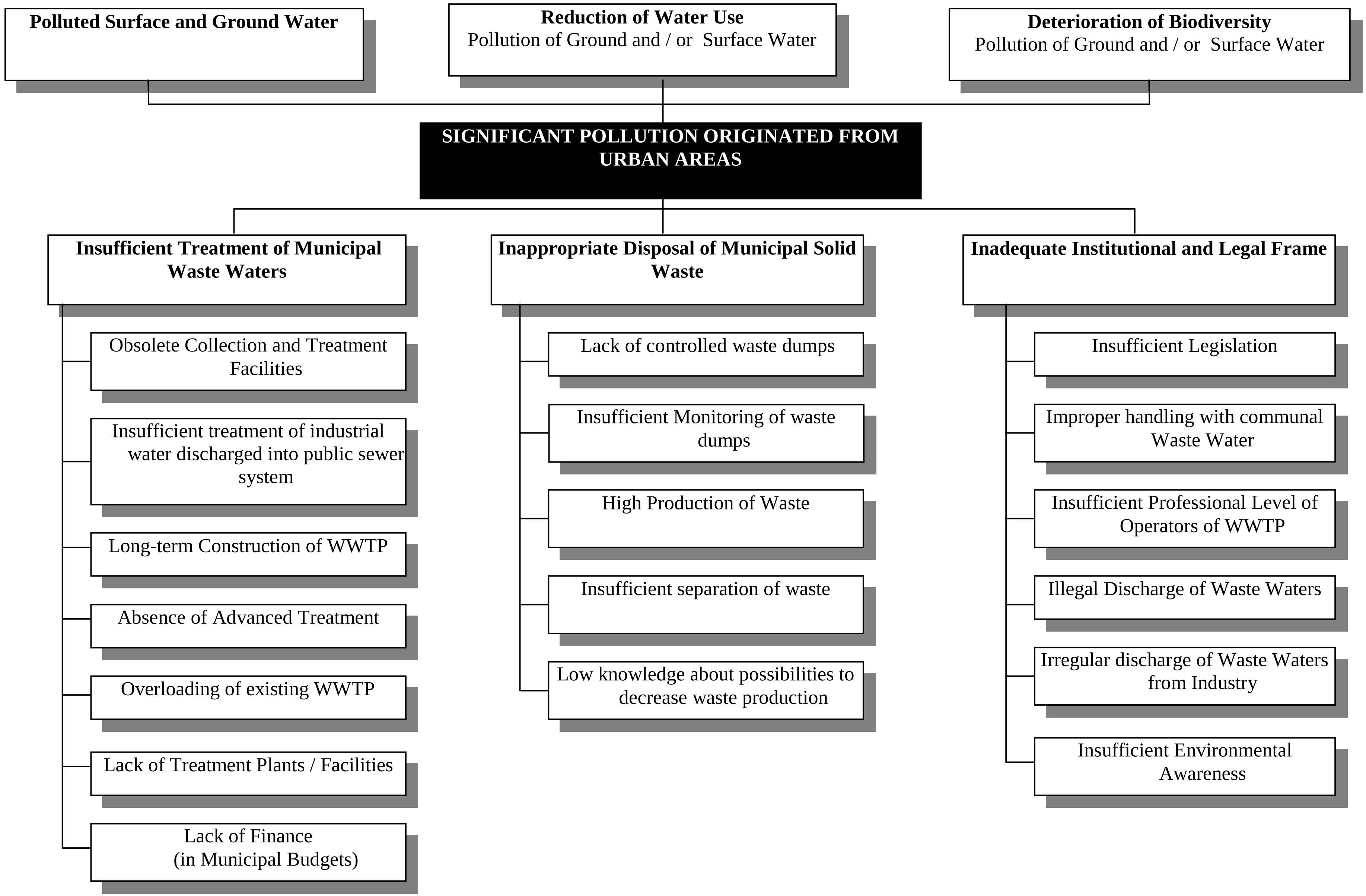
CZECH REPUBLIC - ***Municipality***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

SLOVAK REPUBLIC

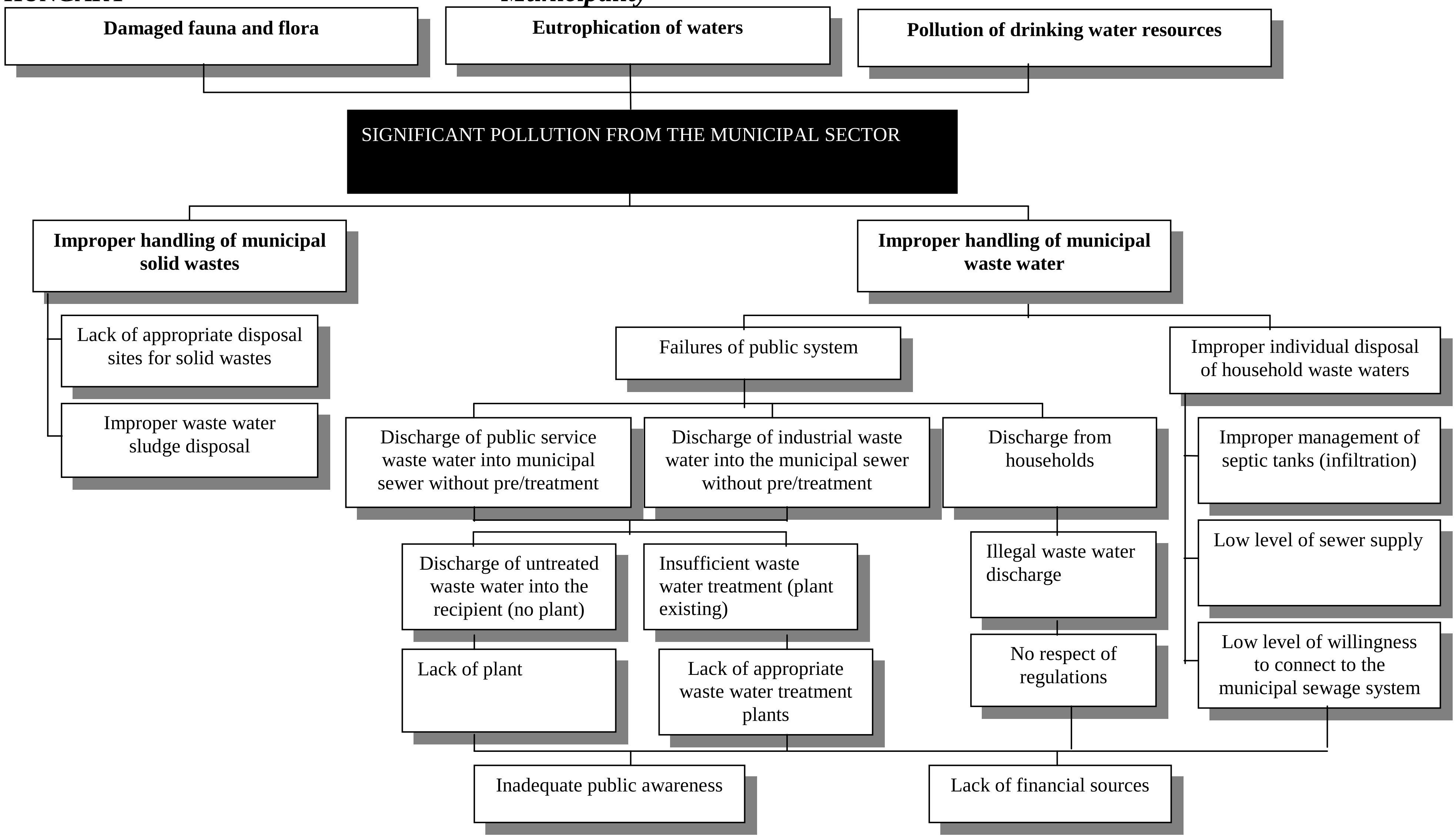
Municipality



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

HUNGARY

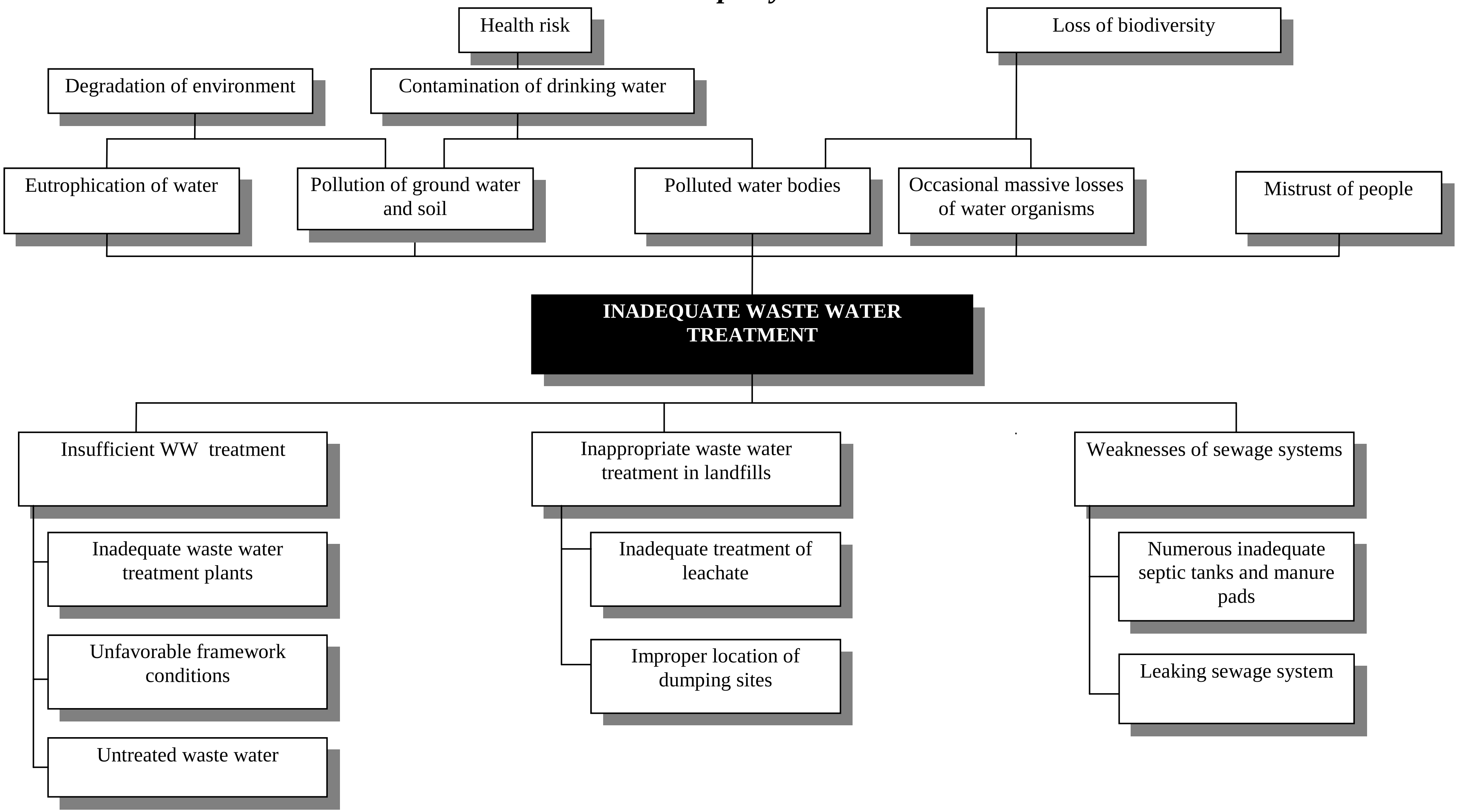
Municipality



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

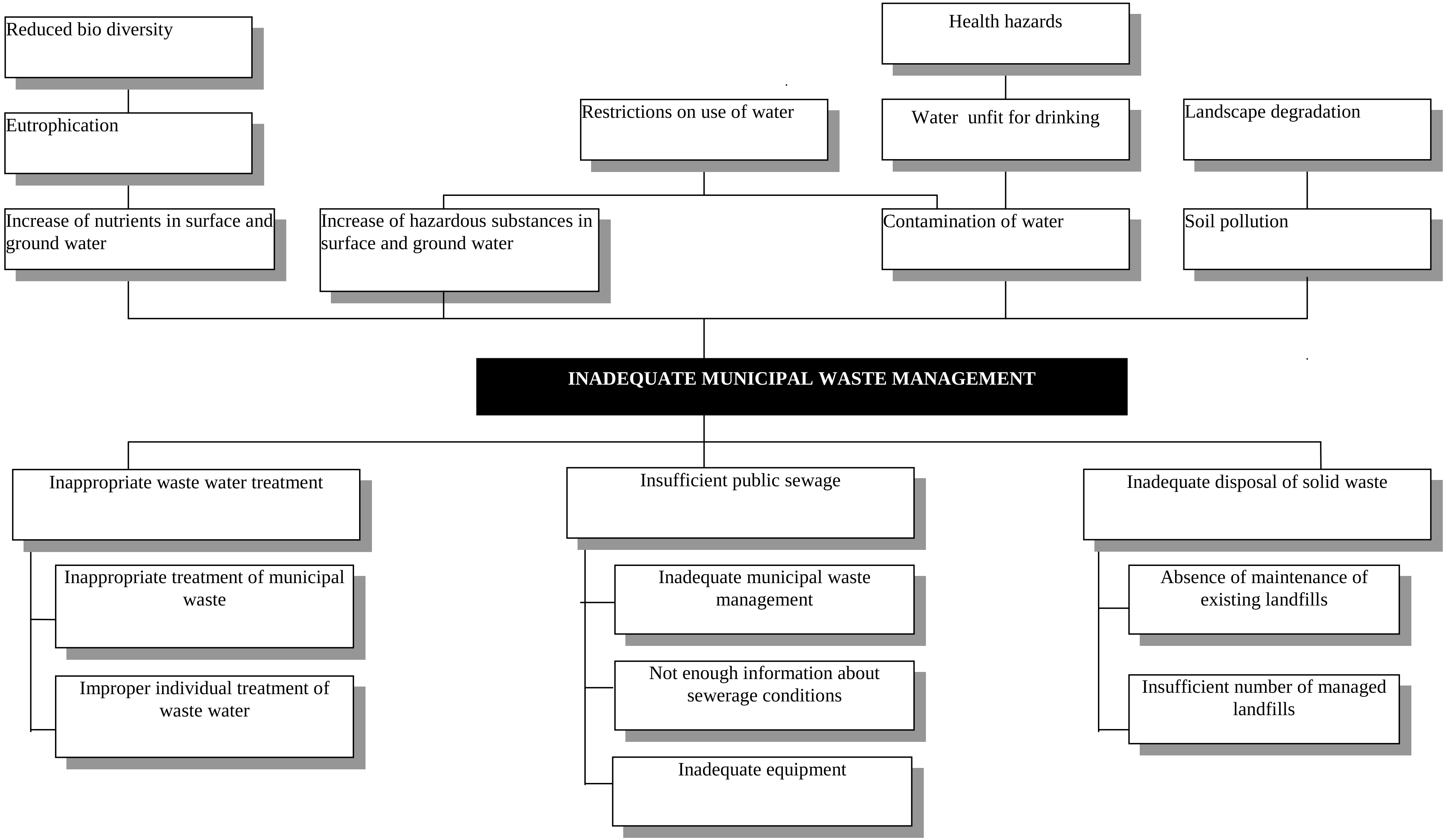
SLOVENIA

Municipality



ROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

CROATIA ***Municipality***

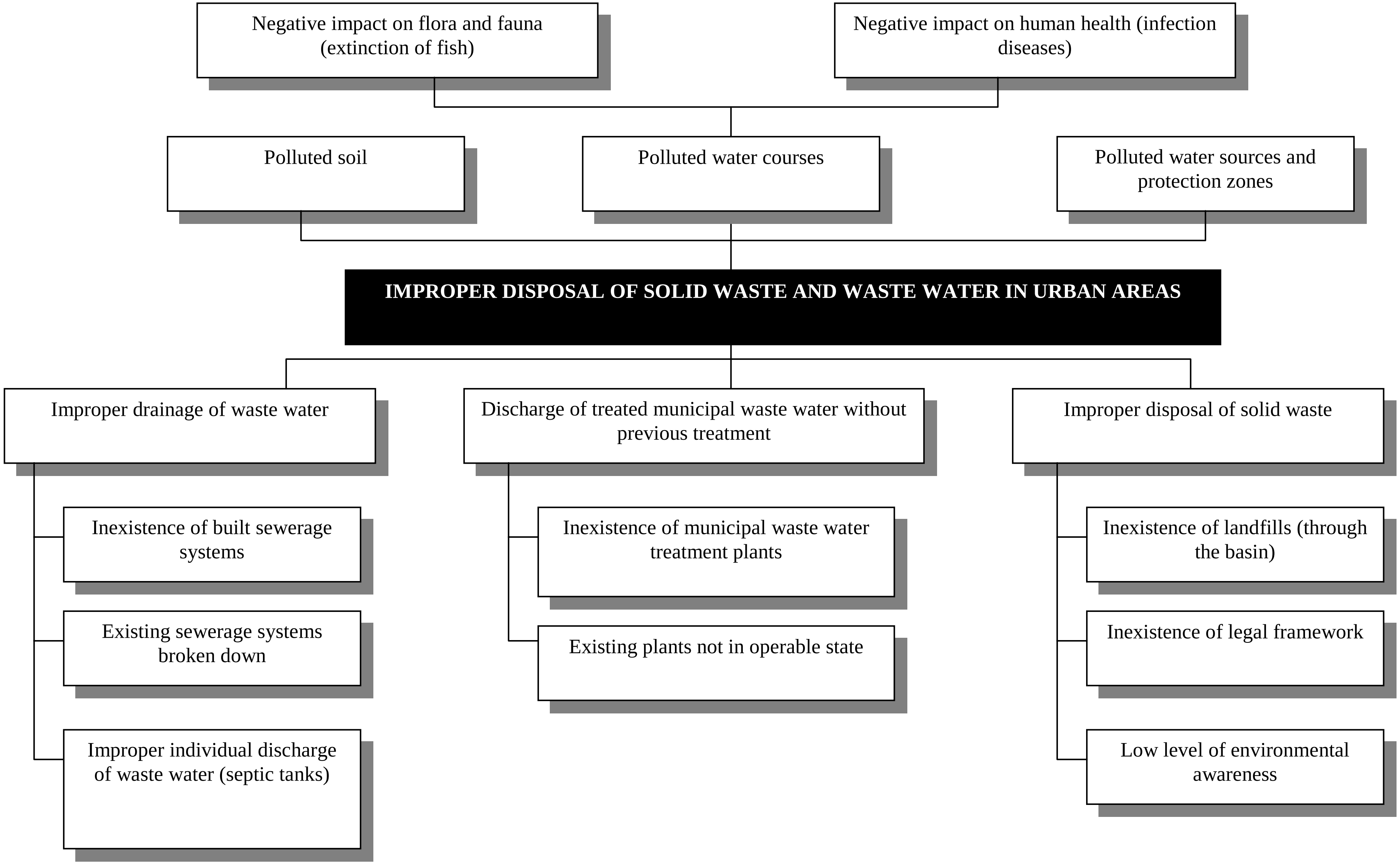


PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

ANNEX 4

BOSNIA - HERZEGOVINA

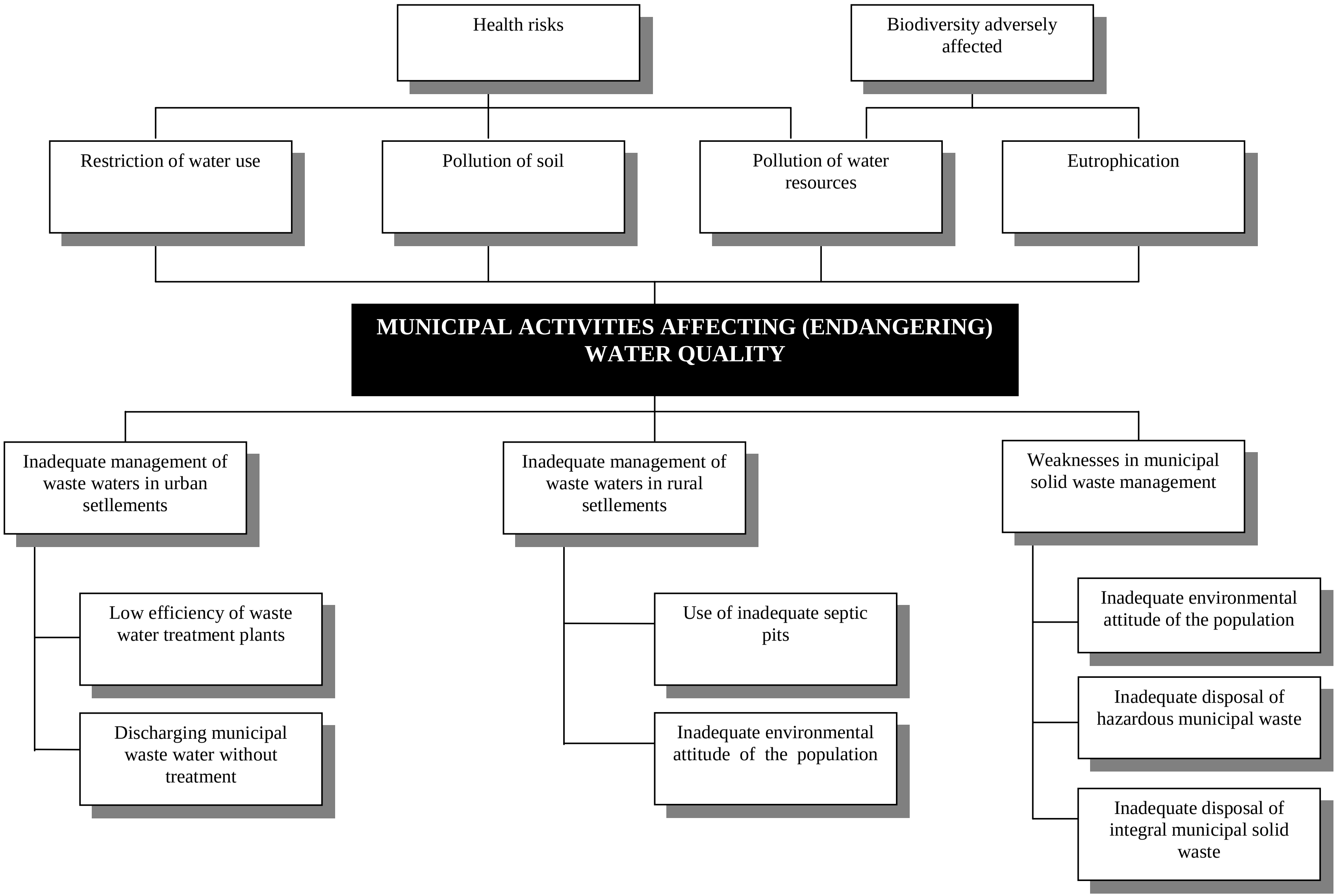
Municipality



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

YUGOSLAVIA

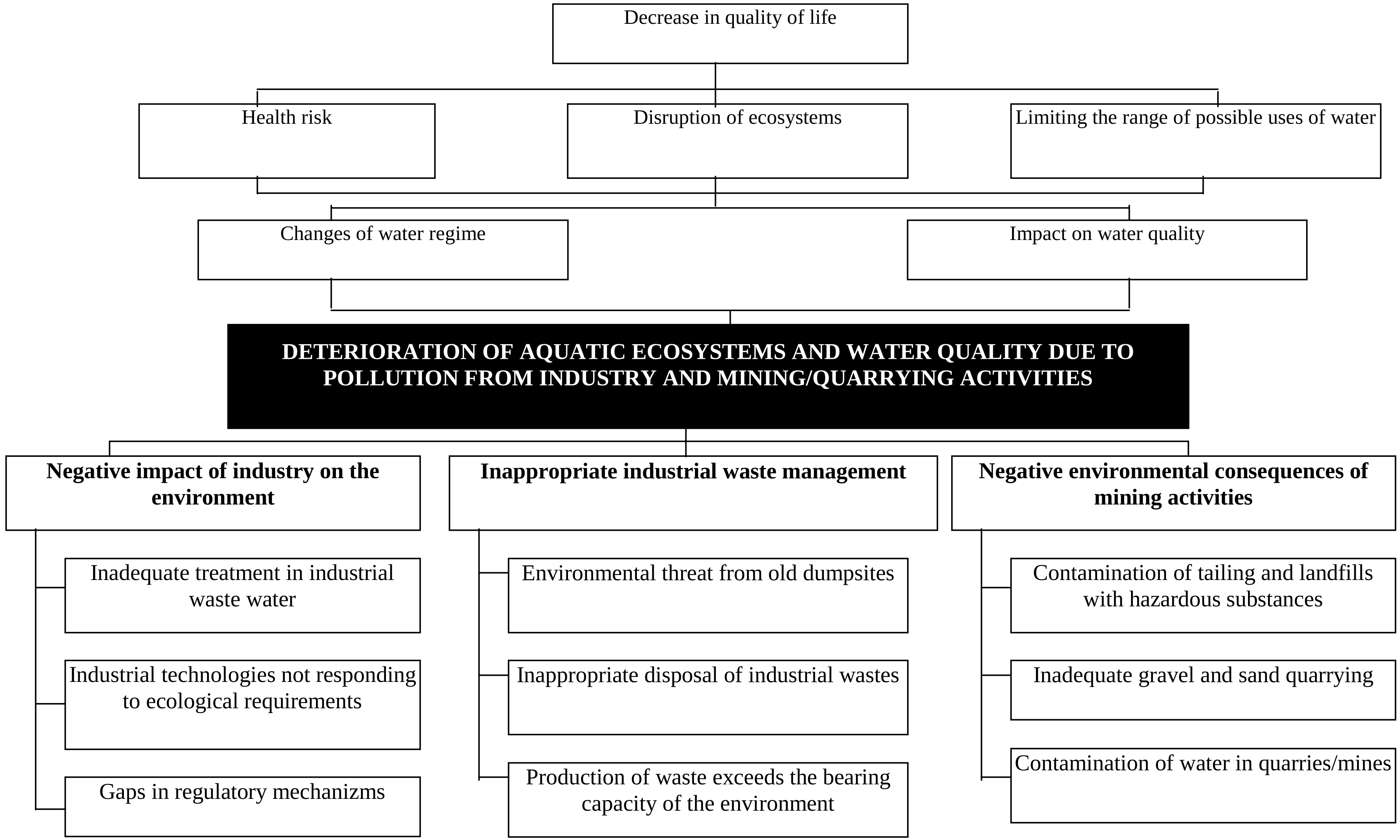
Municipality



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

CZECH REPUBLIC

Industry and Mining



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

SLOVAK REPUBLIC ***Industry***

Effects:

- **Pollution of Ground and Surface Water**
- **Air Pollution**
- **Soil Contamination**
- **Deterioration of Biodiversity**

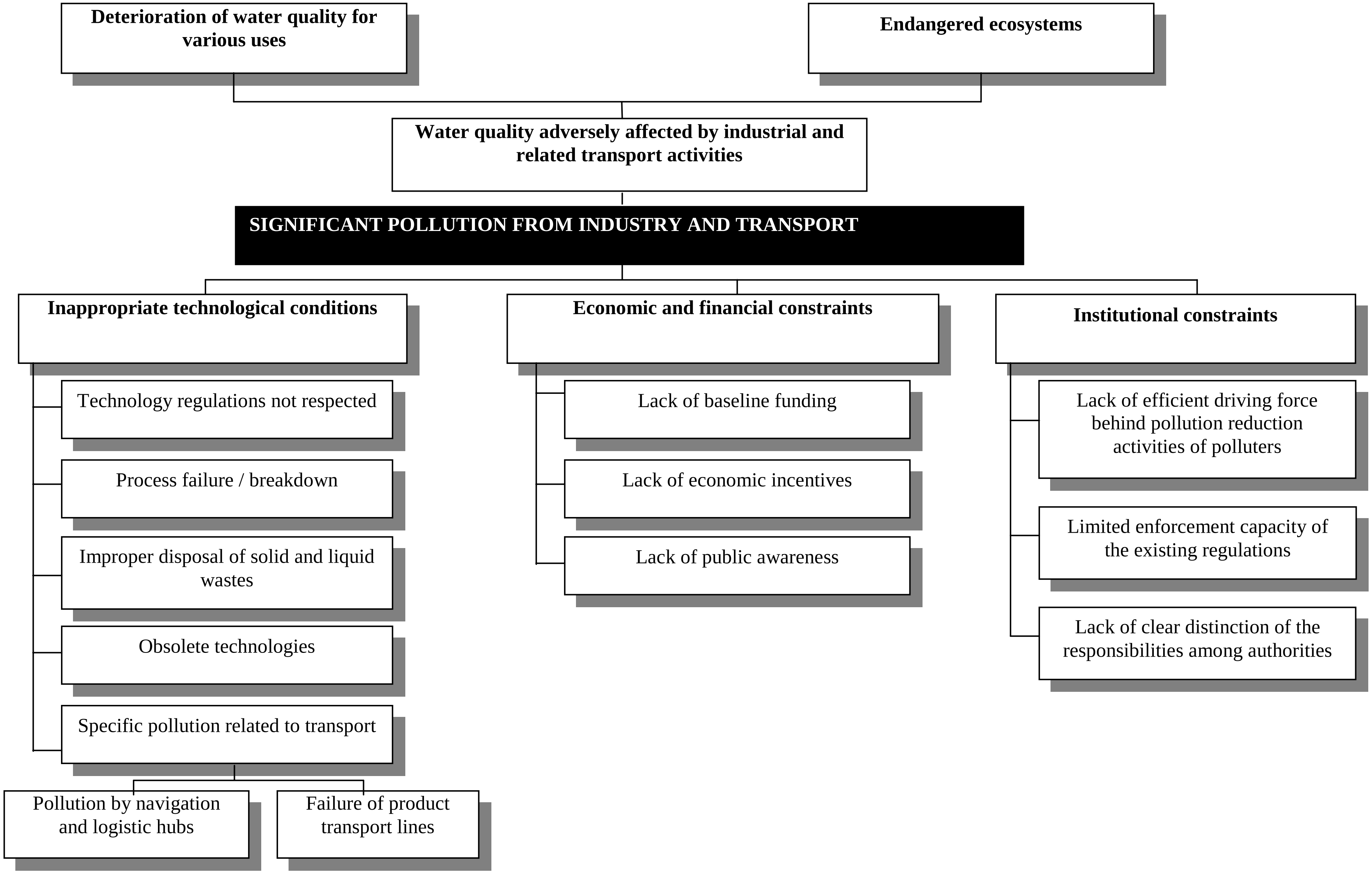
Core problem: HIGH PRODUCTION OF INDUSTRIAL WASTES

Causes:

- **Obsolete Technologies with high production of waste**
  - Energy & Raw Material Demanding Technologies
  - Insufficient Technological Discipline
  - Operational Failures and Accidents
  - Leakage from Production Processes to Environment
  - Inappropriate Technologies Used in Specific Natural Condition
- **Discharge of Insufficiently Treated Industrial Waste Waters**
  - Hydraulically and Mass Overloading of WWTPs
  - Obsolete Technological Equipment
  - Low Quality of Raw Materials
  - Seepage from Sewerage Collection Systems
  - Insufficient technological discipline of the personnel
- **Inadequate Legislation and Financing Mechanisms**
  - Gaps in Legislation
  - Lack of Financial Resources
  - Lack of Information

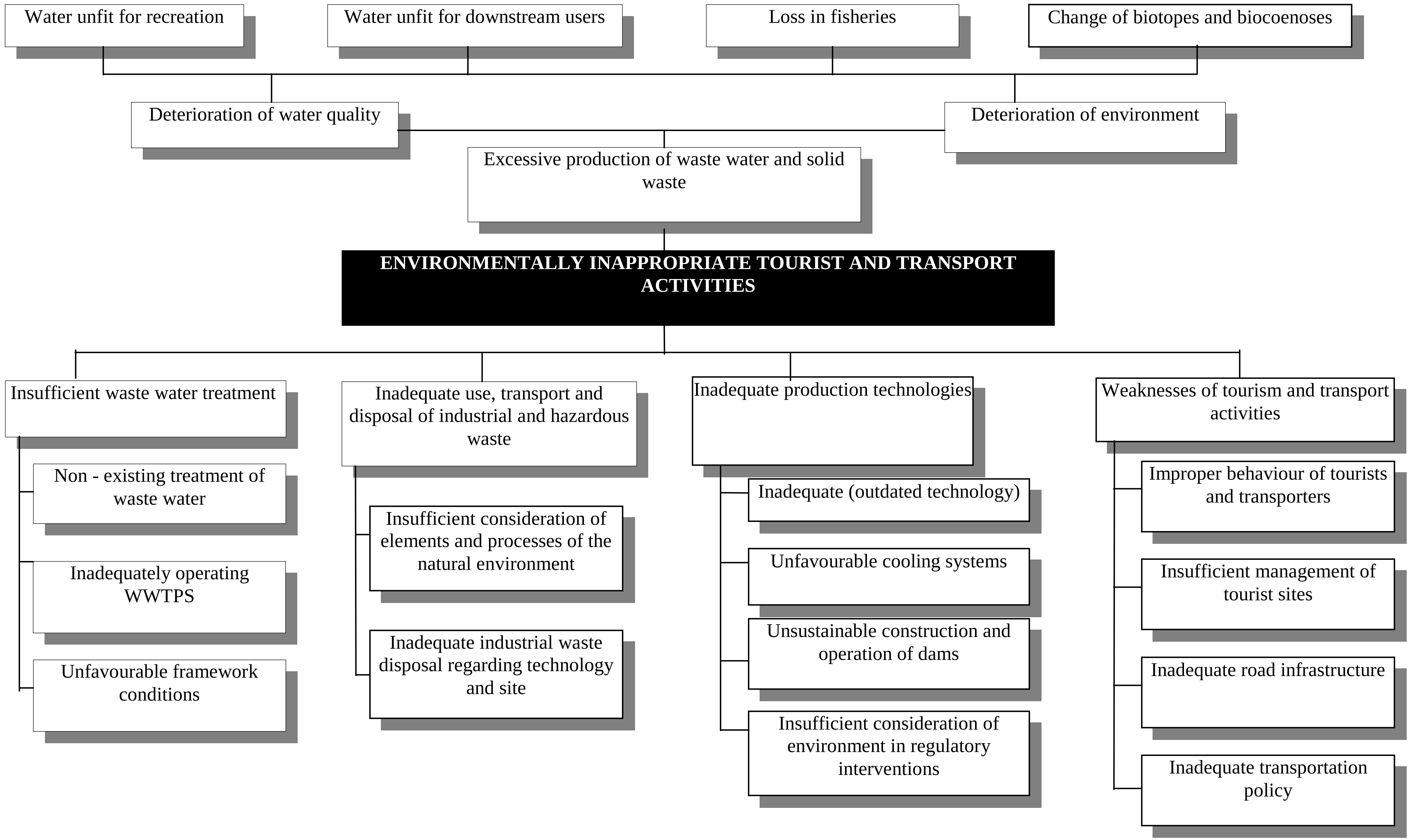
PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

HUNGARY ***Industry and Transport***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

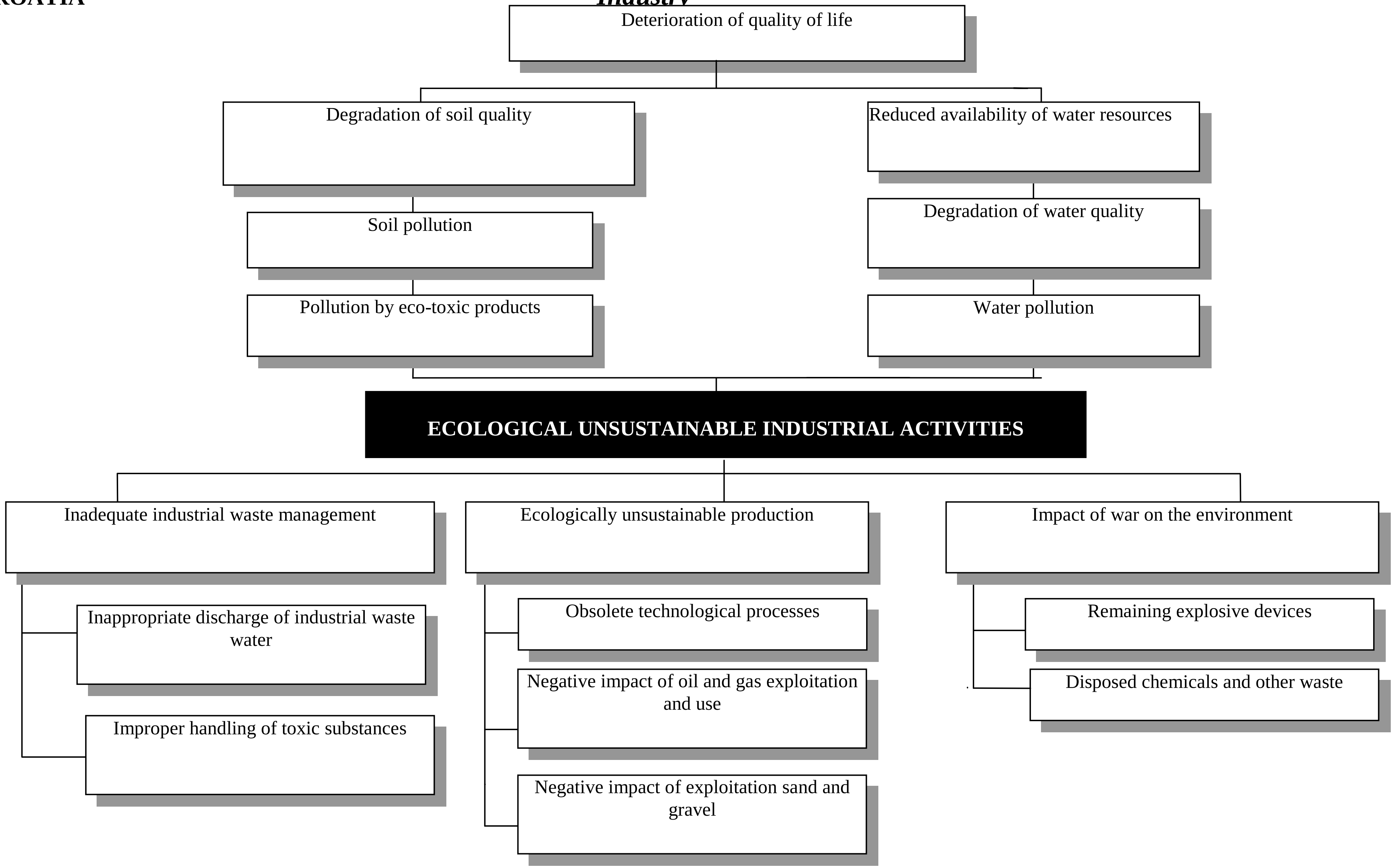
SLOVENIA ***Industry, Tourism and Transport***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

CROATIA

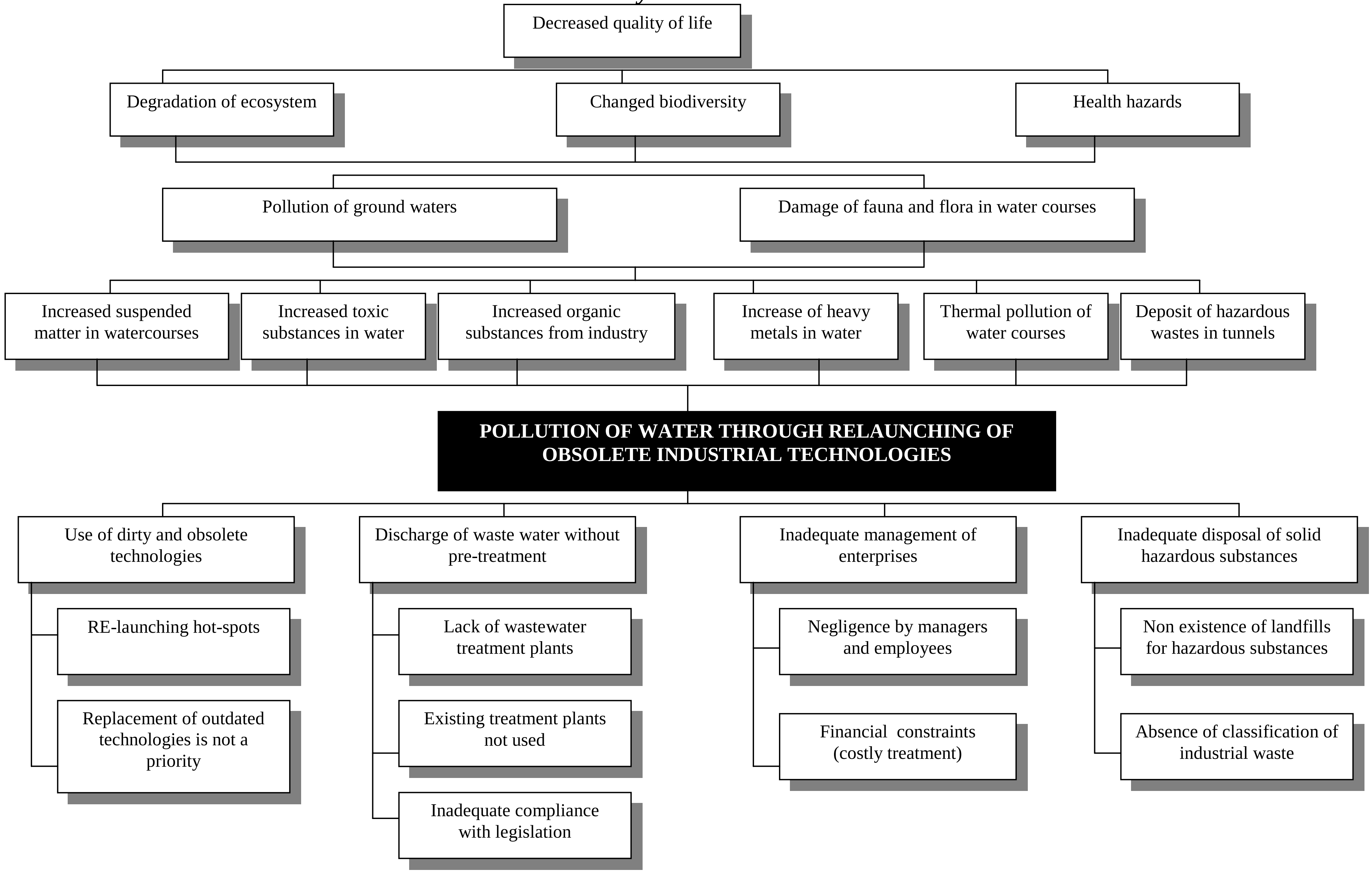
Industry



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

BOSNIA - HERZEGOVINA

Industry

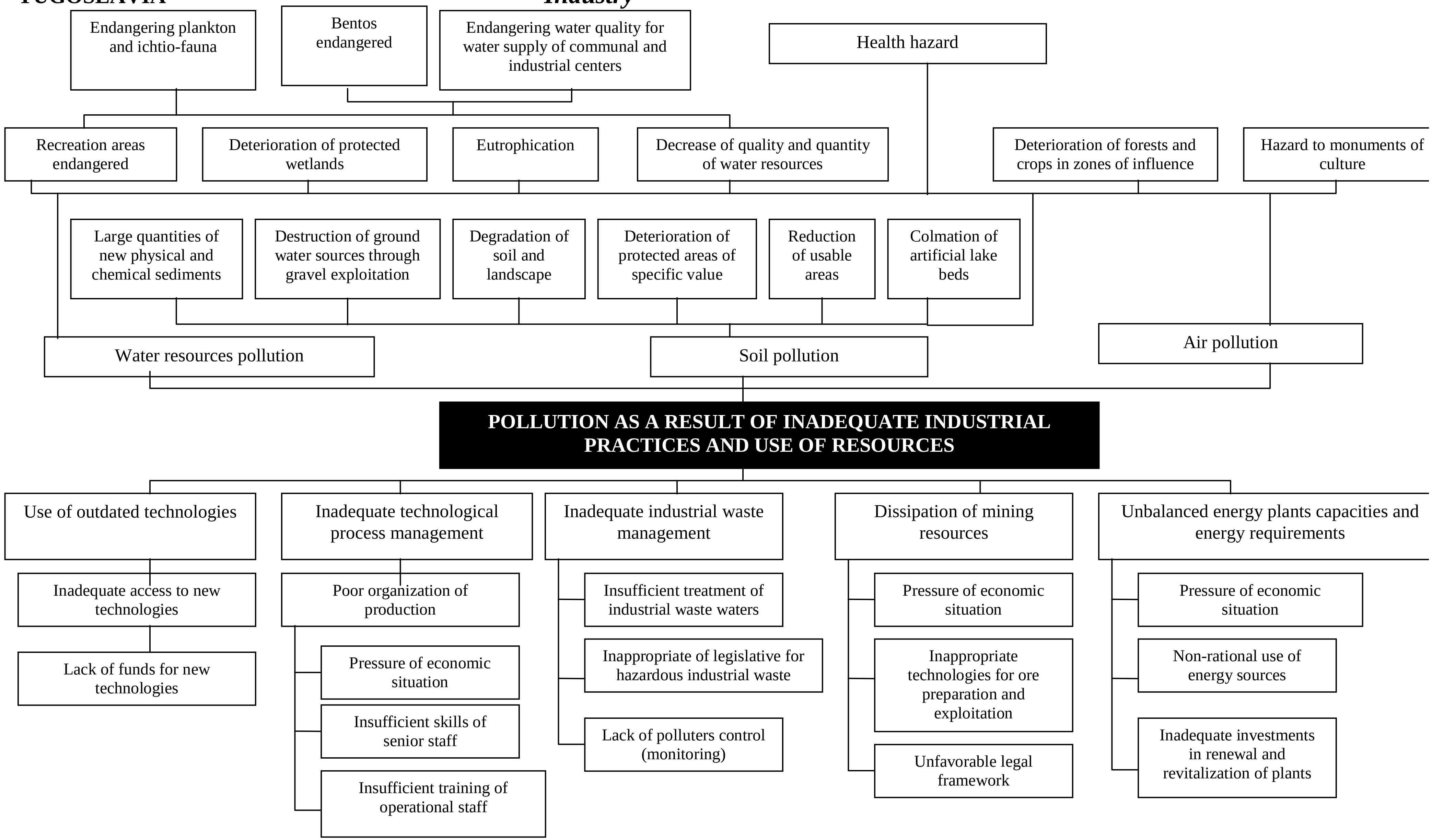


PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

ANNEX 4

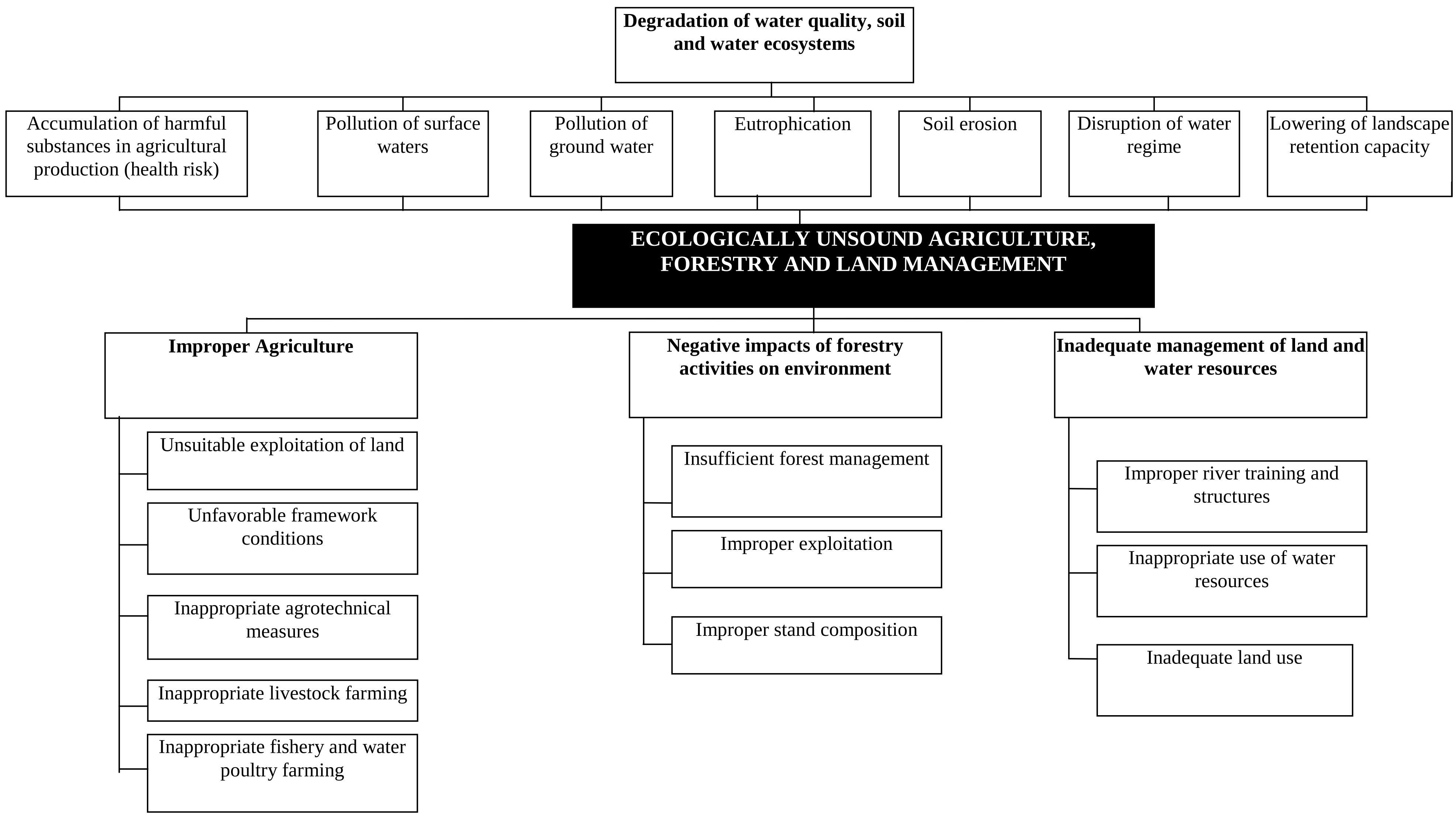
YUGOSLAVIA

Industry



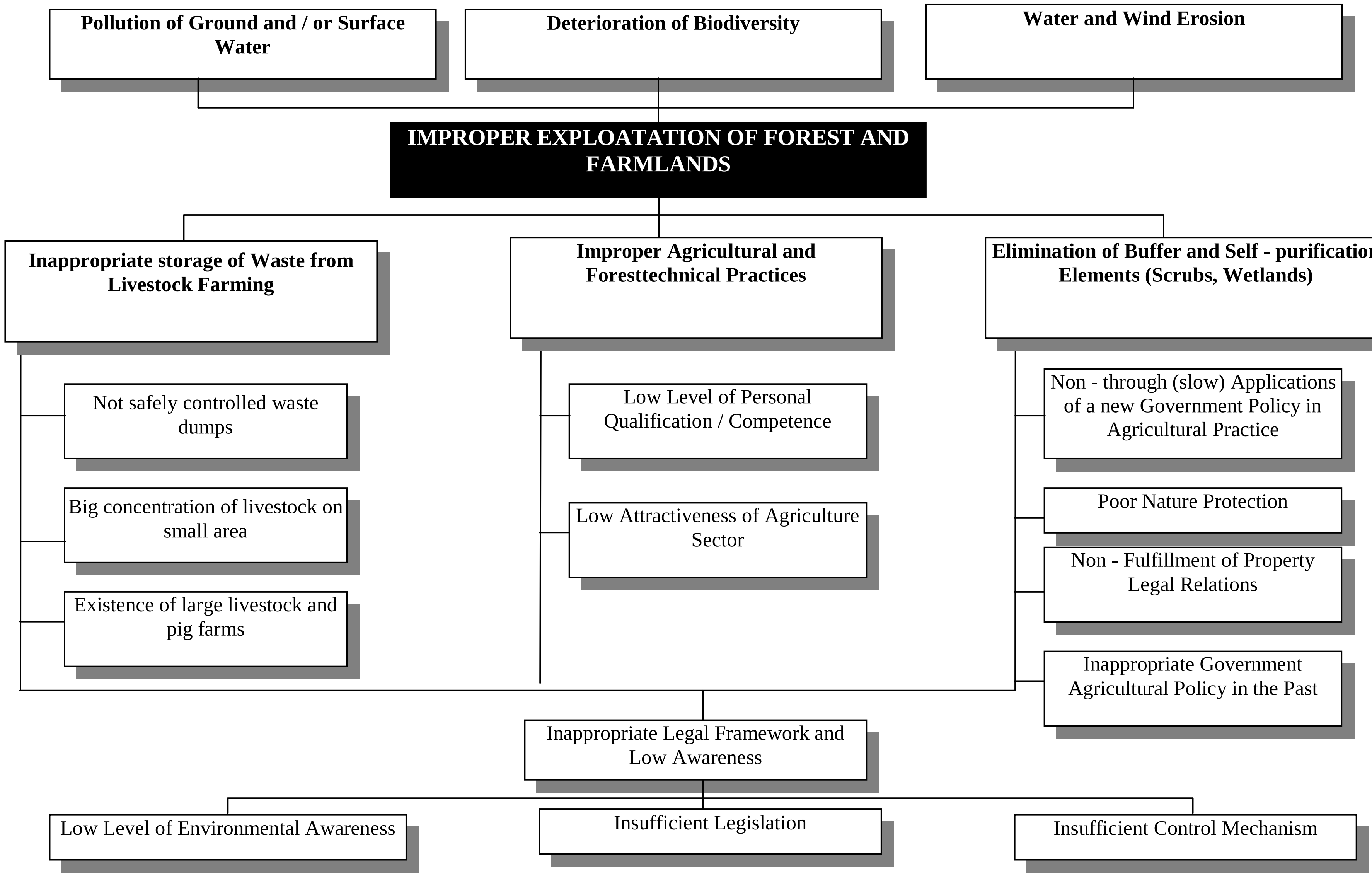
PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

CZECH REPUBLIC ***Agriculture, Forestry and Land Management***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

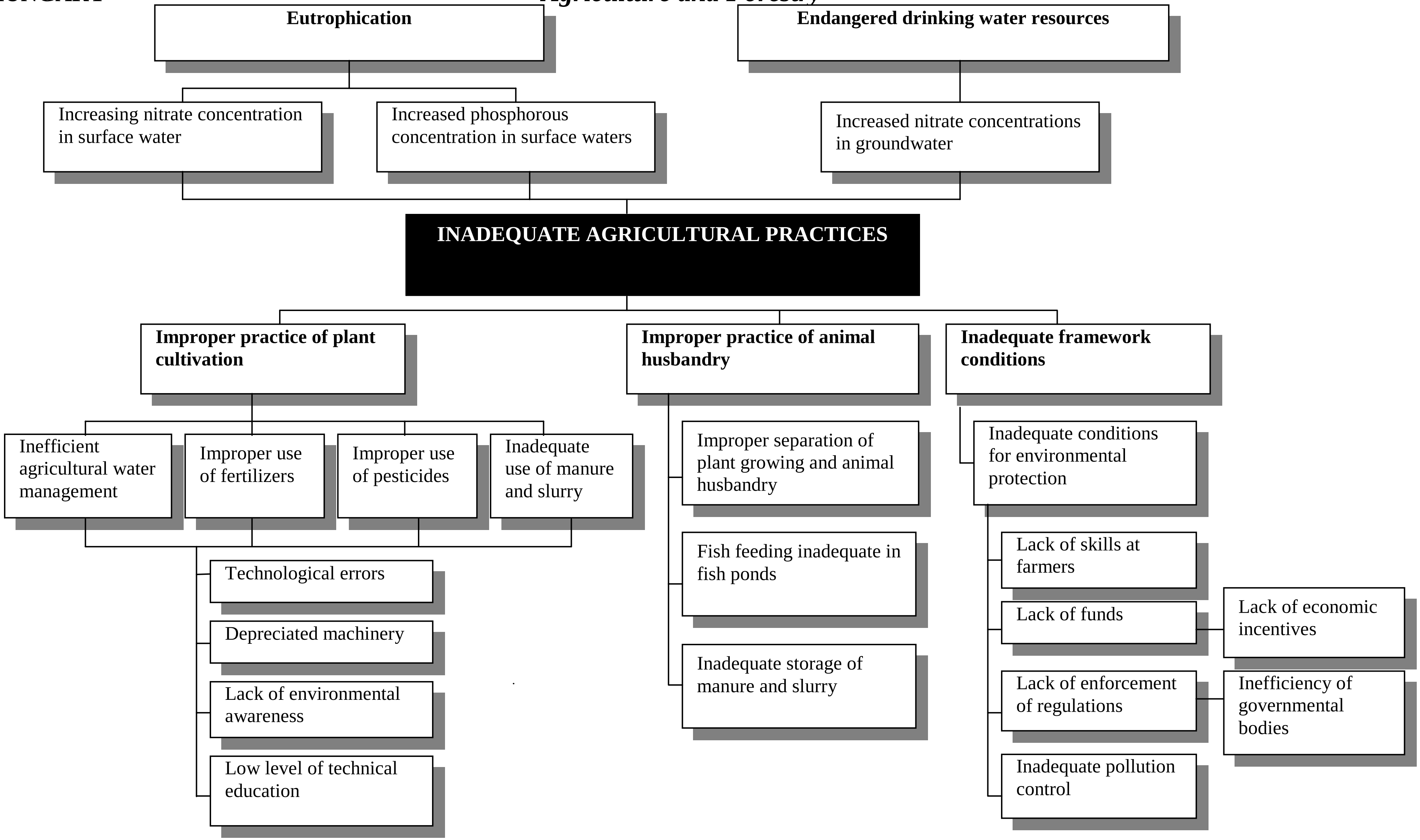
SLOVAK REPUBLIC ***Soil Management***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

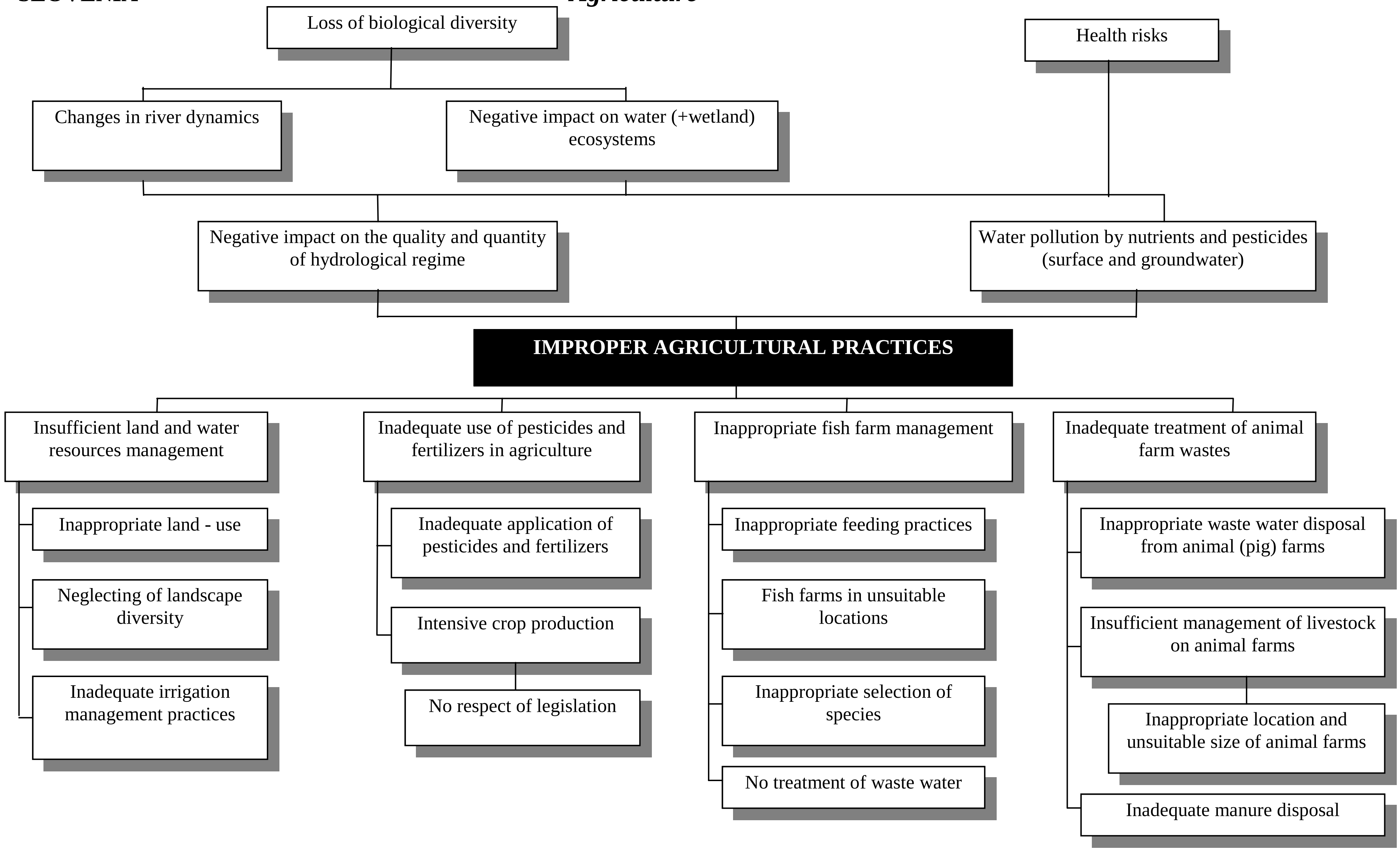
HUNGARY

Agriculture and Forestry



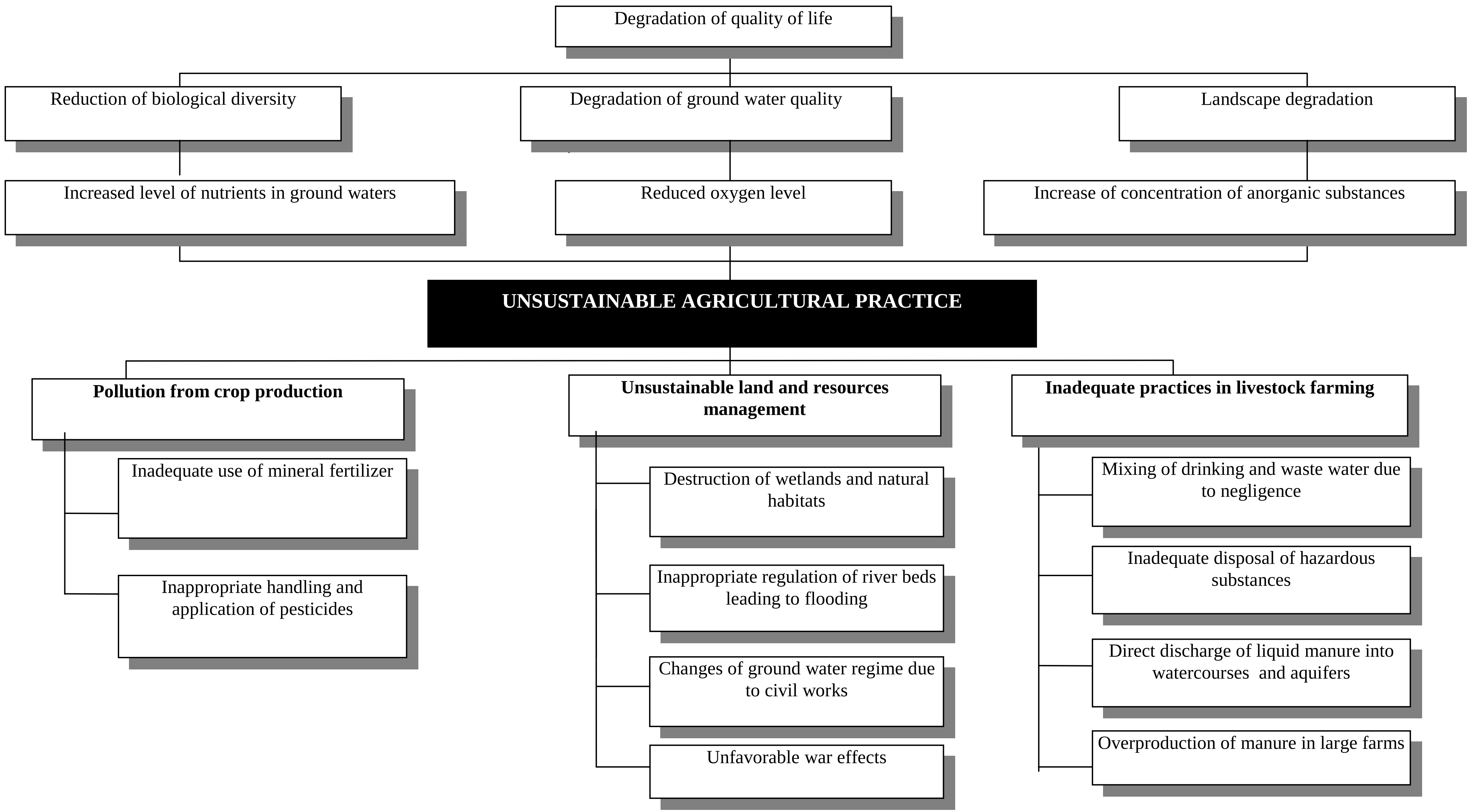
PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

SLOVENIA ***Agriculture***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

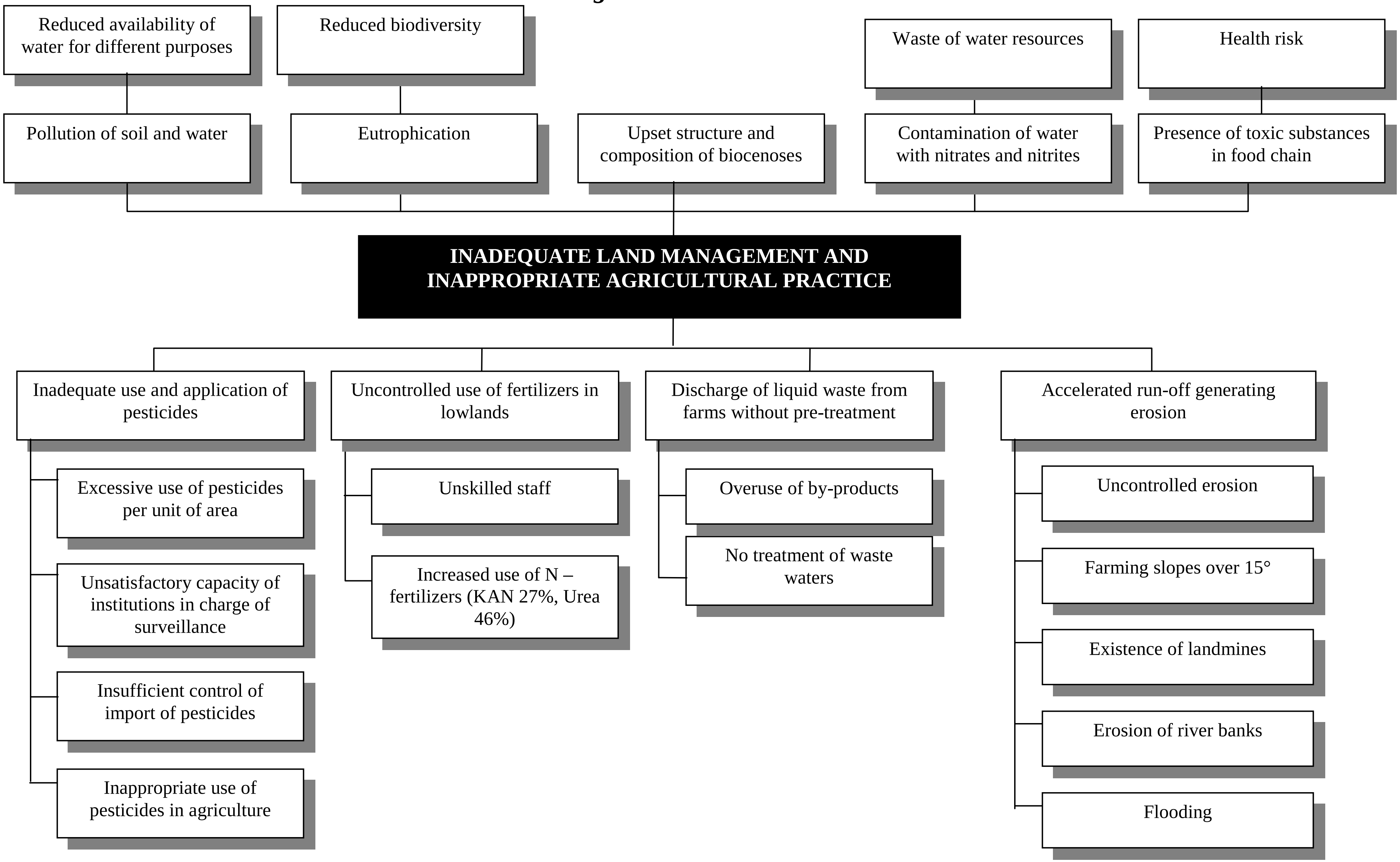
CROATIA ***Agriculture and Land Management***



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES

BOSNIA - HERZEGOVINA

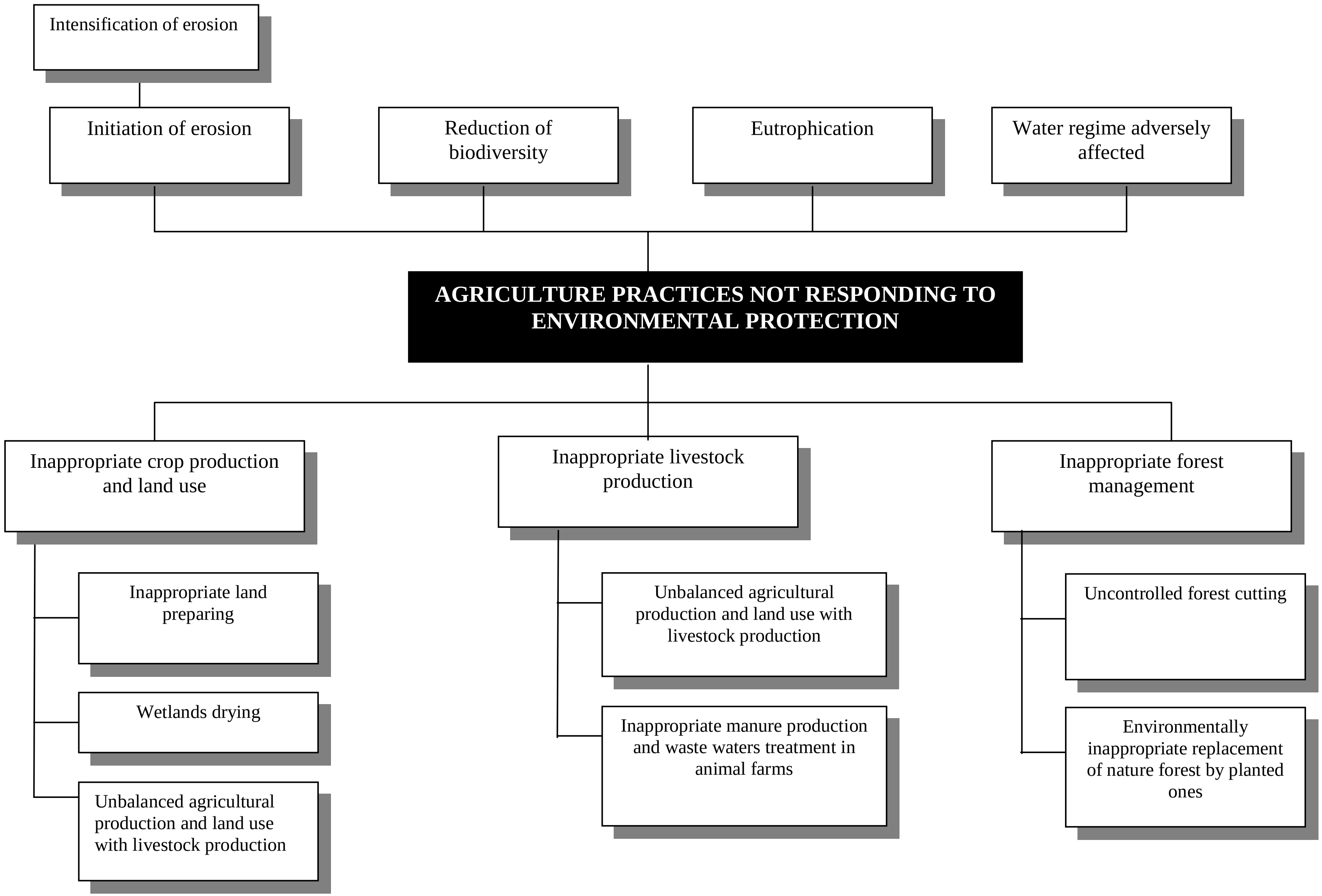
Agriculture



PROBLEM HIERARCHY - MIDDLE DANUBE COUNTRIES **ANNEX 4**

YUGOSLAVIA

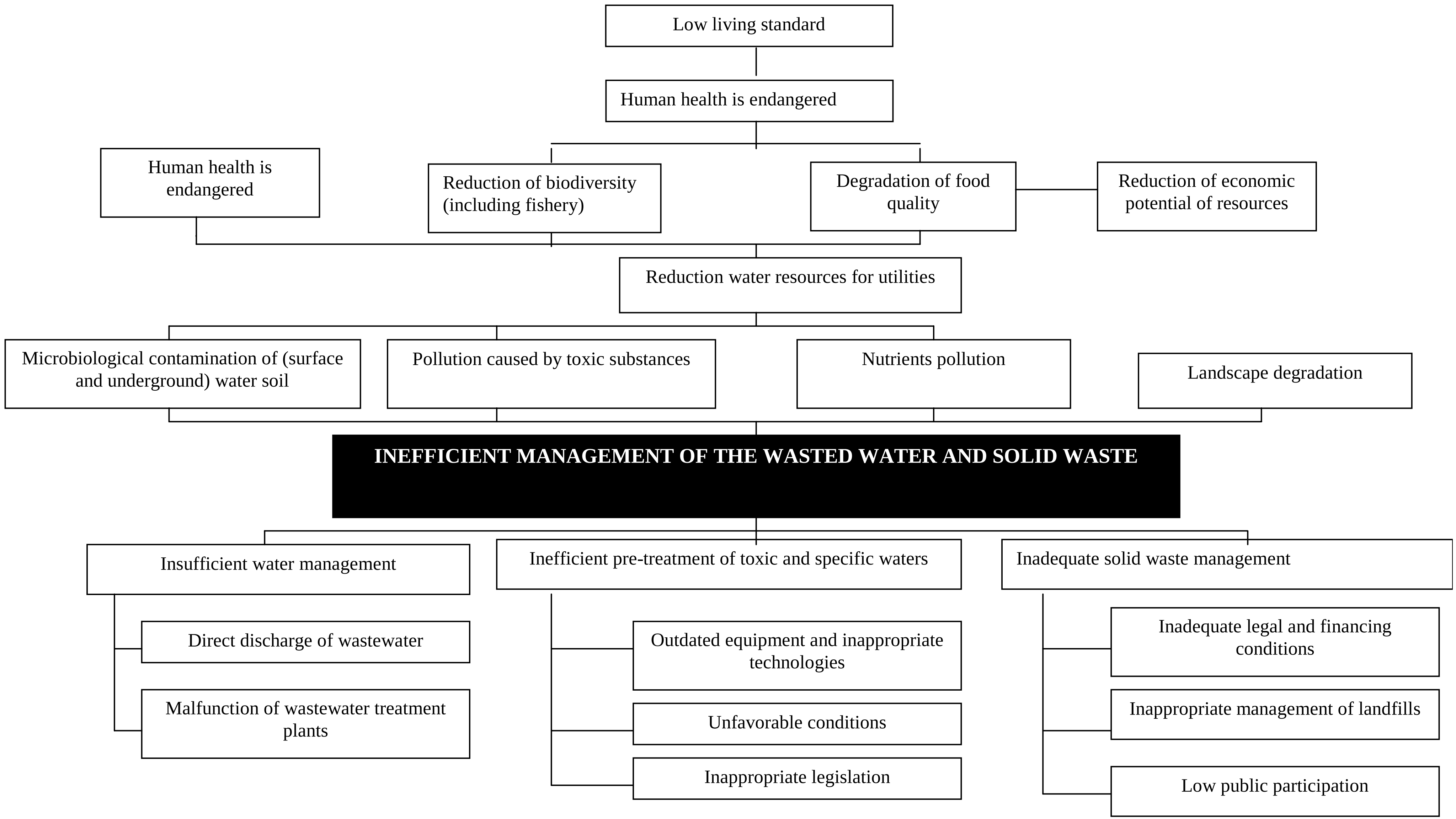
Agriculture



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 4**

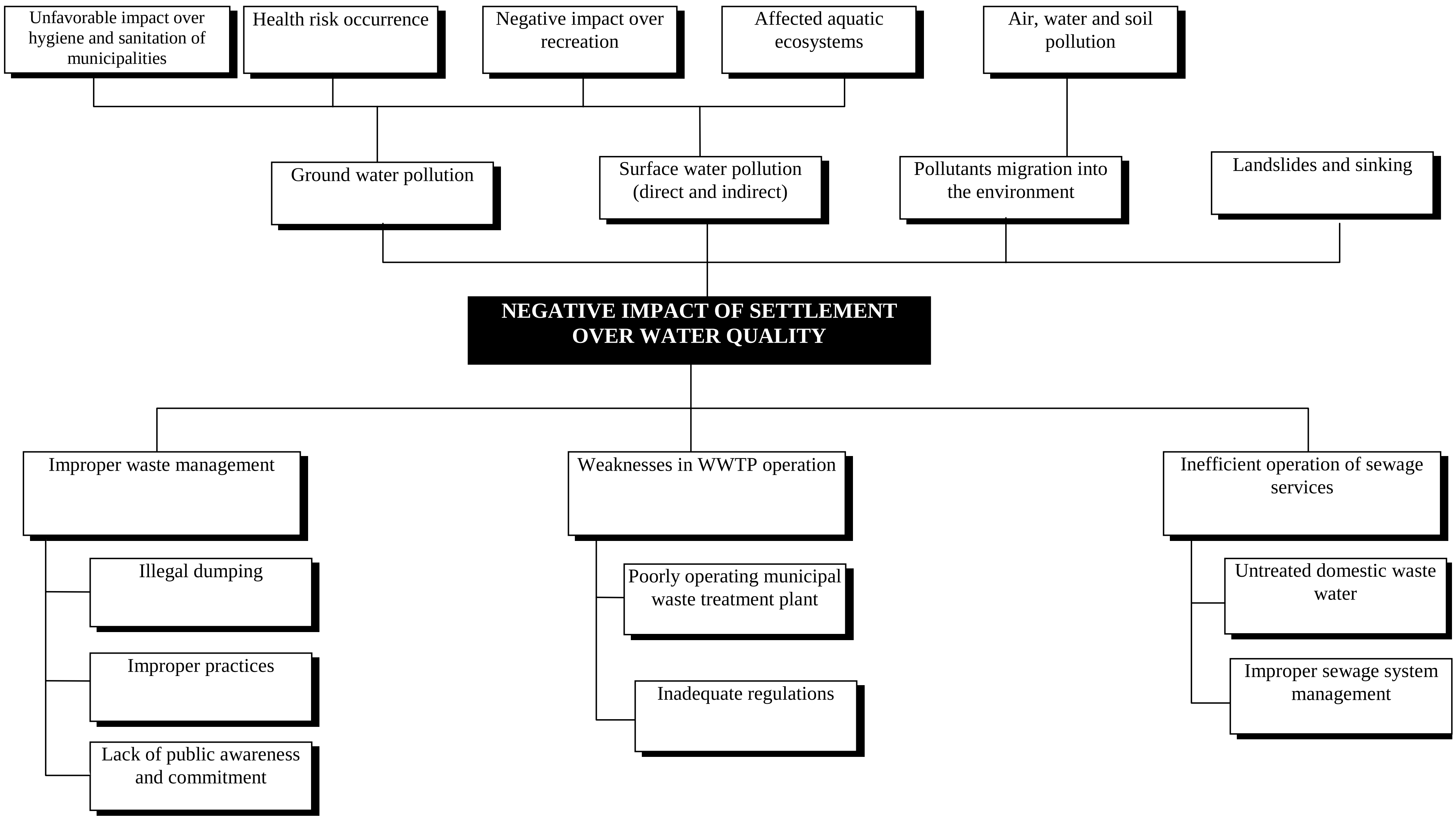
ROMANIA

Municipal Waste Management



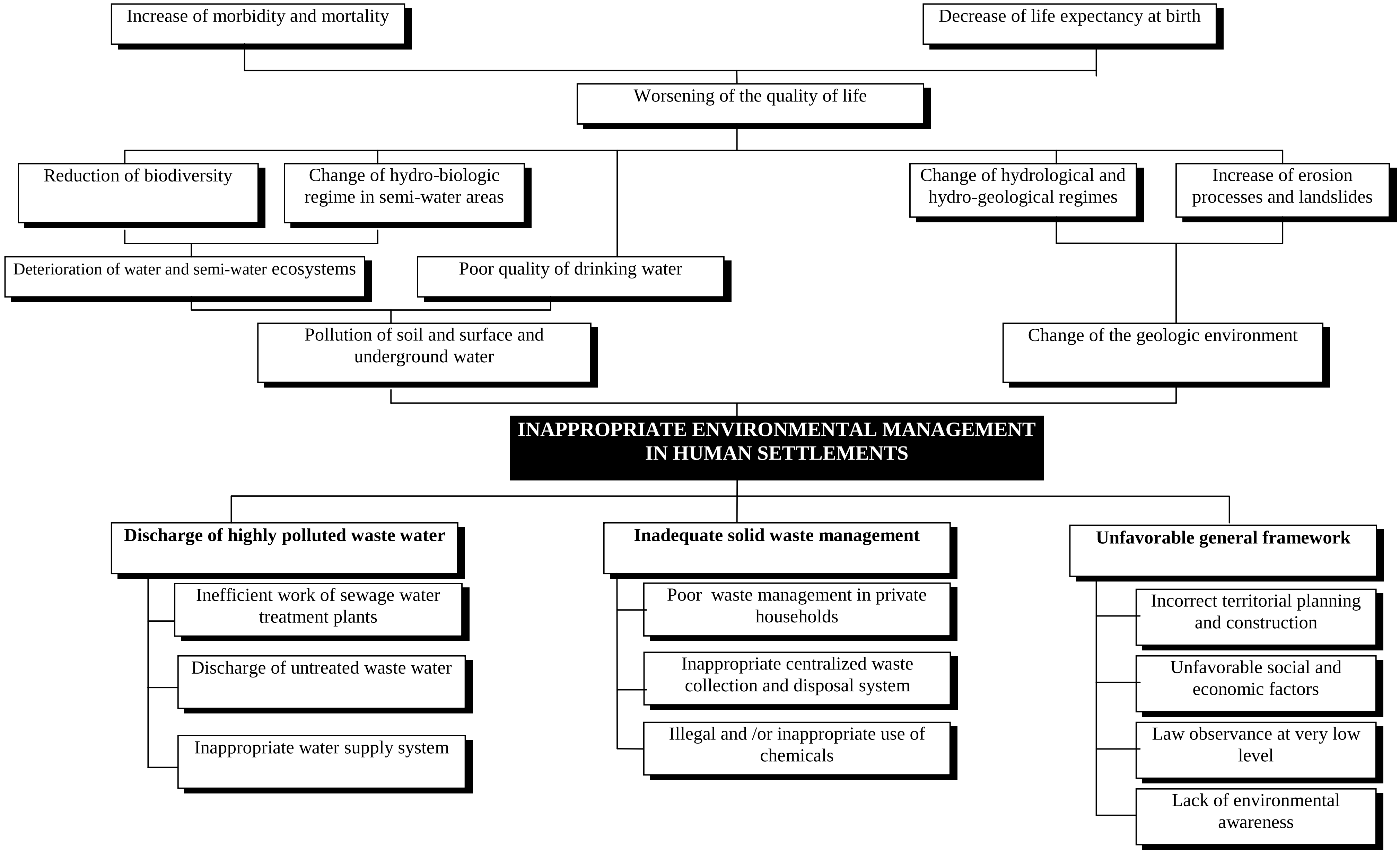
PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 4**

BULGARIA ***Municipalities***



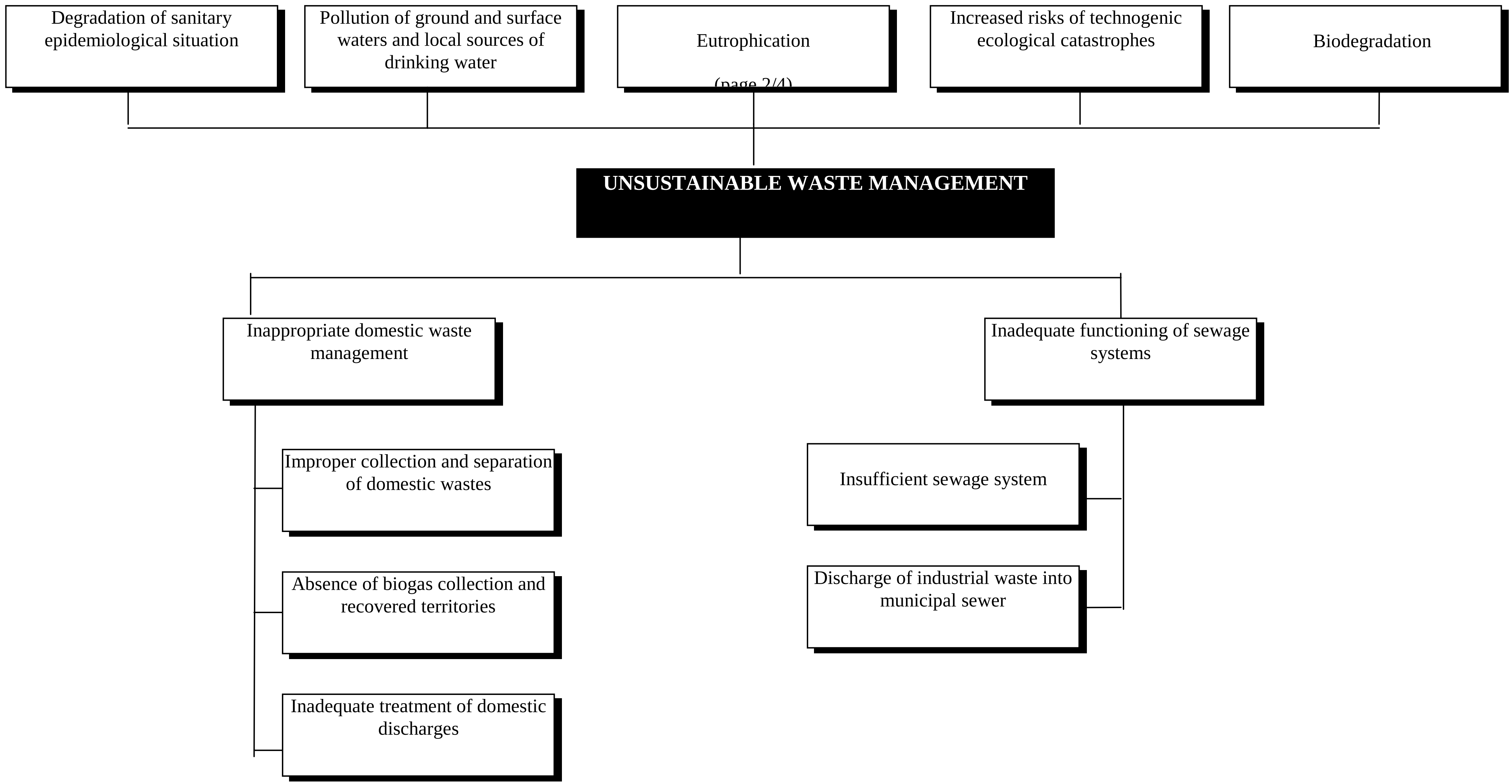
PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

MOLDOVA ***Municipalities***



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

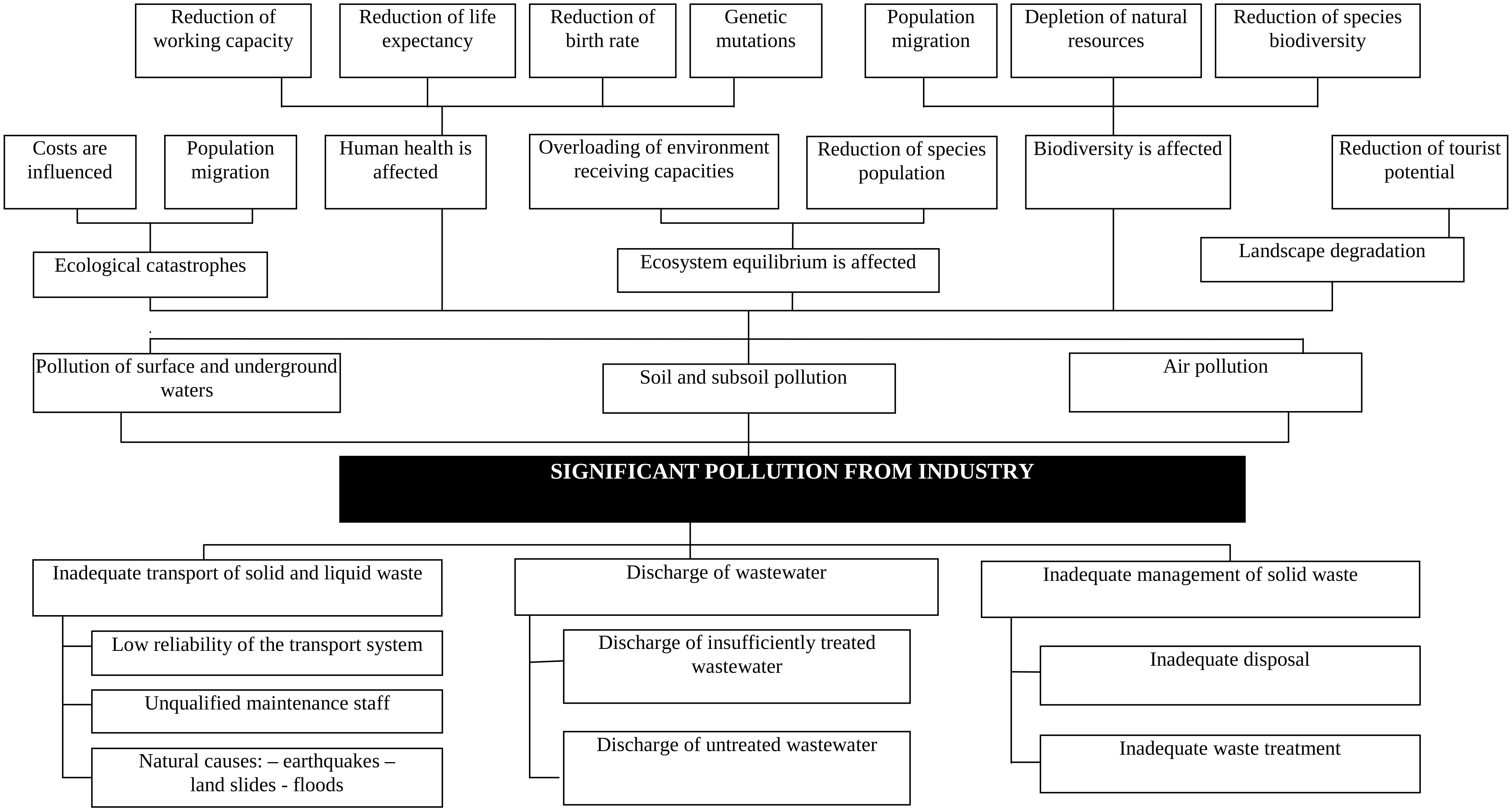
UKRAINE ***Municipalities***



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

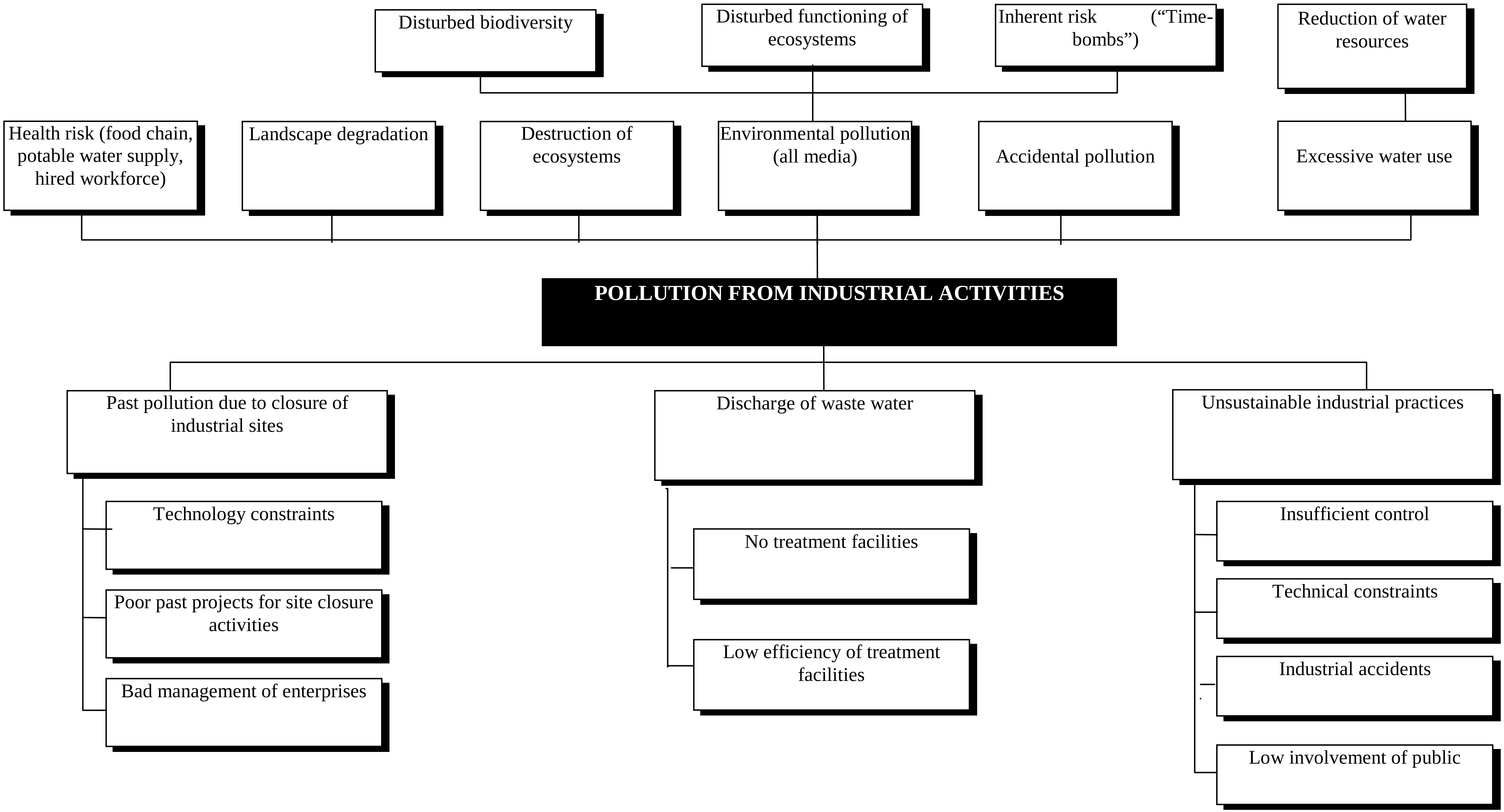
ROMANIA

Industrial Waste Management



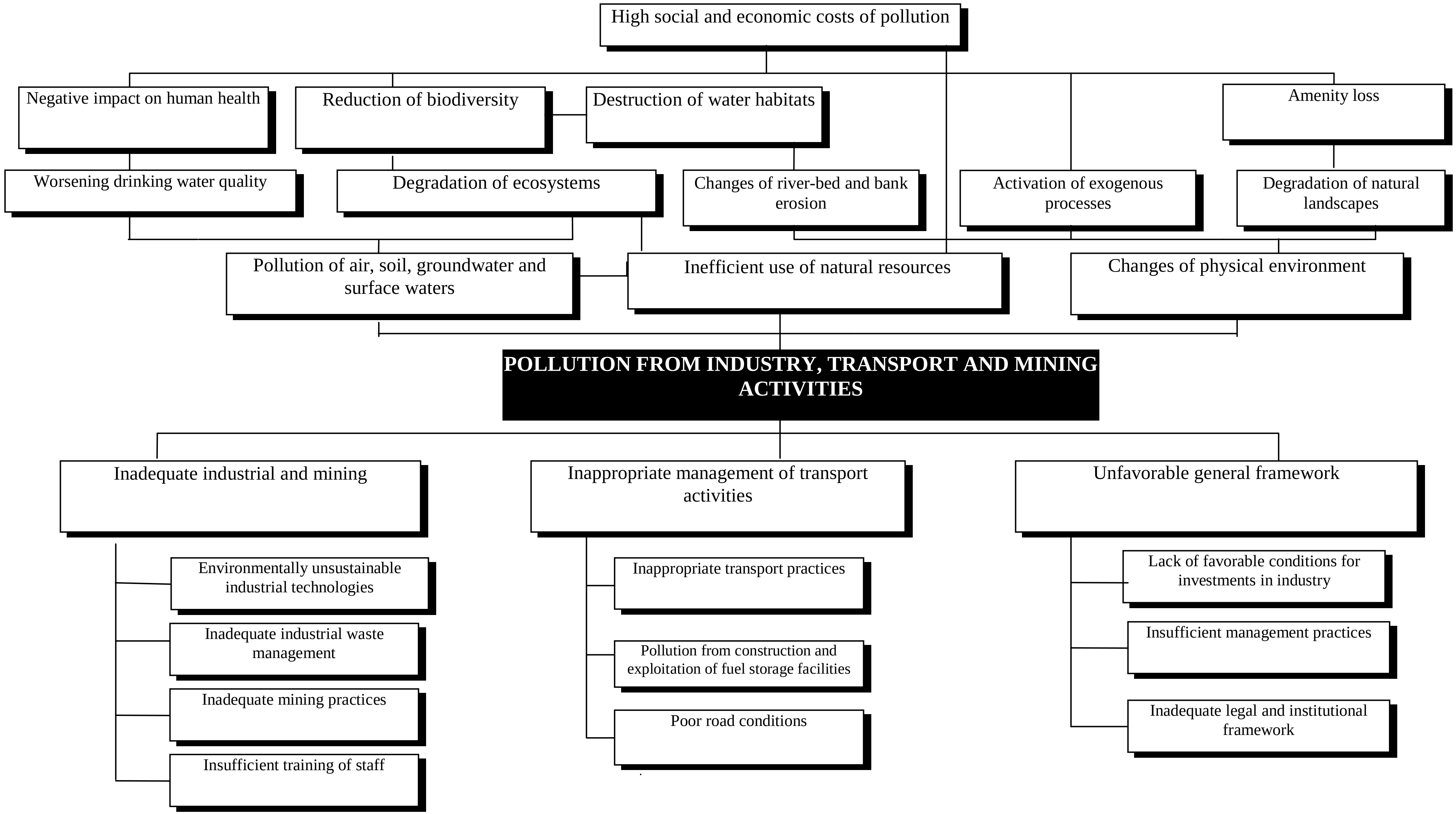
PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

BULGARIA ***Industry***



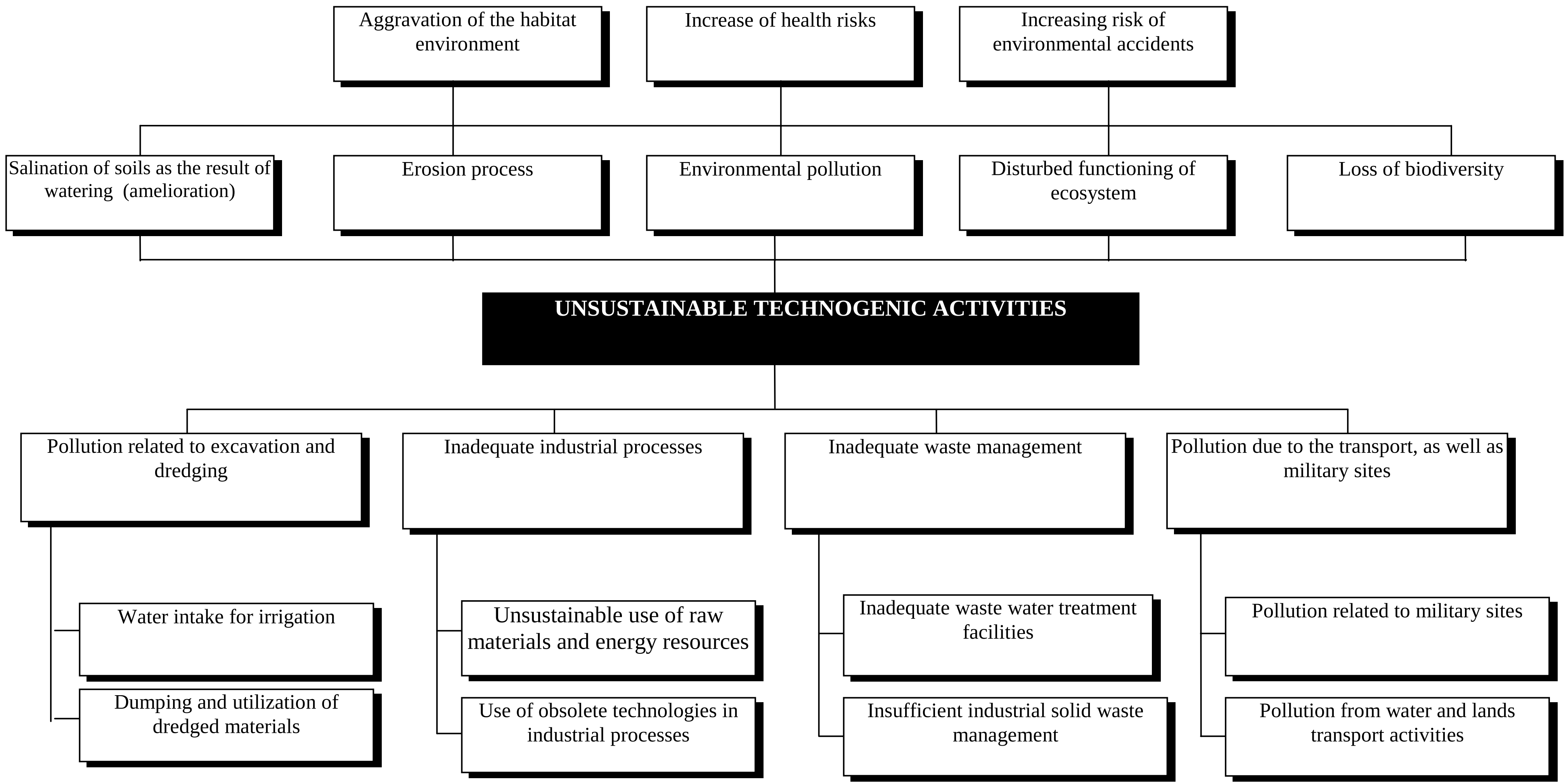
PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

MOLDOVA ***Industry***



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

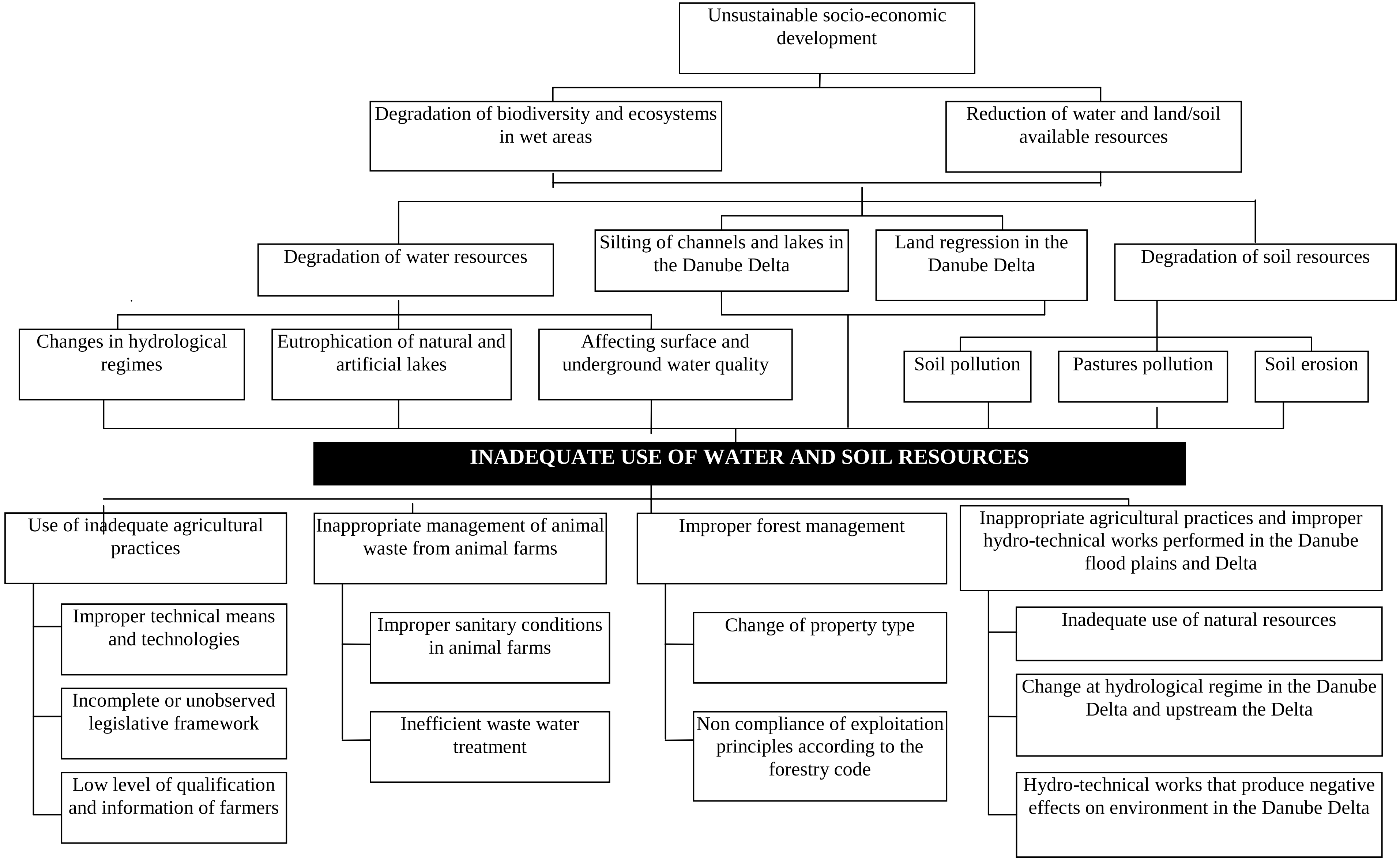
UKRAINE ***Industry***



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

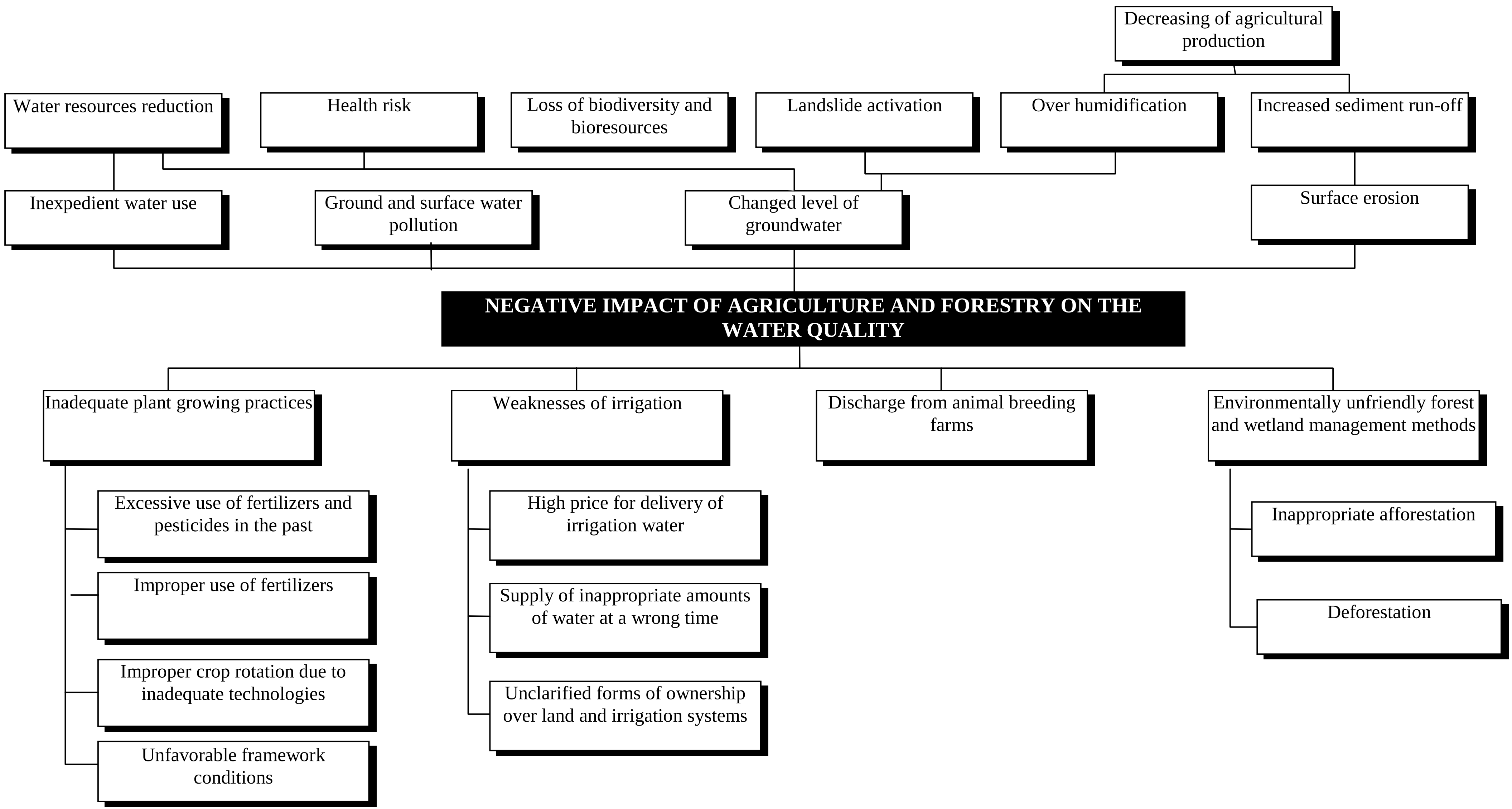
ROMANIA

Agriculture and Land Use



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

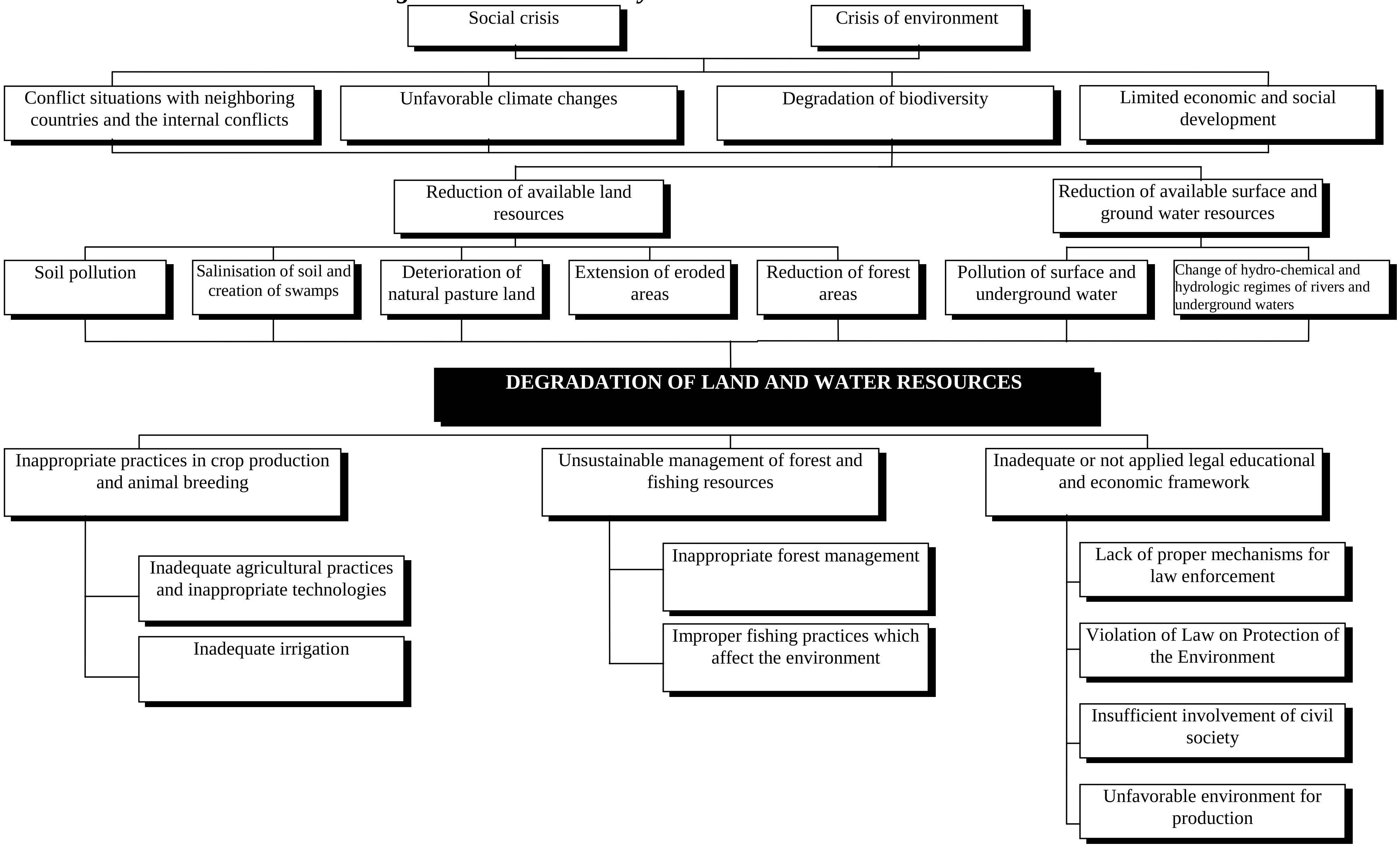
BULGARIA ***Agriculture and Forestry***



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

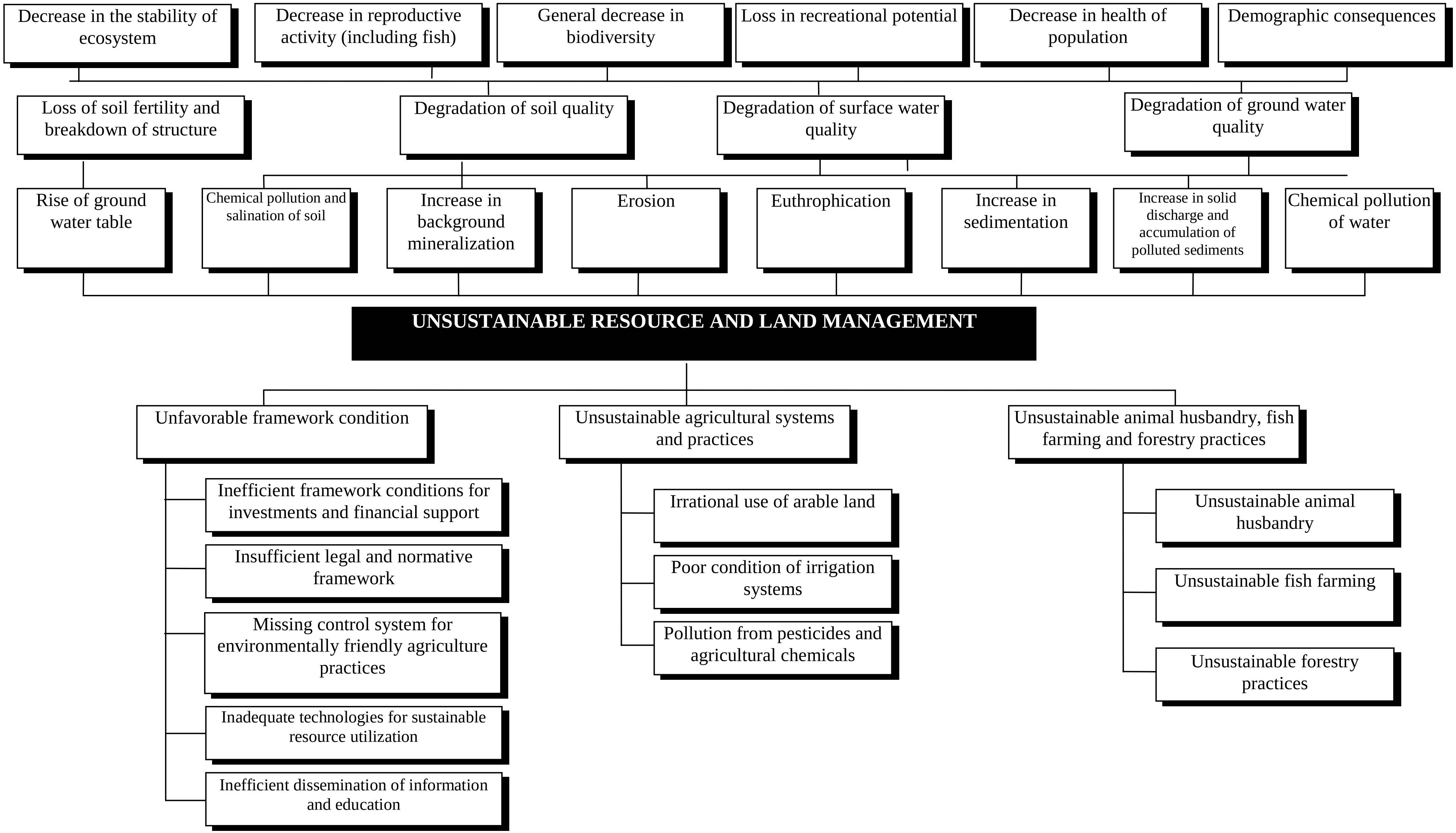
MOLDOVA

Agriculture and Forestry



PROBLEM HIERARCHY - LOWER DANUBE COUNTRIES **ANNEX 5**

UKRAINE ***Agriculture***



Annex 5.1.2 - A

National Ranking of Projects (Upper and Middle Danube)

Annex 5.1.2 – A National Ranking of Projects (Upper and Middle Danube)

Upper Danube - Municipal Projects

#	project title	BOD reduction (t/y)	BOD reduction (t/y) - dilution factor	COD reduction t/y	N - reduction t/y	P - reduction t/y	judgement on SIA	cost effectiveness
1	KOSICE WWTP **SK**	Needs to be calculated		needs to be calculated	446	107	SIA yes in Slovakia and in Hungary	please see financial expert report
2	ZLIN WWTP **CZ**	137		377	237	23	Middle Morava River SIA cumulative effects	please see financial expert report

Upper Danube - Industrial Projects

#	project title	toxic content reduction (t/y)	COD reduction t/y	N - reduction t/y	P - reduction t/y	judgement on SIA	cost effectiveness
1	OTROKOVICE TANNERY WWTP **CZ**	no toxic content	441.7	30	4.0	Middle and Lower Morava River SIA cumulative effects	please see financial expert report
2	HENCOVCE BUKOCEL WWTP **SK**	Formaldehyde Phenols Chloride	100	needs to be calculated	needs to be calculated	SIA Bodrog H+SK	please see financial expert report

Upper Danube - Agricultural Projects

#	project title	BOD reduction (t/y)	N - reduction t/y	P - reduction t/y	judgement on SIA	cost effectiveness
	FLOODPLAIN MEADOWS RESTORATION; LOWER MORAVA		60	7	YES Austria - Hungary-Slovakia transboundary effect	high

Upper Danube - Non-structural Projects

Ranking	Project title
	Pilot - demo project
	Rural development - WWT in villages (in lagoons and ponds) - waste recycling
	Research
	Research of nutrient sink by different types of wetlands
	Capacity building (installations, institutions, HR _ training)
	Institutional strengthening of municipal authorities in the process of water management transformation
	Legislation (guidelines, code of conduct)
	Ban of phosphates in washing powders
	* (In the transition to EC legislation, CZ)

Middle Danube - Municipal Projects

HUNGARY	SLOVENIA	CROATIA	BOSNIA & HERZEGOVINA	FEDERAL REPUBLIC OF YUGOSLAVIA
(H) H/1 BUDAPEST-NORTH BOD 28,000 t/y / 308 / 183 cost-effectivity: US$ 1152/t BOD/y	(SLO) LJUBLJANA BOD = 10,460 N = 1,600 P = 350 cost: US$ 68 million	(HR) ZAGREB BOD = 10,438 t/y N = 1,320 t/y P = 220 t/y	(BiH) SARAJEVO (BH) BOD_14,850 t/y N_1,015 t/y P_150 t/y	(YU) No.5 BELGRAD- CENTRAL BOD red. 31500 t/y COD red 65000 t/y P red. 1183 t/y N red. 876 t/y cost (appx) US$ 210 million
(H) H/2 BUDAPEST-SOUTH BOD 18,700 t/y / 203 / 122 cost-effectivity: US$ 1491/t BOD/y	(SLO) ROG. SLATINA BOD = 250 N = 38 P = 9 inv. ~ US$ 3 million Sotla river at border HR/SLO	(HR) BELISCE BOD = 3000 t/y N = 27 t/y P = 1 t/y (same WWTP like industry!) Drava Kopacki Rit	(BiH) TUZLA BOD_15,840 t/y N_1,080 t/y P_160 t/y	(YU) No.5 NOVI SAD CITY BOD red. 5625 t/y COD red 12000 t/y P red. 268 t/y N red. 150 t/y cost (appx) US$ 52 millio
(H) H/3 SZEGED BOD 5,980 t/y / 270 / 30 cost-effectivity: US$ 1100/t BOD/y		(HR) VARAZDIN - BOD = 1162 t/y N = 132 t/y P = 1 t/y biological treatment Drava	(BiH) BANJA LUKA BOD_9,900 t/y N_675 t/y P_100 t/y	(YU) No.6 NIS CITY t/y BOD red. 5300 COD red 11000 P red. 260 N red. 125 cost (appx) US$ 45 million
		(HR) KARLOVAC BOD = 1225 t/y N = 9 t/y P = 16 t/y		(YU) No.7 PRISTINA CITY BOD red. 3560 t/y COD red 7500 t/y P red. 85 t/y N red. 35 t/y cost (appx) US$ 40 million
		(HR) OSIJEK BOD = 953 t/y		(YU) KOLASIN & MOJKOVAC (protection of UNESCO heritage)

HUNGARY	**SLOVENIA**	**CROATIA**	**BOSNIA & HERZEGOVINA**	**FEDERAL REPUBLIC OF YUGOSLAVIA**
		N = 160 t/y P = 18 t/y Drava Kopacki Rit		Tara river YU_BiH both: BOD = 350 t/y cost (appx.) US$ 7.5 million
		(HR) SISAK BOD = 700 t/y N = 48 t/y P = 2 t/y Kupa/Sava and Lonjsko Polje		

Middle Danube - Industrial Projects

HUNGARY	SLOVENIA	CROATIA	BOSNIA & HERZEGOVINA	FEDERAL REPUBLIC OF YUGOSLAVIA
(H) H/1 SZÁZHALOMBATTA – MOL oil refinery oil reduction: 64,000 kg/y cost-effectivity: US$ 760/kg oil/y I.	(SLO) ICEC-KRSKO pulp-paper industry BOD = 9400 SS = 1400 COD = 300 investment ~ US$ 17 million Sava upstream Zagreb	(HR) BELISCE paper industry BOD=1100 t/y Drava upstream Kop. Rit	(BiH) Banja Luka "Incel" pulp & paper industry BOD_ 39,600 t/y SS _ 9,000 t/y COD_194,000 t/y Vrbas river	(YU) "FOPA" – paper industry CODr .... 15,000 t/y cost.................US$ 15 million S. Morava upstream of confluence with V. Morava
	(SLO) VRHNIKA leather industry) toxic Cr6+ BOD=2000 SLO – Ljubjana cost (approx.):....US$ 17 million wetland, Sava	(HR) Petrokemija Kutina COD=209 t/y BOD=47 t/y wetland "Lonjsko Polje" Sava	(BiH) CELPAK, Prijedor pulp & paper BOD_ 23,800 t/y SS _ 5,850 t/y COD_123,700 t/y Una river	(YU) RTB "BOR" - FLOTATION Cu SSd. 15000 HEAVY METALS....Cu... 15t/y Zn....9.5 cost (approx.).....US$ 35 million
			(BH) KOKSARA, Lukovac coal factory BOD _ 860 t/y COD _ 5250 Spreca: tributary to Bosna river	I (YU) IHP "PRAHOVO" fertiliser P reduction:...........3000 t/y cost (approx.):...US$ 25 million Danube at BG border
				(YU) Recultivation of the ash dump near Belgrad (Tent A, B) area.............100 ha cost (approx.)...US$0.25 million

Middle Danube - Agricultural Projects

HUNGARY	**SLOVENIA**	**CROATIA**	**BOSNIA & HERZEGOVINA**	**FEDERAL REPUBLIC OF YUGOSLAVIA**
	(SLO) NEMSCAK & RAKICAN pig farm BOD=2300 N=350 P= Mura	(HR) Farma Senkovac pig farm BOD=1500 t/y N=7 t/y P=2.8 t/y Drava HR/H border	(BiH) BRCKO pig farm (1) BOD_9900 N_1570 P_350 Sava river	(YU) "NEOPLANTA" Pig Farm BOD reduction:.....5,800 t/y COD reduction:...12,500 t/y Cost (approx.) US$ 8 Cenej (Upper Banat)
	(SLO) PODGRAD (pig farm) + smell problems / Austria, Mura BOD=840 N=126 P=28 Investment: US$ 1.5 million		(BiH) N. Topola (1) pig farm BOD_7,200 N_1.130 P_250 Vrbas river, near Sava	(YU) "D. MAKOVIC" Pig Farm BODr.................3300 t/y CODr.................7200 t/y Cost (approx.) US$ 5 million Obrenovac (upstream Belgrad)
				(YU) "Farmacoop" – Vrbas Pig Farm BOD reduction: 3300 t/y COD reduction: 7000 t/y P reduction: 20 t/y N reduction: 175 t/y Cost (approx.): US$ 5 million
				(YU) Afforestation for preventing erosion & nutrient releasing cca 300 ha cost............US$ 0.75 million along Danube in the Banat region

Middle Danube - Nonstructural Projects

WETLANDS' REHABILITATION	BASELINE STUDIES	WATER POLLUTION CONTROL	AGRICULTURE
rehabilitation of wetlands in Danube, Sava and Tisa river cost:......................US$ 0.35 million (YU)	Study on floodplains' contribution to nutrient removal in Yugoslav part of Danube river (3 years) (YU) cost:.......................US$ 0.21 million	The improvement of water quality monitoring in Yugoslavia cost:............................US$ 0.48 million (YU)	Establishment of the educational centre for farm & agricultural waste management (YU) cost:............US$ 0.75 million
wetland: Kopacki Rit, Gemenc Nutrient Removal Capacity: HIGH Biodiversity: VERY HIGH + positive effects on local population cost:..................~ US$ 100-1000/ha	Study on the impacts on Iron Gate reservoirs (3 years) cost:.......................US$ 1.8 million YU-RO	Improvement of: (YU) - legislature - methodology and instruments for the financing of water pollution control in Yugoslavia cost:............................US$ 0.14 million	Pilot sites and develop projects for the introduction of organic-biological farming HR
wetland: (YU) **Mouth of Drina & Obedska Bara** Nutrient Removal Capacity: HIGH Biodiversity: HIGH + positive effects on local people cost:..................~ US$ 100-1000/ha	Simulation model of Sava river basin (3 years) (4 countries) cost:.......................US$ 0.26 million (YU part: proposal) (YU, SLO, HR, BiH, H)	Good Management Practice for ON SITE (individual) waste water facilities (H + SLO) could be of interest for all Danubian countries	SLOVENIA: project: implementation of good agricultural practice could be of interest for all Danubian countries
wetland: Upper Tisza Nutrient Removal Capacity: HIGH Biodiversity: HIGH cost:..................~ US$ 100-1000/ha **wetland: Lower Tisza** (YU) Nutrient Removal Capacity: HIGH Biodiversity: HIGH cost:..................~ US$ 100-1000/ha	Study on water quality management in Tisa river basin (3 years) cost:.......................US$ 0.69 million (YU part: proposal) (YU, SLO, HR, BiH, H)	Development of WWT in small communities on Kupa river (SLO-HR)	

Annex 5.1.2 - B

National Ranking of Projects (Lower Danube)

Annex 5.1.2 – B National Ranking of Projects (Lower Danube)

Lower Danube - Municipal Projects

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
Development of WWTP BUCHAREST - BOD: 42730 t/y - COD: 5566 t/y - N: 7509 t/y - P: 1744 t/y Qef/Qr= 1/2 **34**	WWTP GORNA ORJAHOVITZA & LJASKOVETZ **SIA (BG-12)** reduction of: 1:8 BOD: -6559 t/y COD: -14370 t/y N: -464 t/y P: -247 t/y	UNGHENI WWTP BOD: -25.2 t/y N: -464 t/y D.e.: 1/625	Uzhgorod WWTP BOD: 646 t/y COD: 807 D.f: 1/16
WWTP BRAILA CITY - BOD: 4526 t/y - COD: 3750 t/y HIGH HEALTH RISK - N: 822 t/y - P: 210 t/y Qef/Qr= 1/5000 **42**	WWTP TROYAN **SIA (BG-9)** reduction of: 1:10 BOD: -1634 t/y COD: -3996 t/y N: -121 t/y P: -56 t/y	Development of treatment facilities at the Comrat WWTP + Taraclia BOD: -2.1 BOD - 2.1 D.e. N: -1.5 N: -1.3 two WWTP's for 1 projects – Yalpugh/285	CHERNIVTSI WWTP BOD: 467.2 t/y COD: 966.00 D.f. 1/29; 16 t/y
WWTP GALATI CITY - BOD: 6028 t/y - COD: 5540 t/y HIGH HEALTH RISK - N: 812 t/y - P: 275 (T) t/y Qef/Qr= 1/3800 **42**	WWTP LOVETCH **SIA (BG-10)** reduction of: 1:12 BOD: -1382 t/y COD: -2927 t/y N: -69 t/y P: -44 t/y	Cantemir WWTP BOD: -52.6 D.e.: 1/567 N: -13.9	Kolomyca WWTP BOD: 149 t/y COD: 223 D.f.: 1/45
WWTP IASI modernisation - BOD: 1390 t/y - COD: 772 t/y HIGH HEALTH RISK - N: 165 t/y - P: 35.4 t/y Qef/Qr= 1/2 **39**	WWTP SEVLIEVO **SIA (BG-11)** reduction of: 1:25 BOD: -1014 t/y COD: -2062 t/y N: -136 t/y P: -42 t/y		Mukachevo WWTP BOD: 165 t/y COD: 206 D.f.: 1/56
Development of WWTP TIMISOARA / Bega - BOD: 3284 t/y - COD: 2561 t/y - N: 444 t/y - P: 101 t/y Qef/Qr= 1/2 **16d**	WWTP RUSSE **SIA-Danube** **Feasibility and Pre-investment Studies** reduction of: 1:2000 BOD: -3883* t/y COD: -8987* t/y N: -603* t/y P: -219* t/y * - 1994 data		Izmail WWTP BOD: 41.25 t/y COD: 109 D.f.: 1/17,000 The source of persistent organo-chlorines, oil heavy metals, etc.

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
Development of WWTP RESITA CITY - BOD: 1501.97 t/y - COD: 1729 t/y - N: 241 t/y - P: 52.7 t/y Qef/Qr= 1/13 **16e**			
WWTP ZALAU - BOD: 475.74 t/y - COD: 846 t/y - N: 111.6 t/y - P: 33.6 t/y Qef/Qr= 1/2 **21**			
WWTP DEVA CITY / Mures - BOD: 816.3 t/y - COD: 1156 t/y - N: 63.2 t/y - P: 31.4 t/y Qef/Qr= 1/227 **18**			

Lower Danube - Industrial Projects

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
WWTP expansion at SC ANTIBIOTICE IASI - COD: 54.7 t/y - BOD: 34.3 t/y - N: 8.4 (T) t/y - P: 2.52 (T) t/y Qef/Qr= 1/23 **39**	WWTP Gorna Orjahovitza sugar and alcohol factoty reduction of: BOD: -5440 t/y	Vulcanesti Pesticide Dump Site **SIA - 14, 15 (MD)**	Reconstruction of timber processing industry (clean production + wastewater) in Upper Tisza in Ukraine (Velily Bychkiv, Teresva, Rakhiv) BOD: 86, P˜30
WWTP at SC CELOHARI DONARIS BRAILA/ DANUBE - BOD: 621 t/y Qef/Qr= 1/17789 **42**	COD: -11360 t/y N: -350 t/y P: - 60 t/y **SIA (BG-12)**		
SIDEX - GALATI (iron) / Danube - COD: 2535 t/y - N: 754.6 (T) t/y - P: 10.6 (T) t/y - Fe: 12.9 (T) t/y - Phen: 97 t/y - Zn: 10.8 t/y Qef/Qr= 1/22 **42**	Completion of WWTP "Antibiotic" Razgrad + Rehabilitation of municipal WWTP Razgrad: BOD: -200 t/y		
Modernisation of installations from SC LETEA BACAU: S.A. / SIRET - BOD: 9.6 t/y - N: 1.28. (T) t/y - P: 362 (T) t/y Qef/Qr= 1/2 **36**	COD: -331 t/y N: -9 t/y P: - 2 t/y **SIA (BG-13)**		
INDAGRARA ARAD - COD: 2448 t/y - BOD: 1112 t/y - N: 280 t/y Qef/Qr= 1/172 **16**	WWTP "HIMKO" Vratza Fertiliser Plant sugar and alcohol factoty reduction of: BOD: -118 t/y		
Removal of chromium and zinc from wastewater discharged from fabrication of inorganic dyes and phenols SC SINTEZA ORADEA	COD: -239 t/y N: -121 t/y P: - 3 t/y **SIA (BG-7)**		

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
- Fe: 0.2 t/y - Phen: 1.35 t/y - Pb: 263.5 t/y - Zn: 718.25 t/y Qef/Qr= 1/2387 **20**			
PHOENIX BAIA MARE (mine) Sasar - Somes - Tisa - COD: 83.3 t/y - Fe: 23.2 t/y - Cu: 7.14 t/y - Pb: 2.55 t/y Qef/Qr= 1/22 **21**			
Modernisation of the secondary treatment of WWTP SC SIDERCA CALARASI S.A. - COD 18.02 t/y - Fe: 5.44 t/y - Phen: 6.25 t/y - CN: 0.4 t/y Qef/Qr= 1/39000 **39**			
SOMES CEJ (chemicals) / Somes - COD: 3522 t/y - BOD: 993 t/y - N: 91 t/y Qef/Qr= 1/32 **21**			

Lower Danube - Agricultural Projects

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
Comsuin Beregsau / Bega (250,000 pigs) BOD: 1909 t/y COD: 2586 t/y N: 573 t/y Phen: 0.6 t/y Qef/Qr= 1/26 **16d**	Restoration of the Belene Island wetland	Edinet pig farm with capacity of 45,000 pigs	Animal farms in Kylia region (Lower Danube) - untreated sewage (wastewater) 45 th m3/year
Suiprod Independenta - Birladet / Siret BOD: 350 t/y COD: 409 t/y N: 226 (T) t/y Qef/Qr= 1/223 **42**	Restoration of the Vardim wetland		
Capacity increase of WWTP of Comtom-Tomesti / Prut BOD: 35 t/y COD: 73.1 t/y N: 26.6 (T) t/y P: 0.21 (T) t/y Qef/Qr= 1/101 **39**		Pilot projects to be multiplied by other countries (MD, RO, UA, HU) for the treatment and complex utilisation of the waste manure in the Yantra river basin	
Comsuin Ulmeni BOD: 221 t/y COD: 488 t/y N: 330 (T) P: 0.91 (T) Qef/Qr= 1/62963 **34**			

Lower Danube - Non-structural Projects

ROMANIA	BULGARIA	MOLDOVA	UKRAINE
Introduction of new instruments for water management	Training for plant managers on introducing environmental management systems	Wetland restoration in Lower Prut basin **SIA - 14, MD + RO**	NGO information centre for Ukranian NGO's in DRB
Restoration of wetlands with multipurpose goals in Lower Danube part between Romania and Bulgaria "Balta Greaca" and Calarasi	Preparation of a long term program for (re)solving past pollution problems	Development of BAP in agriculture, including irrigation **MD, RO, UA**	Reduction of nutrient load from diffuse sources in Ukraine and Moldova
Prevention and control measures for accidental pollution	Actualisation of nutrient balance by the adaptation of EU methods for assessment of pollution load from diffuse sources	Wetland restoration in lower Yalpugh and Danube **MD + UA**	Introduction of practices for water re-use and waste recycling in technological processes as a pilot project
Ecological reconstruction at Zlatna (demo project)	Assessment and adaptation of irrigation systems in Danube catchment to the needs of private farming		Pollution reduction and rehabilitation of small streams of Ukrainian section of the river Danube basin
Restoration of wetland in the Danube Delta respective "Polder Pardina"			Training centre for the sustainable land use (ecological farming)
Harmonisation of national standards with EU legislation of water emissions			
Pilot project for Environment Integrated Monitoring Systems (to be multiplied by MD, UA, BG)			

Annex 5.1.2 - C

Preliminary High Ranking Municipal Projects listed in Order of Expected Load Reduction of N and P

Annex 5.1.2 – C Preliminary High Ranking Municipal Projects listed in Order of Expected Load Reduction of N and P

First ten municipal projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
7,509 - RO - wwtp Bucharest	1,244 - RO - wwtp Bucharest
1,600 - SI - wwtp Ljubjana	1,183 - FRY - wwtp No. 5 Belgrad Central
1,320 - HR - wwtp Zagreb	350 - SI - wwtp Ljubjana
1,080 - BIH - wwtp Tuzla	275 - RO - wwtp Galati City
1,015 - BIH - wwtp Serajevo	268 - FRY - wwtp No. 5 Novi Sad City
876 - FRY - wwtp No. 5 Belgrad Central	260 - FRY - wwtp No. 6 Nis City
822 - RO - wwtp Braila City	247 - BG - wwtp Gorna Orjahovitza/Ljaskovetz
812 - RO - wwtp Galati City	220 - HR - wwtp Zagreb
675 - BIH - wwtp Banja Luka	219 - BG - wwtp Russe
630 - SI - wwtp Domzale	210 - RO - wwtp Braila City

Second ten municipal projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
603 - BG - wwtp Russe	160 - BIH - wwtp Tuzla
464 - BG - wwtp Gorna Orjahovitza/Ljaskovetz	150 - BIH - wwtp Serajevo
464 - MD - wwtp Unoheni	140 - SI - wwtp Domzale
446 - SK - wwtp Kosice	107 - SK - wwtp Kosice
444 - RO - wwtp Timisoara	101 - RO - wwtp Timisoara
350 - SI - wwtp Ptuj	100 - BIH - wwtp Banja Luka
241 - RO - wwtp Resita City	85 - FRY - wwtp No. 7 Pristina City
237 - CZ - wttp Zlin	77 - SI - wwtp Ptuj
165 - RO - wwtp Iasi modernization	56 - BG -wwtp Troyan
160 - HR - wwtp Osijek	53 - RO - wwtp Resita City

Third ten municipal projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
150 - FRY - wwtp No. 5 Novi Sad City	44 - BG - wwtp Lovetch
136 - BG - wwtp Sevlievo	42 - BG - wwtp Sevlievo
132 - HR - wwtp Varazdin	35 - RO - wwtp IASI modernization
125 - FRY - wwtp No. 6 Nis City	34 - RO - wwtp Zalau
121 - BG - wwtp Troyan	31 - RO - wwtp Deva City/Mures
112 - RO - wwtp Zalau	23 - CZ - wwtp Zlin
69 - BG - wwtp Lovetch	18 - HR - wwtp Osijek
63 - RO - wwtp Deva City/Mures	16 - HR - wwtp Karlovac
48 - HR - wwtp Sisak	9 - SI - wwtp Rog. Slatina
38 - SI - wttp Rog. Slatina	2 - HR - wwtp Sisak

Fourth ten municipal projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
35 - FRY - wwtp No. 7 Pristina City	1 - HR - wwtp Belisce
27 - HR - wwtp Belisce	1 - HR - wwtp Varazdin
14 - MD - wwtp Cantemir	There are 12 others w/o P-reduction values
9 - HR - wwtp Karlovac	
3 - MD - Development of treatment facilities at the Comrat wwtp + Taracia	
There are 9 others w/o N-reduction figures.	

Total reductions for municipal projects for which reductions are estimated: 22,458 t/y N reduction
5,761 t/y P reduction

Annex 5.1.2 - D

Preliminary High Ranking Industrial Projects listed in Order of Expected Load Reduction of N and P

Annex 5.1.2 – D Preliminary High Ranking Industrial Projects listed in Order of Expected Load Reduction of N and P

First ten industrial projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
755 - RO - Sidex-Galati (iron)/Danube	3,000 - FRY - IHP Prahovo fertilizer
621 - RO - wwtp at SC Celohari Donaris	362 - RO - Modernization of installations from SC Letea Bacau; S.A. / Siret
420 - H/2 BalatonfuzfopNike chemical factory	60 - BG - wwtp Gorna Orjahovitza sugar and alcohol factory
350 - BG - wwtp Gorna Orjahovitza sugar & alcohol factory	30 UA - Reconstruction of timber processing industry (clean production + wastewater) in Upper Tisza (Velily Bychkiv, Teresva, Rakhiv)
280 - RO - Indagrara Arad	11 - RO - Sitex - Balati (iron / Danube
121 - BG - wwtp "Himko" Vratza fertilizer plant & sugar and alcohol factory	4 - CZ - Otrokovice Tannery wwtp
91 - RO - Somes Cej (chemicals) / Somes	3 - BG - wwtp "Himko" Vratza fertilizer plant
30 - CZ - Otrokovice Tannery wttp	2 - RO - wwtp expansion at SC Antibiotice Iasi
9 - BG - Completion of wwtp	2 - BG - Completion of wwtp "Antibiotic" Razgrad + Rehabilitation of municipal wwtp Razgrad
8 - RO - wwtp expansion at SC Antibiotice Iasi	There are 21 others w/o P-reduction values.

Second ten industrial projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
1 - RO - Modernizations of installations from SC Letea Bacau: S.A. / Siret	
There are 18 others w/o N-reduction figures.	

Total reductions for industrial projects for which reductions are estimated: 2,686 t/y N reduction

3,474 t/y P reduction

Annex 5.1.2 - E

Preliminary High Ranking Agricultural Projects listed in Order of Expected Load Reduction of N and P

Annex 5.1.2 – E Preliminary High Ranking Agricultural Projects listed in Order of Expected Load Reduction of N and P

First ten agricultural projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
1,570 - BIH - Brcko pig farm	350 - BIH - Brcko pig farm
1,130 - BIH - N. Topola pig farm	250 - BIH - N. Topola pig farm
573 - RO - Comsuin Beregsau / Bega	28 - SI Podgrad pig farm
350 - SI - Nemscak & Rakican pig farm	20 - FRY - Farmacoop - Vrbas pig farm
330 - RO -Comsuin Ulmeni	7 - A, H, SK - Floodplain meadows restoration; lower Morava
226 - RO - Suiprod Independenta-Birladet/ Siret	2.8 - HR - Farma Senkovac pig farm
175 - FRY - Farmacoop - Vrbas pig farm	2 - BIH - Tuzla cow farm
126 - SI - Podgrad pig farm	1.4 - HR - Farma Luzan pig farm
60 - A, H, SK - Floodplain meadows restoration; lower Morava	0.9 - RO - Comsuin Ulmeni
27 - RO - Capacity increase of wttp of Comtom-Tamesti / Prut	0.2 - RO - Capacity increase of wwtp of Comtom / Prut

Second ten agricultural projects

Nitrogen Reduction (t/y)	Phosphorus Reduction (t/y)
7 - HR - Farma Senkovac pig farm	There are 10 others w/o P-reduction values.
5 - BIH - Tuzla cow farm	
There are 8 others w/o N-reduction values.	

Total reductions for agricultural projects for which reductions are estimated: 4,579 t/y N reduction

662 t/y P reduction