DANUBE POLLUTION REDUCTION PROGRAMME

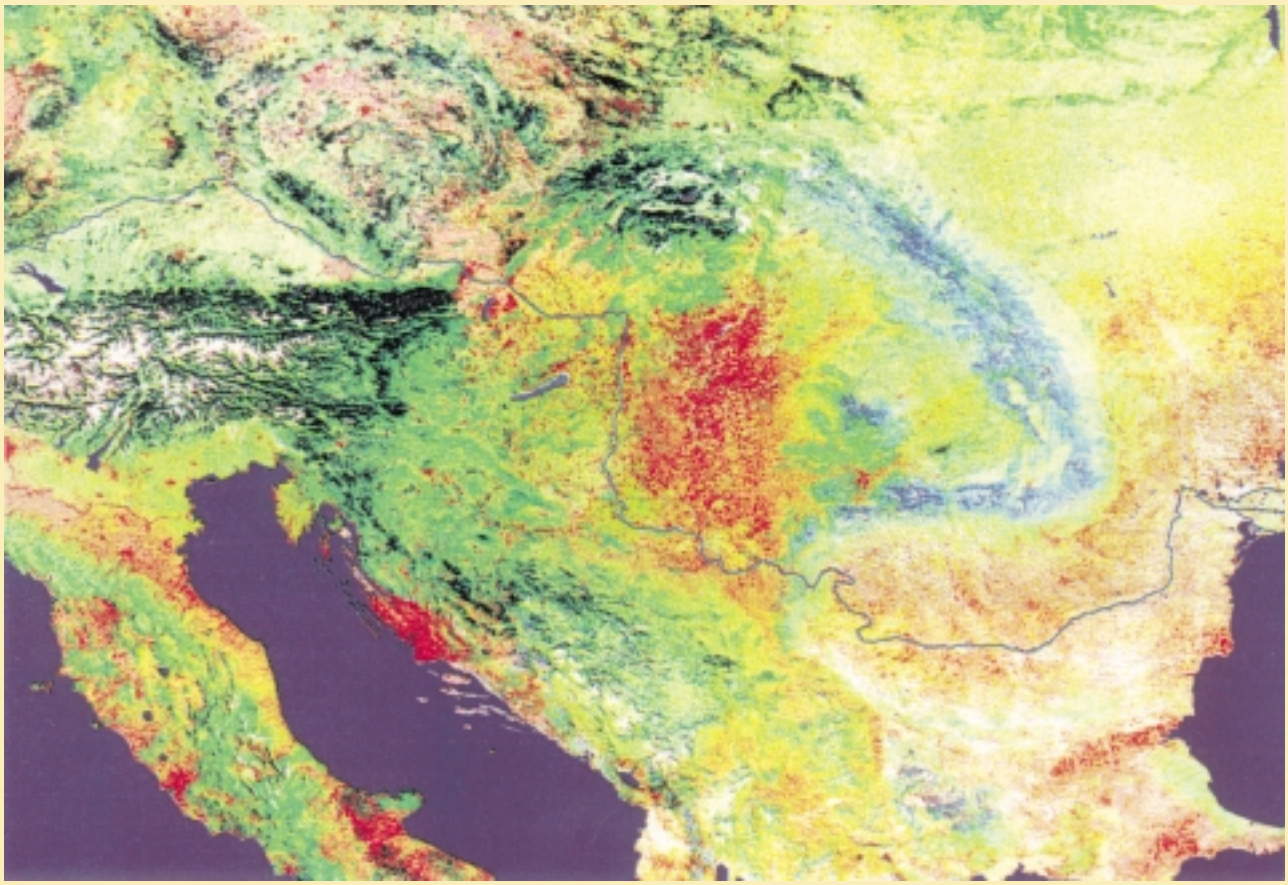
THEMATIC MAPS
OF THE DANUBE RIVER BASIN

Social and Economic Characteristics

with particular attention to

Hot Spots, Significant Impact Areas and Hydraulic Structures

June 1999



Programme Coordination Unit
UNDP/GEF Assistance

prepared by

Zinke Environment Consulting for Central and Eastern Europe
and Mihaela Popovici
Vienna, Austria

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Preface

The report on "*Thematic Maps of the Danube River Basin*" gives an overview of social and economic characteristics of this region, with particular attention to Hot Spots, Significant Impact Areas and Hydraulic Structures which were addressed during the preparation of the Pollution Reduction Programme. This includes the results of two workshops in Hernstein / Austria (24-30 January and 11-16 May 1999) where "*Sub-River Basins"* have been identified as new planning units for transboundary cooperation. The production of thematic maps and overlays did not only use existing national data but is equally based on new information gathered at the national level. The present report was first drafted as a background information for the "Transboundary Analysis Workshop", and then revised as a contribution to the Pollution Reduction Programme. In a final step, a structural analysis of the rivers of the Danube Basin with focus on hydraulic structures was added.

The conceptual preparation and the organisation of activities were carried out by Joachim Bendow, UNDP/GEF Project manager.

The report was prepared by *ZINKE ENVIRONMENT CONSULTING FOR CENTRAL AND EASTERN EUROPE* (maps by Ulrich Schwarz), with the support of Mihaela Popovici, Bucharest. The report was edited by Michael Sokolnikov.

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Annexes

1. Introduction

The following "Thematic Maps of the Danube River Basin" Report tries to give an overview of a proposed new sub-division developed for the PRP-Transboundary Analysis. This Report uses information from the National Reviews, adding socio-economic and ecological information, results from Water Quality Data and National Planning Reports (1998) and from questionnaires (landuse, agriculture, population, river characteristics), circulated in February and June 1999.

In a new planning approach, the entire Danube Basin was nationally sub-divided into so-called "***Sub-river Basin Areas***", i.e. aggregated, geographical units of several similar hydrographic parts (basins of mostly the Danube's first-order tributaries); these were discussed and agreed at the National Planning Workshops. There are one to four of such Areas per country and 32 Sub-river Basin Areas altogether in the Danube basin, as shown on Map 3. This allows an easier approach for the national assessment of environmental problems and their solutions. A summary text briefly describes the character of each **Sub-river Basin Area** *(national view)*, the Annex further gives **comparative charts** for each Danube basin country and its Sub-river Basin Areas, regarding the following socio-economic issues:

- **Population Density** (excluding the main cities): Map 4
- **Land Use**: Map 5
- **Agriculture** (lifestock, fertiliser consumption and production of three main crops): Maps 6 and 7.
- **Hot Spots**: Maps 8 and 9

In a second step, these areas were looked at from a transboundary perspective and further aggregated, resulting in 15 – mostly transboundary - "***Sub-River Basins"*** which were discussed and agreed at the Transboundary Workshop in Hernstein (Map 2). Objective was to better address local and national river basin management needs at the Danube basin level; as stipulated i.a. by the new EU Water Policy Directive (asking for transboundary "river basin districts"). This was achieved by reducing their number and by connecting transboundary hydrographic regions (e.g. catchment areas). The text chapter „*Sub-River Basins*" briefly describes the new aggregated regions (basic geographical and typical landscape characteristics, climate, most important economic data and environmental problems).

The third step was the identification of "***Significant Impact Areas***" which are most intensively affected by pollution and which are valuable from an environmental and/or conservation point of view. This report lists and describes all 51 SIAs. The overlay of Hot Spots, SIAs and Wetlands (Maps 10 and 11) facilitated the needed selection and ranking of pollution reduction projects within the PRP.

In a fourth step, ***Geomorphological Regions*** (Map 1) and ***Major Hydraulic Structures of Danube Basin Rivers*** (Map 12) were identified.

There are some differences in the information given which should be briefly addressed before: Especially for the theme "Land Use" (Map 5), the provided data proved to be insufficient to cover the needed level of Sub-river Basin Areas. Therefore, the data given in this report are based on the CORINE geographical information system and may vary in a small degree from the national data given in some of the National Reports or the questionaires.

For Agriculture (see maps 6 and 7), it was agreed with the Danube PCU to concentrate on few indicators (absolute and relative values for lifestocks and fertiliser consumption, the three main agricultural products). Due to the difference in detail information, only national data were compared.

The national data reports from Germany, Austria and Hungary did not follow the same methods to define geographical Sub-river Basin Areas (Germany and Hungary referred to their administrative structure, and Austria did not present any Sub-river Basin Area), so they related their data differently. In addition, the German and Austrian reports do not contain the same volume of information as the other national reports (e.g. much less detailed data; no Hot Spots - later "sources of pollution" were indicated).

The text on "*Significant Impact Areas*" gives a more specific information on each of the SIAs, i.e. on the local character of the area, the pollution sources (Hot Spots) and effects. Many SIAs are linked or even overlap with Priority Wetlands for Restoration (see Map 10). The latter are described in a separate report produced by WWF. Tables presenting the results from working groups of the Transboundary Workshop are given in the annex. So far, 51 SIAs were identified, some of them were reviewed after Hernstein in their name and size (regrouping of adjacent SIAs). The overlay of Hot Spots, SIAs and Wetlands is given on Map 11 and allows from a basin-wide perspective the better identification of Danube regions of future concern.

In Map 1, "*Geographical Indicators: Geomorphical Regions and Annual Precipition*", the Danube basin was subdivided into 45 different geographical areas. Their outline is based on various geographical and national PRP information, including the "Atlas of Danube Countries".

Map 12 on "*Major Hydraulic Structures and Description of Rivers in the Danube Basin*" is based on another questionnaire and further research. As the time for replying was very short and the availability of data on national level differs in the region, the data sets and comparability of information is limited. It should be emphasized that such an overview did not exist so far for the Danube Basin.

2. Climate, Morphology and Hydrological Network

Both the geography and the management of the Danube River Basin are dominated by the natural hierarchy of the Danube‘s hydrological network. **Map 1** showing the Geomorphological Regions and **Map 2** presenting, as a result of the PRP Transboundary Workshops, the Sub-river Basins reflect and respect this natural order. A detail description of each of the 15 Sub-river basins is given in chapter 4.

2.1. Geomorphological Regions

The geography of the Danube river basin is very diverse. It includes high mountain chains, large plains, sand dunes, large forested or marshy wetlands and, very specifically, the karst and the delta. Similarly, climate and precipitation vary significantly; and they continuously form the basin’s landscapes.

Generally, the Danube basin is dominated by a continental climate (central and eastern regions). Only the western parts of the upper basin in Germany are influenced by the Atlantic climate and the south-west of the basin (ex-Yugoslavian countries) by mediterranean climate. The Alps in the west, the Dinaric-Balkan mountain chains in the south and the Carpathian mountain bow in the eastern center are distinctive morphological and climatic regions and barriers.

These mountain chains receive the highest annual precipitation (1,000-3,200 mm per year) while the inner and outer basins (Vienna basin, Pannonian basin, Romanian and Prut low plains), the uplands of the Czech Morava and the delta region are very dry (350-600 mm per year). The rivers with their water and moisture from the wet mountains help to balance evapotranspiration deficits, typical for the Pannonian plain and the delta, in the dry lowlands. 50 to 70 days of annual snowfall are recorded at high elevations in the Alps and in the Carpathians, while the plains have just 1-3 days/year of snowfall.

In terms of geomorphology and annual precipitation, 45 regions in the Danube basin can be distinguished, as presented in map 1 (“*Geographical Indicators*”).

After the source of the Danube in the wet Black Forest, rainfall gradually increases from the west to the east, along the Swabian & Frankonian Middle Mountains (average precipitation 600 – 700 mm/year), the Bavarian Forest & Austrian Mühlviertel (over 1,000 mm). There are each 4 pre-alpine and alpine regions, with top rainfalls reaching more than 2,000 mm/year at the Arlberg and the Kitzbühel and Julian Alps. Downstream the Wachau canyon (Bohemian mountains), the Danube enters the Vienna basin which is, together with the Moravian hills and lowlands, the driest area (below 600 mm/yr) of the Upper Danube.

The middle part or ”heart” of the Danube Basin is a circle of mountain chains around the huge Pannonian plain in the center. It is composed of six regions including parts of Austria, Slovakia, Hungary, Romania, Croatia and Yugoslavia. This inner basin is filled with Miocene marine sediments, tertiary clays and sands as well as with pleistocene fluvio-glacial and loess deposits. This results in little variation in the orography (hilly lands and the Danube and Tisza low plains) and in precipitation (500-750 mm/year).

The Carpathian mountains in the northern and the central-eastern parts of the Danube basin receive varying rainfall from 750 mm in the foothills to over 1,500 mm in the ridges, and have quite cold winters (average temperature in January –8 to –10° C). The ridges of the Tatra, the Wood Carpathians and the Southern Carpathians receive highest precipitation (over 2,000 mm/year around the highest peaks at over 2,500 m). The Transilvanian tableland is a dry upland (500-700 mm) in between the moist Apuseni mountains (over 1,000 mm) in the west and the Eastern and the Southern Carpathians (upper reaches of Mures and Olt rivers).

Table 1 Geomorphological Regions

Geomorphological Region	Annual Precipitation (mm/year)	Example Station (average data for the period 1965 –1970)	Countries touching the region
1. Black Forest	1,000 - 1,500		D
2. Swabian & Frankonian Middle Mountains	500 - 600		D
3. Bavarian Forest & Mühlviertel	1,000 - 1,500		D A
4. Foothills of the Alps	750 – 1,000		D A
5. Eastern Alps	1,000 – 1,500		A D
6. Central Eastern Alps	1,500 - 2,000		A D
7. Alpine Ridges	over 2,000		A
8. South-Eastern Alps	1,000 - 1,500	Zagreb (163m): 870 mm	A SLO HR
9. Julian & Carnian Alps	over 2000		SLO A
10. Central South-Eastern Alps & Kapela Mountains	1,500 - 2,000		SLO A
11. Pre-Alpine Hills	750 - 1,000		A SLO HR H
12. Morava - Dyje Hills & Lowlands	500 – 600		CZ SK A
13. Sudete Mountains	750 – 1000		CZ
14. Beskide Mountains & Lower Tatra	750 – 1,000		CZ SK
15. High Tatra	1,500 – 2,000		SK
16. Slovak - Hungarian Hills	600 – 750		SK H
17. Small Hungarian Plain	500 – 600		H SK
18. Inner Pannonian Hills	600 – 750	Vienna (202m): 670 mm	H A
19. Great Hungarian Plain	500 – 600	Budapest(130m): 650 mm	H RO YU
20. Drava - Sava Hills	750 – 1,000		HR H BIH YU
21. Bosnian - Serbian Mountains	750 – 1,000	Sarajevo (637m): 880 mm	BIH YU HR
22. Bosnian Ridge	1,000 – 1,500		BIH HR YU
23. Albanian Alps	1,500 – 2,000		YU
24. Danube - Drava - Sava Lowlands	500 – 600	Belgrade (138m): 690 mm	YU HR BIH
25. Velika Morava & Kosovo	600 – 750		YU
26. Banat Lowlands	600 – 750		YU RO
27. Crisana & Mures Hills	600 – 750		RO
28. Zakarpate Hills	750 – 1,000		RO UA SK
29. Wood Carpathians	1,000 – 1,500		UA
30. Wood Carpathian Ridge	1,500 – 2,000		UA
31. Eastern Carpathians	1,000 – 1,500		RO

Table 1 continued

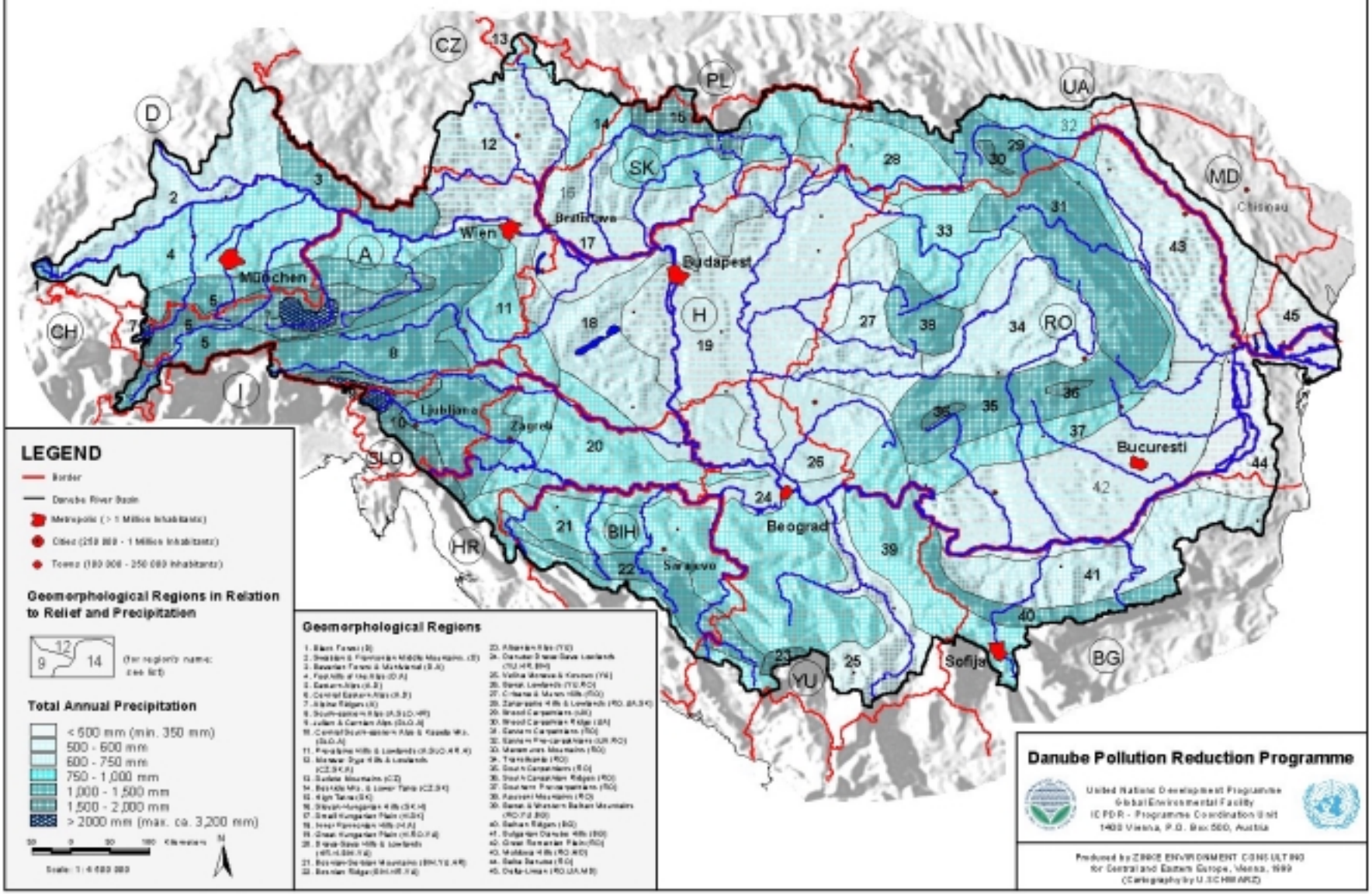
32. Eastern Pre-Carpathians	750 – 1,000		UA RO
33. Maramures Mountains	750 – 1,000		RO
34. Transilvania	600 – 750		RO
35. South Carpathians	1,000 – 1,500		RO
36. South Carpathian Ridges	1,500 – 2,000		RO
37. Southern Pre-Carpathians	750 – 1,000		RO
38. Apuseni Mountains	1,000 – 1,500		RO
39. Banat & Western Balkan Mountains	750 – 1,000	Sofia (588m): 650 mm	RO YU BG
40. Balkan Ridges	1,000 – 1,500		BG
41. Bulgarian Danube Hills	600 – 750		BG
42. Great Romanian Plain	500 – 600	Bucarest (82m): 650 mm	RO
43. Moldova Hills	500 – 600		RO MD
44. Balta Danube	Below 500		RO
45. Delta - Liman	Below 500	Sulina (9m): 505 mm	RO UA MD

The Dinaric Mountains form the borderline of the south-eastern Danube basin which is under mediterranean (southern Sava tributaries) and continental influence (Drava-Mura lowlands). Precipitation is over 1,000 mm along the Slovene-Croatian border, along the Bosnian mountain ridges and the Albanian Alps, and goes down below 700 mm in the Danube/Pannonian plains. The Southern Morava valley (Serbia/Kosovo) is a relatively dry, north-south directed barrier (average rainfall at 700 mm, evapo-transpiration at 550 mm) between the Bosnian mountains and the Banat/Western Balkan mountains.

The moist Balkan mountain ridges form the southern borderline of the lower Danube and supply water for the relatively hot and dry Bulgarian hills and lowlands. East of the Carpathians, the huge plain of the Romanian Lowlands and the Moldova hills are subject to a temperate-continental dry climate along the lower Danube resp. the Siret and Prut rivers.

The lowlands around the Balta Danube, the liman lakes and the Danube delta receive an annual precipitation of partly less than 400mm/year. Frequent droughts and a very high evapotranspiration are balanced by riverine moisture (high groundwater, network of islands and lakes, floodplains).

Map 1: Geographical Indicators: Geomorphological Regions and Annual Precipitation



2.2. Hydrological Network

The Danube river basin can be divided into four parts: the *Upper Danube*, from its source to the confluence with the river Morava at Bratislava; the M*iddle Danube*, ranging from Bratislava to the Iron Gate dams (Romania-Yugoslavia); the *Lower Danube* is formed by the Romanian-Bulgarian lowlands, and finally, the fourth part, the *Danube Delta*.

The main tributaries of the Danube are listed in Table 3.1.2. The most important Sub-River Basins of the Danube are:

The **Inn** is only the sixth largest and seventh longest Danube tributary. At its mouth in Passau, it brings more water into the Danube than the latter itself. However, its catchment area of 26,130 km² is only nearly half as big than the Danube at this point. Main Inn tributary is the Salzach.

The **Drava** is the third largest and fourth longest Danube tributary. It rises in the southern Alps in Italy but is the dominant river of southern Austria, eastern Slovenia and Croatia. Main Austrian sub-tributaries are Isel, Möll, Lieser and Gurk, and the Mura with its mouth at the Croatian-Hungarian border.

The **Sava** river is the largest Danube tributary (av. 1,513 m³/sec) and the second by catchment area. It rises in the western Slovenian mountains and passes through Croatian lowland before forming the border between Croatia and Bosnia Herzegovina. Its main sub-tributaries are Ljubljanica, Kupa, Una, Vrbas, Bosna and Drina.

The **Tisza** river is the longest (966 km) and by catchment (157.200 km^2) the biggest tributary of the Danube river. Its flow volume is second after the Sava river. Its main sub-tributaries are Hornad, Bodrog, Slana and Bodva in Slovakia; Rica, Teresva, Tereblia, Borjava, Latoritsa and Uz in Ukraine; Somes, Crisul Repede, Crisul Alb, Mures, Timis, Bega in Romania; Tarna, Koros, Krasna, Szamos, and Maros in Hungary.

The **Siret** river basin is situated in the eastern part of the basin and of the Carpathians. It has the third-largest catchment area. Main sub-tributaries are Suceava, Moldova, Bistrita, Trotus and Buzaul.

The **Prut** river is the last tributary of the Danube and its second longest (950 km), with its mouth just upstream the delta. Its source is in the Ukrainian Wood Carpathians. Main sub-tributaries are Ceremus, Volovat, Baseu, Corogea, Jijia, Chinej, Cigur and Lapusna.

The *Danube Delta* is largely situated in Romania and partly in Ukraine. The entire protected area covers 679,000 ha including floodplains and marine areas. The core of the reserve (312,400 ha) has been established as a "World Nature Heritage" in 1991. The Delta has a channel network of 3,463 km, with a density of 1.03 km/km². The highest density of channels is between the arms Chilia and Sulina, 1,17 km/km², while between Sulina and Sf. Gheorghe their density is only 0.71 km/km². There are 668 natural lakes larger than one hectare and with 9,28 % of the Delta's surface. The Delta is an environmental buffer between the Danube River and the Black Sea, filtering out pollutants and permitting both water quality conditions and natural habitats for fish in the Delta and in the environmentally vulnerable shallow waters of the north-western Black Sea. Moreover, it is Europe's largest remaining natural wetland, with unique ecosystems with extensive reed beds, forests, sand dunes and grasslands. It is home to several rare bird species, an important resting point for migrating birds, rich in fish and in an unusual flora.

Table 2 The main Danube tributaries, their length, catchment area and flows

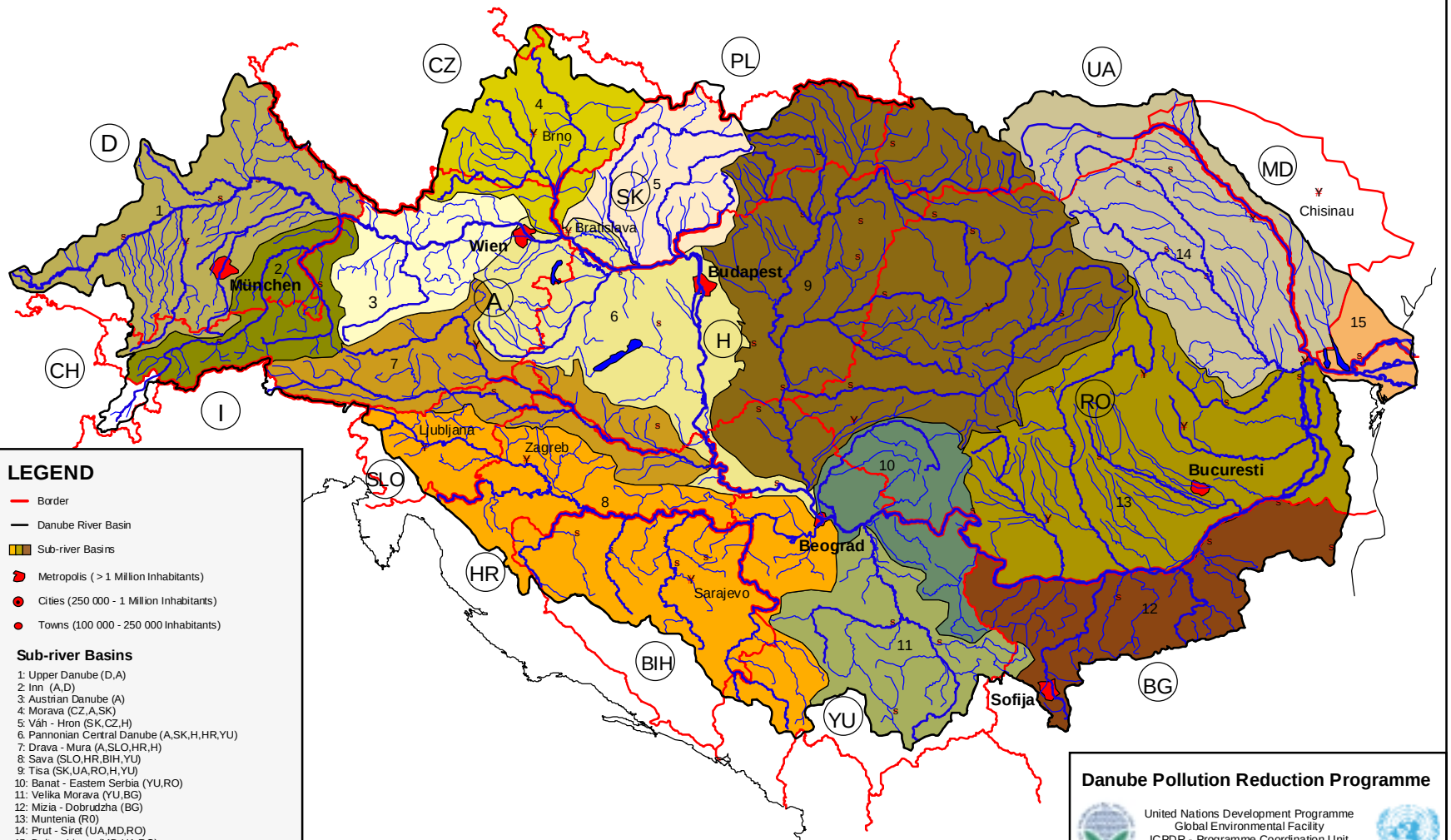
River	Mouth at Danube km	Length in km	Size of Sub-basin in km² (larger than 4,000 km²)	Flow – m³/sec		
				Min	Max	Average
Lech	2,496	254	4,125			114
Naab	2,384	191	5,508			54
Isar	2,282	283	8,964			173
Inn	2,225	515	26,130			727
Traun	2,125	146	4,277			118
Enns	2,112	349	6,080			190
Morava (CZ)	1,880	340	26,642	45	229	110
Raba	1,794	240	14,830			80
Vah	1,766	398	19,131			152
Hron	1,716	260	5,439			54
Ipel	1,708	140	5,145			17
Sio	1,498	124	14,800			30
Drava	1,382	893	40,076			670
Tisza	1,214	966	157,186	380	1,785	813
Sava	1,170	861	100,590	1,022	2,560	1,513
Morava (YU)	1,103	430	37,597			236
Timok	846	180	4,600			15
Jiul	692	240	9,200			80
Iskar	636	400	8,437			28
Olt	604	542	23,282			160
Yantra	537	271	7,850			24
Arges	432	270	9,200			80
Ialomita	244	270	9,900			70
Siret	159	520	44,000			300
Prut	134	950	27,447			150

The river's runoff highly depends on the altitude zones and varies in a broad range: average yearly runoff compared to dry years varies from 1:8-1:16.

The river network of the Danube Basin and of the Sub-river Basins are shown on Map 2.

Map 2: Sub-river Basins

Based on Transboundary Analysis Workshop 1999



LEGEND

- Border
- Danube River Basin
- Sub-river Basins
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Sub-river Basins

1: Upper Danube (D,A)
2: Inn (A,D)
3: Austrian Danube (A)
4: Morava (CZ,A,SK)
5: Váh - Hron (SK,CZ,H)
6. Pannonian Central Danube (A,SK,H,HR,YU)
7: Drava - Mura (A,SLO,HR,H)
8: Sava (SLO,HR,BIH,YU)
9: Tisa (SK,UA,RO,H,YU)
10: Banat - Eastern Serbia (YU,RO)
11: Velika Morava (YU,BG)
12: Mizia - Dobrudzha (BG)
13: Muntenia (R0)
14: Prut - Siret (UA,MD,RO)
15: Delta - Liman (MD,UA,RO)

50 0 50 100 150 Kilometers

Scale: 1: 4 500 000

N

Danube Pollution Reduction Programme

United Nations Development Programme
Global Environmental Facility
ICPDR - Programme Coordination Unit
1400 Vienna, P.O. Box 500, Austria

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for Central and Eastern Europe, Vienna, 1999
(Cartography by U.SCHWARZ)

3. Danube Sub-river Basin Areas (National Workshop Information)

The list and description of Danube Sub-river Basin Areas is based on the results of National Planning Workshop Reports which were produced after respective national workshops in 11 countries in 1998. Additional natopnal information was provided by Germany and Austria.

The following national summary texts briefly describe the character of each of the 32 **Sub-river Basin Areas**, shown on **Map 3**. In the following Maps 3 to 8 and in the Annex, further detail national information is given in comparative charts for each Danube basin country and for its Sub-river Basin Areas, regarding the following socio-economic issues:

- **Population Density** (excluding the main cities)**:** **Map 4**
- **Land Use:** **Map 5**
- **Agriculture:** **Maps 6 and 7**
- **Hot Spots:** **Maps 8.**

Table 3 National Sub-river Basins

1.	Baden-Württemberg Sub-river Basin Area (D)
2.	Bavaria Sub-river Basin Area (D)
3.	Austria Sub-river Basin Area (A)
	3.1. Inn Sub-basin Area
	3.2. Austrian Danube Sub-basin Area
	3.3. Pannonian Central Danube Sub-basin Area
	3.4. Drava-Mura-Sub-basin Area
4.	Morava Sub-river Basin Area (CZ)
5.	Morava – Danube Sub-river Basin Area (SK)
6.	Váh Sub-river Basin Area (SK)
7.	Hron Sub-river Basin Area (SK)
8.	Bodrog – Hornad Sub-river Basin Area (SK)
9.	Danube-Drava Sub-river Basin Area (H)
10.	Tisza Sub-river Basin Area (H)
11.	Mura Sub-river Basin Area (SLO)
12.	Danube – Drava Sub-river Basin Area (HR)
13.	Sava Sub-river Basin Area (HR)
14.	Sava Sub-river Basin Area (B-H)
15.	Danube Corridor Sub-river Basin Area (YU)
16.	Tisa Sub-river Basin Area (YU)
17.	Sava Sub-river Basin Area (YU)
18.	Velika Morava Sub-river Basin Area (YU)
19.	Western Region Sub-river Basin Area (BG)
20.	Central Region Sub-river Basin Area (BG)
21.	Eastern Region Sub-river Basin Area (BG)
22.	Transilvania Sub-river Basin Area (RO)
23.	Muntenia Sub-river Basin Area (RO)
24.	Moldova Sub-river Basin Area (RO)

Table 3 continued

25.	Upper Prut Sub-river Basin Area (MD)
26.	Lower Prut Sub-river Basin Area (MD)
27.	Yalpugh and Cahul Sub-river Basin Area (MD)
28.	Transcarpathian Sub-river Basin Area (UA)
29.	Prut Sub-river Basin Area (UA)
30.	Lower Danube Sub-river Basin Area (UA)

Table 4 Cities with a Population over 100,000 Inhabitants within the Danube River Basin

Country	City	Number of Inhabitants
Germany	München	1,225,809
	Augsburg	258,000
	Regensburg	125,000
	Ulm	115,000
	Ingolstadt	113,000
Austria	Wien	1,600.000
	Graz	240,000
	Linz	190,000
	Salzburg	145,000
Czech Republic	Brno	387,642
	Olomouc	105,000
Slovakia	Bratislava	451,581
	Kosice	240,390
Hungary	Budapest	1,886,215
	Debrecen	208,449
	Miskolc	177,495
	Szeged	166,156
	Pecs	161,156
	Györ	127,429
	Nyiregyhaza	113,489
	Szekesfehervar	106,772
Slovenia	Ljubljana	263,033
	Maribor	98,811 (1992: 103,961)
Croatia	Zagreb	706,770 (1991)
	Osijek	104,761 (1991)
Bosnia & Herzegovina	Sarajevo	437,038
	Banja Luka	240,000 (expected)
	Zenica	145,517
	Tuzla	131,513
	Prijedor	120,000 (expected)
	Doboj	110,000 (expected)

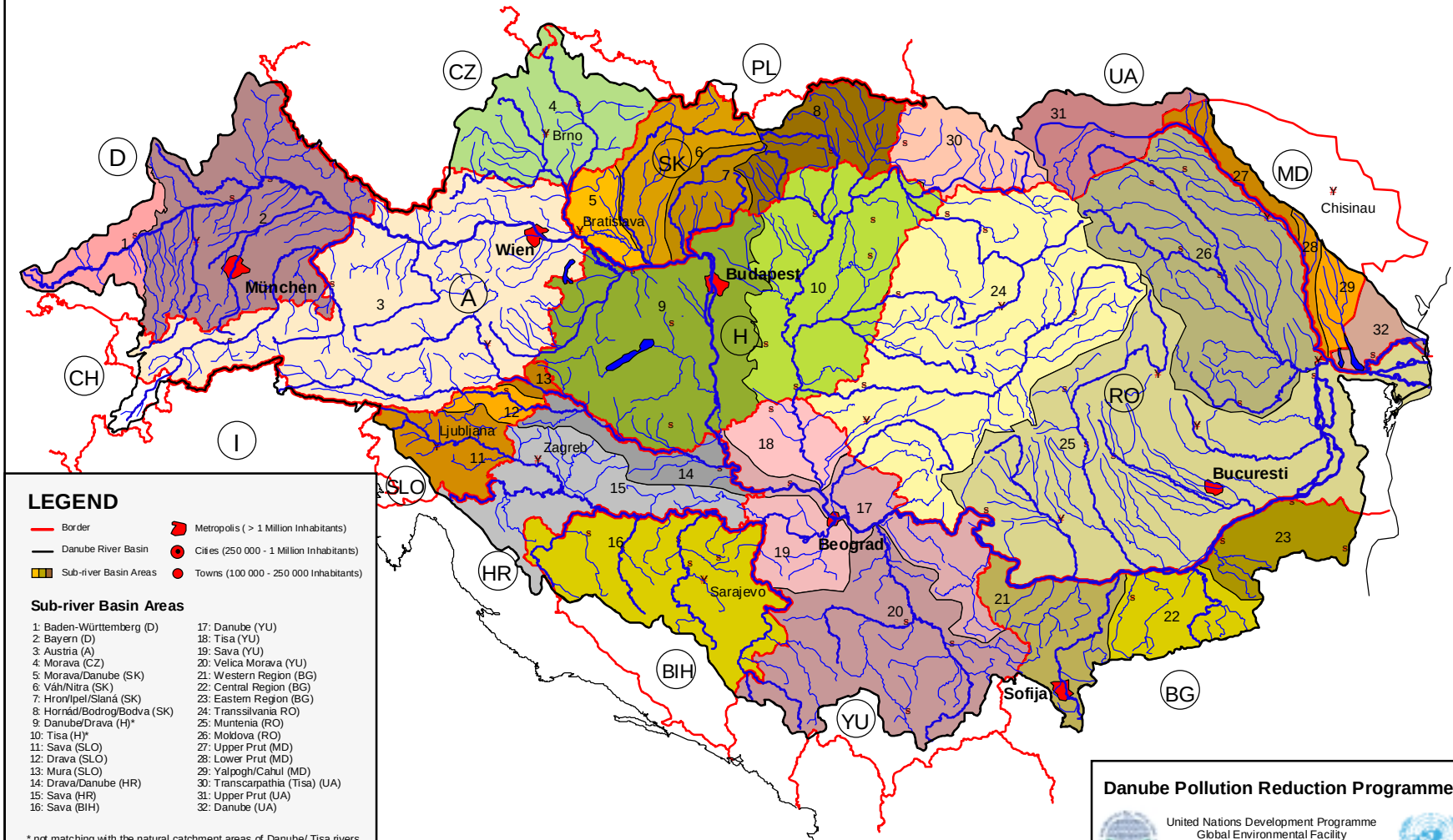
Table 4 continued

Federal Republic of Yugoslavia (1991 data)	Beograd	1,602,226
	Novi Sad	265,464
	Nis	248,086
	Pristina	199,645
	Kragujevac	180,084
	Leskovac	161,986
	Subotica	150,534
	Krusevac	138,111
	Zrenjanin	136,778
	Sabac	133,633
	Pancevo	125,261
	Kraljevo	125,772
	Cacak	116,808
	Smederevo	115,617
	Kosovska Mitrovica	104,885
	Gnjilane	103,000
Bulgaria	Sofia	1,112,847
	Rousse	167,352
	Pleven	123,550
	Dobrich	101,760
Romania	Bucuresti	2,054,079
	Iasi	343,330
	Timisoara	333,049
	Cluj-Napoca	330,943
	Galati	328,058
	Brasov	322,977
	Craiova	308,031
	Ploiesti	254,386
	Braila	236,197
	Oradea	222,994
	Bacau	208,519
	Arad	187,286
	Pitesti	185,636
	Sibiu	170,139
	Targu Mures	166,972
	Baia Mare	150,201
	Buzau	149,524
	Satu Mare	131,077
	Botosani	129,099
	Piatra Neamt	126,569
	Ramnicu Valcea	118,877
	Dobreta Turnu Severin	118,816
Ukraine	Chernivtsi	261,200
	Uzhgorod	124,900

Sources: Questionnaires of Danube-basin countries: all data are for 1996, except for figures given in brackets.

Map 3: Sub-river Basin Areas

Based on National Planning Workshop Reports 1998



LEGEND

- Border
- Danube River Basin
- Sub-river Basin Areas
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Sub-river Basin Areas

1: Baden-Württemberg (D)
2: Bayern (D)
3: Austria (A)
4: Morava (CZ)
5: Morava/Danube (SK)
6: Váh/Nitra (SK)
7: Hron/Ipel/Slaná (SK)
8: Hornád/Bodrog/Bodva (SK)
9: Danube/Drava (H)*
10: Tisa (H)*
11: Sava (SLO)
12: Drava (SLO)
13: Mura (SLO)
14: Drava/Danube (HR)
15: Sava (HR)
16: Sava (BIH)
17: Danube (YU)
18: Tisa (YU)
19: Sava (YU)
20: Velica Morava (YU)
21: Western Region (BG)
22: Central Region (BG)
23: Eastern Region (BG)
24: Transsilvania RO)
25: Muntenia (RO)
26: Moldova (RO)
27: Upper Prut (MD)
28: Lower Prut (MD)
29: Yalpogh/Cahul (MD)
30: Transcarpathia (Tisa) (UA)
31: Upper Prut (UA)
32: Danube (UA)

* not matching with the natural catchment areas of Danube/ Tisa rivers

50 0 50 100 150 Kilometers

Scale: 1: 4 500 000

N

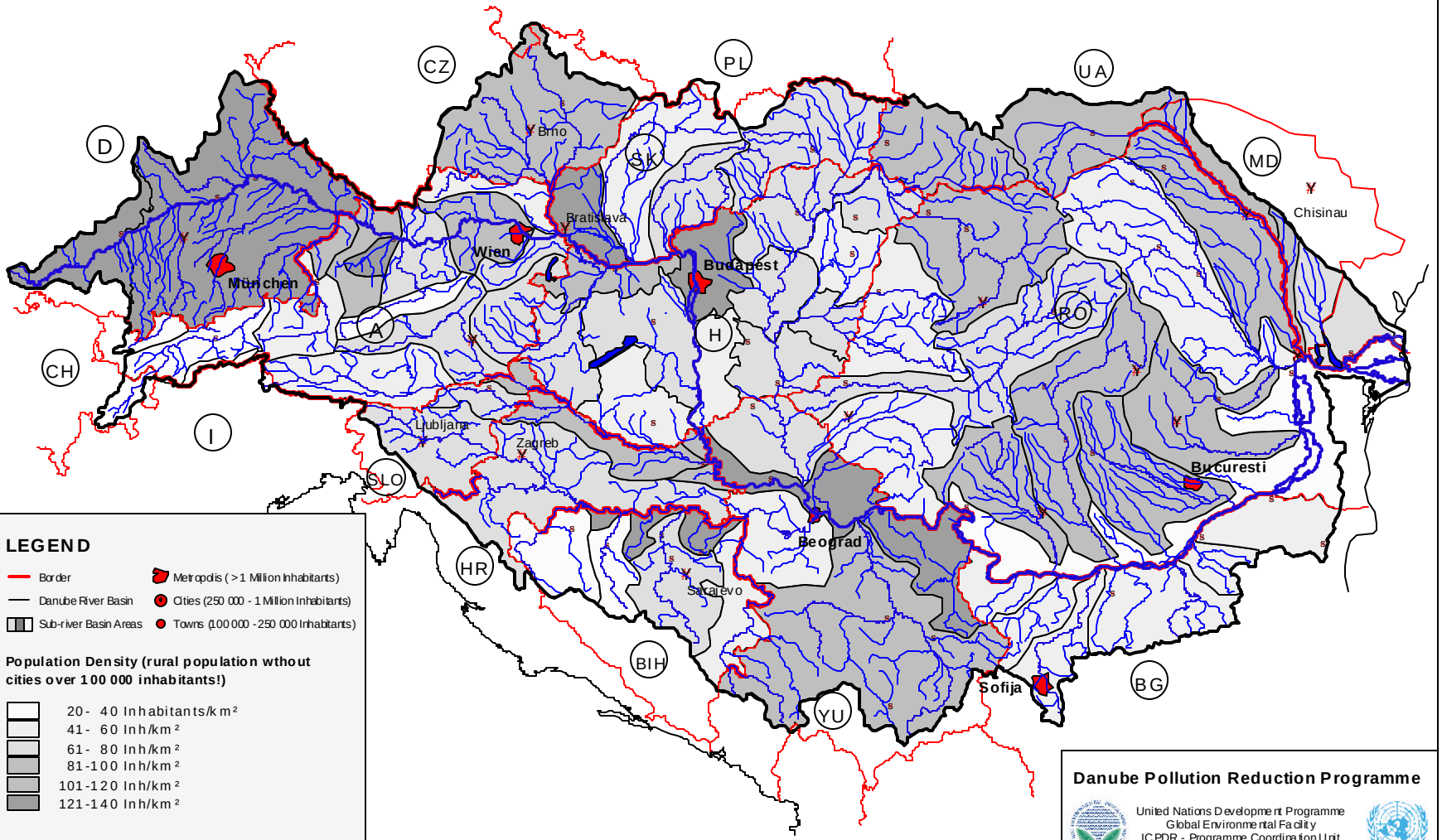
Danube Pollution Reduction Programme

United Nations Development Programme
Global Environmental Facility
ICPDR - Programme Coordination Unit
1400 Vienna, P.O. Box 500, Austria

Produced by ZINKE ENVIRONMENT CONSULTING
for Central and Eastern Europe, Vienna, 1999
(Cartography by U.SCHWARZ)

Map 4: Population Density in the Danube Sub-river Basin Areas

Based on National Planning Workshop Reports 1998



LEGEND

- Border
- Danube River Basin
- Sub-river Basin Areas
- Metropolis (>1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Population Density (rural population wthout cities over 100 000 inhabitants!)

- 20 - 40 Inhabitants/km²
- 41 - 60 Inh/km²
- 61 - 80 Inh/km²
- 81 - 100 Inh/km²
- 101 - 120 Inh/km²
- 121 - 140 Inh/km²

50 0 50 100 150 Kilometers

Scale: 1: 4 500 000

N

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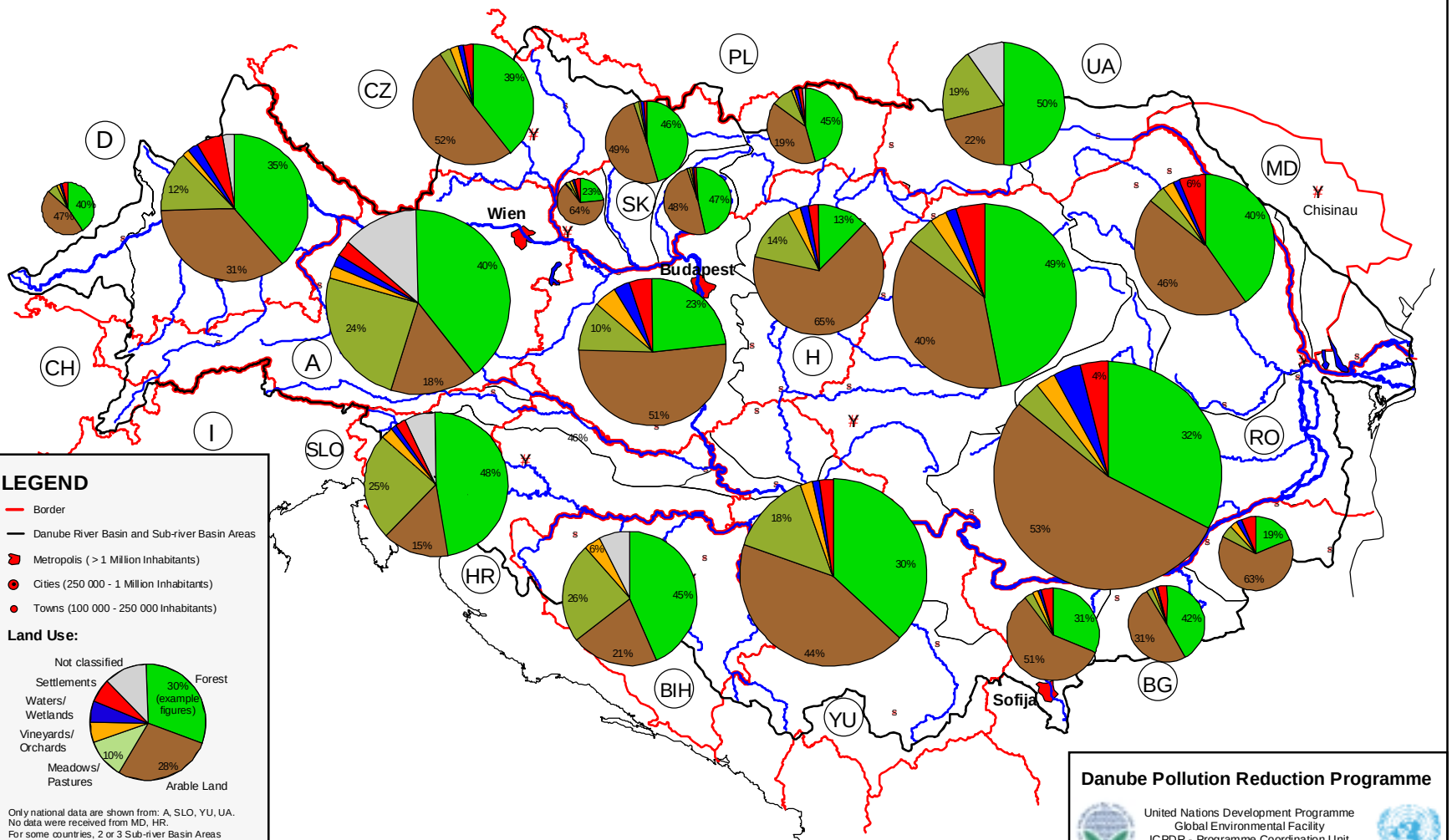
Map 5: Land Use in the Danube Sub-river Basin Areas

Based on CORINE Land Use Data, National Planning Workshop Reports 1998 and Updates May 1999



LEGEND

- Border
- Danube River Basin and Sub-river Basin Areas
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Land Use:

Only national data are shown from: A, SLO, YU, UA.
No data were received from MD, HR.
For some countries, 2 or 3 Sub-river Basin Areas were identified in the National Planning Workshops.

50 0 50 100 Kilometers

Scale: 1: 4 500 000

N

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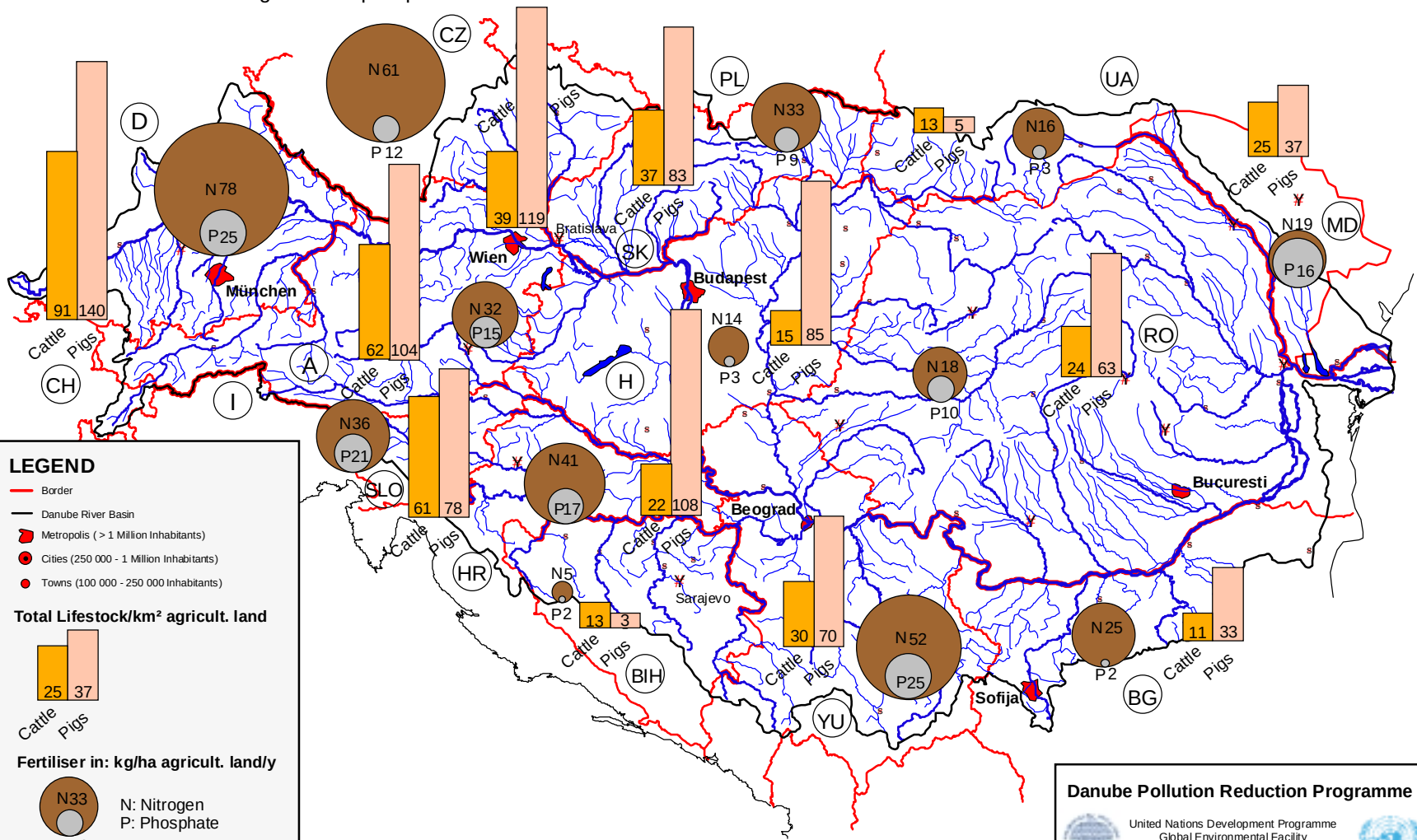
Map 6: Agricultural Indicators I (Lifestock/Fertiliser) in the Danube Basin Countries

Based on National Planning Workshop Reports 1998



LEGEND

- Border
- Danube River Basin
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Total Lifestock/km² agricult. land

25 37
Cattle Pigs

Fertiliser in: kg/ha agricult. land/y

N33
P10

N: Nitrogen
P: Phosphate

50 0 50 100 Kilometers

Scale: 1: 4 500 000

N

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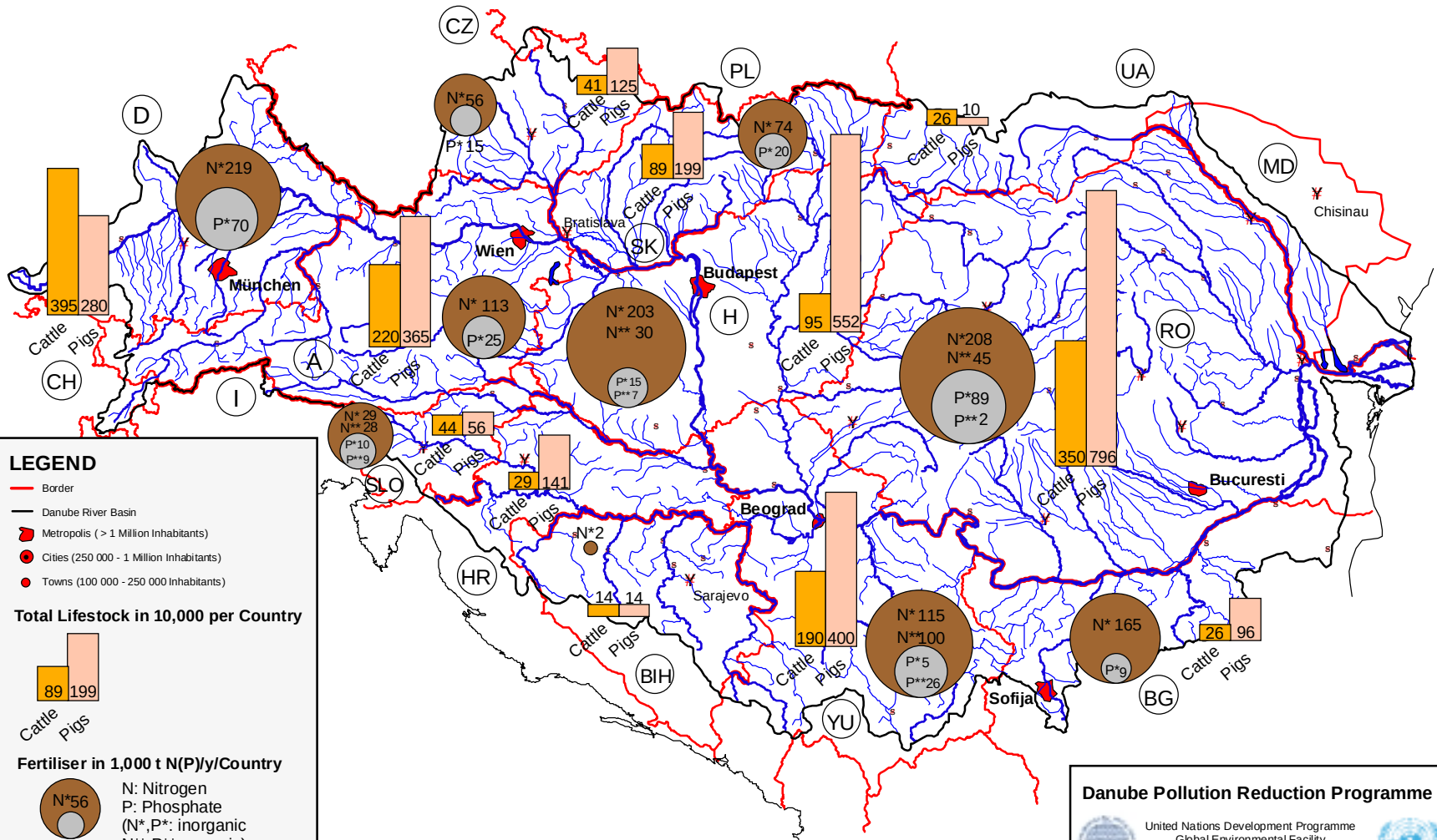
Map 7: Agricultural Indicators II (Total Lifestock, Total Fertiliser per Country)

Based on National Planning Workshop Reports 1998



LEGEND

- Border
- Danube River Basin
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Total Lifestock in 10,000 per Country

89 199

Cattle Pigs

Fertiliser in 1,000 t N(P)/y/Country

N*56
P*15

N: Nitrogen
P: Phosphate
(N*,P*: inorganic
N**,P**: organic)

50 0 50 100 Kilometers

Scale: 1: 4 500 000

N

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Produced by ZINKE ENVIRONMENT CONSULTING
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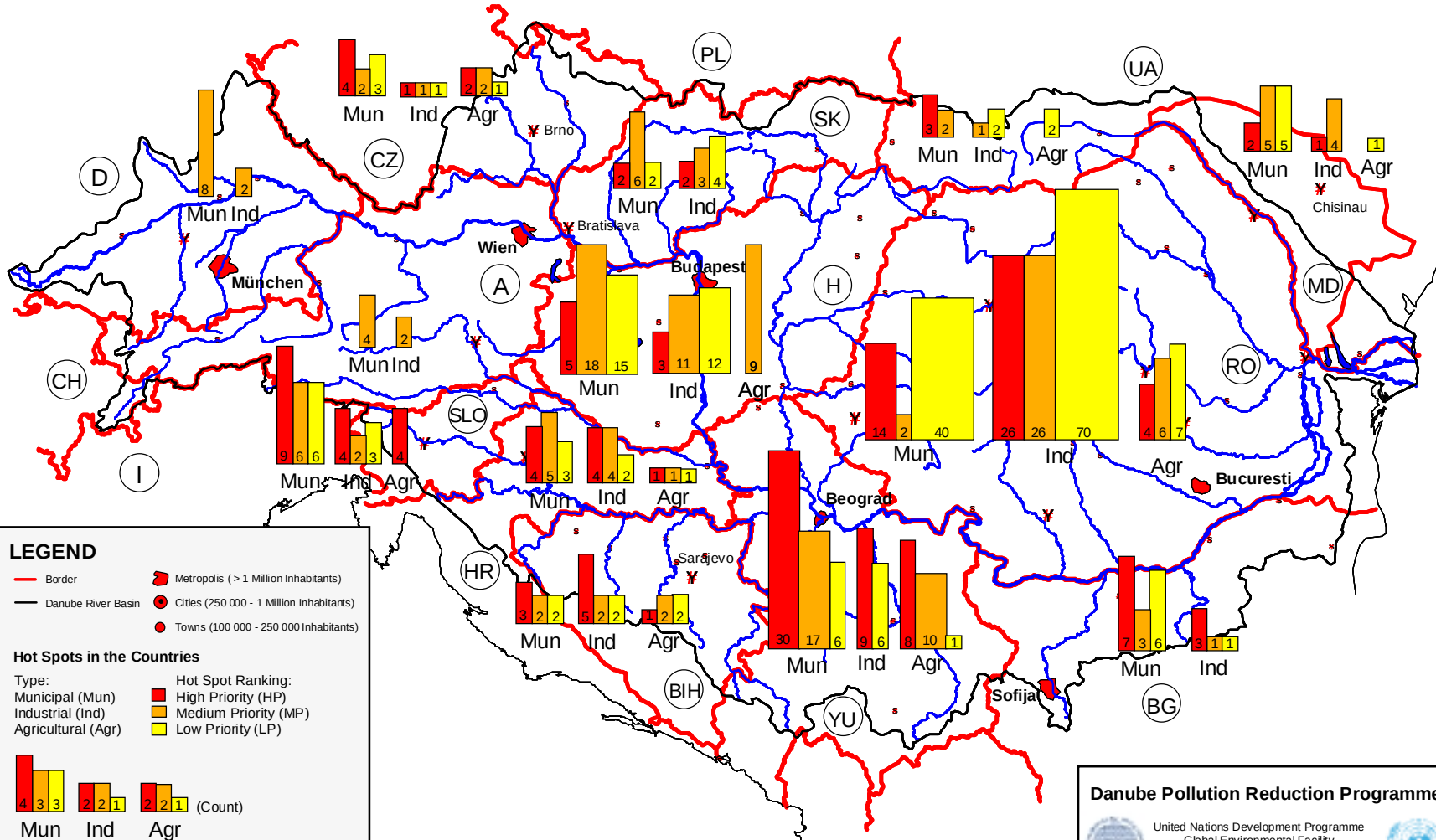
(Cartography by U.SCHWARZ)

Map 8: Hot Spots in the Danube Basin Countries

Based on National Planning Workshop Reports 1998, Updates March 1999



Danube Pollution Reduction Programme

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(Cartography by U.SCHWARZ)

3.1. Germany

The Danube rises at the confluence of the two source-rivers Brigach and Breg near Donaueschingen in the Black Forest in the German province of "Baden-Württemberg", and continues through Bavaria towards the Austrian border. The length of the Danube in Germany is some 580 kilometres. The flow regime is both of mountaineous (upper section and northern tributaries) and alpine character (lowest section and southern tributaries).

Precipitation data in the German Danube-basin Area are between 600 and 1,500 mm/year – growing steadily with the altitude of the Alps (average value at 1,000 mm per year).

Along the river, the are more than 20 small nature reserves; the Upper Danube Valley is a nature park (857 km²), the mouth of the Isar river is a floodplain reserve of national importance. Two national parks exist in upper parts of the Regen and of the Salzach rivers (Bavarian Forest resp. Berchtesgaden).

The German part of the Danube Basin was nationally divided into two Sub-river Basin Areas, corresponding to the administrative borders of the two provinces of Baden-Württemberg and Bavaria.

It represents 56,240 km² of the state territory of Germany. With a population of 9.1 million and an average density of 131 people/km² (without cities with a population over 100,000), the region is rather intensively developed and densely populated. River regulation in form of hydrodams and diffuse pollution, mainly due to intensive agriculture, resulting in a loss of natural buffer zones are the main water-related problems.

For the Bavarian State Ministry for Environment it is important to establish, that there are no Hot Spots – under the given UNDP/GEF criteria – but "sources of pollution". Ten such sources were identified (eight municipalities and two industrial).

The German part of the river basin has borders with Austria and the Czech Republic.

1. Baden-Württemberg Sub-river Basin Area (D)

With its 8,034 km² this area is much smaller than the Bavarian Sub-river Basin Area. The character of the Danube in this region is only partly near-natural (some wetlands and protected floodplain meadows) as almost of the entire stretch is impounded by small hydrodams.

52% of the area are under agricultural production. There are, except for Ulm, no major cities.

This Area has no borders with other countries.

2. Bavaria Sub-river Basin Area (D)

The Bavarian Sub-river Basin Area has a size of 48,206 km². Except for short sections, most of the Danube and its southern tributaries are impounded by chains of hydrodams. The Inn as the largest tributary of the Upper Danube has its mouth near the border with Austria. The Rhine-Main-Danube Canal as a major European navigation route ends ustream of Regensburg.

Several big urban agglomerations like the cities of Munich (capital of Bavaria with a population far over 1 million people), Regensburg, Augsburg and Ingolstadt (each with more than 100,000 inhabitants) are located within the area.

Total agricultural land is 24,000 km² (50%), composed of 14,000 km² of arable land and of 10,000 km² of meadows and pastures.

The area has borders with Austria and Czech Republic.

3.2. Austria

3. Austria Sub-river Basin Area

Nearly the entire country area of Austria (80,853 km² = 96%) is part of the Danube River Basin. The Austrian National Reports do not indicate a sub-division of Sub-river Basin Areas within the national territory. A sub-division of 14 Austrian river sub-basins is given in the following table. In addition, at the TDA "Workshop for a Transboundary Analysis" (24-30 January in Hernstein), four Sub-river Basin Areas were identified for Austria: Inn, Austrian Danube (incl. Vienna), Drava - Mura and Pannonian - Central Danube.

The state territory varies a lot: the western und central parts are a high alpine mountain region with 1,500 to over 2,500 mm of annual precipitation, while the eastern basins and plains east and north of Vienna receive only 500 to 600 mm.

Forests and grasslands (cattle breeding and dairy production) dominate over arable lands. Governmental subsidy programmes for traditional, ecological farming have put Austria in the 1990s into the world's top position for eco-farming.

While Austria has a share of some 10% of the entire Danube catchment area, it supplies about 25% of all Danube waters entering the Black Sea. Four of the main Danube tributaries (Traun, Enns, Ybbs and March/Morava) have their confluence in Austria, three (Inn, Drau/Drava and Mur/Mura) are transboundary rivers.

The Danube (10 dams) as much as most tributaries are impounded by chains of hydrodams in their lower and middle sections; only small parts especially in the upstream reaches still show natural flow conditions. Most valuable floodplain areas are limited to the eastern and southern borders: the Danube downstream of Vienna (since 1996 national park area), the Lower March/Morava - Thaya/Dyje along the Czech and Slovak borders and the Mur/Mura along the Slovenian border.

After subtracting the cities over 100,000 inhabitants (Vienna, Linz, Graz, Salzburg and Innsbruck), the population density in this Area is 64 inhabitants/km². As the Austrian water resources dilution capacity is very large and as the legal requirements for water protection and use are very stringent (partly beyond EU standards), Austria has listed only 4 medium municipal and two medium industrial "Sources of Pollution". The potential to reduce overall pollution loads is more limited than in other parts of the Danube basin.

The table in the Annex indicates the 14 hydrological sub-basins, as given by Austrian water authorities in their national data report, but allocated here to the four Sub-River Basins, as agreed for the Austrian territory at the Hernstein workshop.

3.3. Czech Republic

The Czech Republic's part of the Danube Basin has only one Sub-river Basin Area, corresponding to the sub-basin of the Morava river. This represents 27% (21,145 km²) of the state territory.

4. Morava Sub-river Basin Area (CZ)

The length of the Morava in the country is 353 km. The altitude of the territory fluctuates between 148 and 1,491 metres above sea level. Average precipitation is 635 mm and fluctuates between 450 mm (Breclav) and 1,150 mm (Beskydy Mountains). Some 54% of the area are made up by agricultural land, forests cover 34%, 12% include urban areas and water-covered regions (many reservoirs). The area is affected by relatively high erosion, mainly caused by intensive agriculture.

With a population over 2,78 Million people, the average population density in the Morava river sub-basin is 108 persons/km². 14% (390,000) of the population are concentrated in the largest city, Brno. The only other city over 100.000 inhabitants is Olomouc (105,000). Industry is the main human activity impacting the environment.

Mechanical Engineering and Chemical Production complemented by the processing of local resources in the food, leather and wood working industry and in the manufacturing of building materials are typical for the Morava river sub-basin.

About 14% of the area is protected – these areas are the most important part of regional and supra-regional systems of ecological stability. There are three Ramsar Wetlands in the territory, including very valuable floodplain forests. All would be affected by the newly planned "Danube-Oder-Elbe Canal", designed to provide a new major navigation route across the Morava valley. More than 50% of the Czech hydro-power capacity is concentrated in the Morava river sub-basin.

The Danube-basin Area of the Czech Republic is a quite dry region. Within most of the region, yearly average precipitation lies between 500-600mm.

In the lowlands - the most fertile part of the Czech Republic - five Agricultural Hot Spots were identified. Industrial wastewaters and solid wastes contribute an important part of wastewaters in the Sub-basin. All together three industrial and nine municipal Hot Spots were identified.

The Sub-river Basin Areas has borders with Austria, Poland and Slovakia.

3.4. Slovakia

The Slovak part of the Danube Basin is divided into four Sub-river Basin Areas with ten Sub-Basins, representing nearly 96% (49,014 km²) of the total area of the Slovak Republic.

The Slovak part of the River Basin has borders with Austria, Czechia, Poland, Ukraine and Hungary.

5. Morava - Danube Sub-river Basin Area (SK)

This Sub-river Basin Area consists of the Morava, Danube and the Small Danube River sub-basins. With its 3,395 km², this is the smallest Sub-river Basin Area of the Slovak Republic.

The two main rivers are the Danube and the Morava. The relief of the Morava mainly consists of lowlands and valleys; it includes some of the largest floodplain meadws in Central Europe.

The region around the Small Danube (former side-arm) is most fertile, agricultural land. The Danube part includes large floodplain forests which, since 1992, are affected by the Gabcikovo hydropower complex.

Without counting the capital Bratislava (451,000inhabitants), the density of 125 inhabitants/km² is still the highest in the country. With one medium and one „low priority“ industrial hot spots, the region lies in the average of the Slovak Republic.

The area has borders with the Czech Republic, Poland and Austria.

6. Váh Sub-river Basin Area (SK)

The Váh Sub-river Basin Area is created by the two sub-basins of the Váh and Nitra rivers and is situated in the northeast of the country.

The Váh River is situated in a mountainous area, characterised by a very low population density. The sub-basin represents one quarter of the total territory of Slovakia (biggest Sub-river Basin Area of Slovakia) and with its discharge of 152 m³/sec it is Slovakia’s biggest river. Although the population rate is quite low in this region we find five municipal and two industrial hot spots. Industrial activities are represented with chemical, heavy and food-processing industries. This area has the highest rate of employment in the industrial sector.

The Nitra River rises on the Southern slopes of Malá Fatra mountains (Small Carpathians) and confluences with the Vah River just before running into the Danube.

The area has borders with the Czech Republic and Poland.

7. Hron Sub-river Basin Area (SK)

This area is in the Southern part of central Slovakia and includes the Hron, Ipel and Slaná sub-basins.

The Hron River itself rises in the Slovenské Rudohorie mountains at an elevation of 934 meters and flows into the Danube River at 102 metres. The Hron Sub-river Basin Area is much more industrialised (mainly heavy industries) than the rivers Ipel and Slaná (32% urbanised) where agricultural production prevails.

The Ipel river is affected by food industries. Three industrial Hot Spots („low priority“) can be found along the Hron. The area has only borders with Hungary.

8. Bodrog - Hornad Sub-river Basin Area (SK)

This part of Slovakia lies in the East and has borders with Poland and the Ukraine. The Sub-river Basin Area contains the Bodrog, Hornad and Bodva rivers.

This part of Slovakia includes the second-largest city, Kosice (240,000 inh.). The high population density – especially in the Hronad sub-basin – is connected with one „high priority“ and three “medium priority” municipal hot spots. Agriculture is one of important pollution sources, mainly influencing the groundwater quality. The main industrial sectors are mining activities and ore-processing.

The Sub-basin has borders with Hungary.

3.5. Hungary

Hungary, located in the center of the Carpathian basin, belongs to a single watershed, the Danube, therefore representing 100% or 93,030 km² of the total area of the country.

Different to other countries, the available Hungarian data are not based on a hydrographic sub-division but on an administrative structure of the country's 12 regional water directorates.

For pragmatic reasons of this comparative report and to avoid a mixing with non-comparable data, the sub-division of the UNDP/GEF Report Part A for Hungary (Social and Economic Analysis in relation to Water Pollution) was used to get two Sub-river Basin Areas, with each six sub-Basins (in this separation of the Tisza and the Danube-Drava areas, the hydrographic and administrative borders almost match).

Hungary is the country of the whole Danube Basin with the lowest average precipitation: Within most parts of the country rainfall will not climb above 600mm per year.

9. Danube-Drava Sub-river Basin Area (H)

The Sub-river Basin Area consists of the Drava and the Danube Rivers, covering 50,547km² (54,3%) of the country. It consists largely of the small Hungarian plain and the Hungarian low mountains.

Internationally important wetlands are located along both the Danube (in the Szigetköz/NW Hungary – affected by the Gabcikovo power plant - and in the Gemenc-Béda area in the South) and the Drava rivers (almost the entire borderline with Croatia).

Without counting the cities over 100,000 inhabitants, still more than 4 million people live in this area, which corresponds to more than 81 people per km². Apart from the capital Budapest with a population of 2 million, there are another three cities in the category over 100,000 inhabitants.

25 municipal Hot Spots were identified in this area, four in the highest category. 15 Hot Spots were calculated for the industrial sector, two rated as "High priority".

Around the district capital Székesfehérvár, large chemical and aluminium industries are operating. In the lake Balaton region, tourism became the most important economical factor.

The Sub-river Basin Area has borders with Austria, Slovakia, Croatia and Yugoslavia.

10. Tisza Sub-river Basin Area (H)

The Sub-river Basin Area consists of the Tisza and covers 42,483 km² (45,7%) of the country. The area consists largely of the big Hungarian plain and a part of the Hungarian low mountains. The Tisza river with many largely intact floodplain habitats and the famous "puszta" pastures are partly affected by agricultural use.

More than 2,9 million people (without the five cities with a population over 100,000) live in this area, which corresponds to more than 70 people per km².

All together 12 Municipal and 11 Industrial Hot Spots were identified, "Industrial" with the majority ranked as "Low priority".

The north is considered as a socio-economic crisis area: The unemployment rate is above the national average, emigration is significant and existing manpower is poorly qualified. Also some large units of chemical industries are situated in this area.

The Sub-river Basin Area has borders with Slovakia, Ukraine, Romania and Yugoslavia.

3.6. Slovenia

The Slovenian part (2%) of the Danube Basin is divided into three sub-basins and Sub-river Basin Areas, representing 81% (16,363 km²) of the total area of the country and hosting 80% of its population. The upper part of the watershed is on carbonaceous rocks, which makes 1/3 karstic underground watershed and 2/3 fluvial relief on gravel. Almost the entire part of the Danube river basin belongs to forest ecosystems (entire country: 53% and still increasing). Bio-climatically, the Danube river sub-basin is characterised by a transition from a humid climate (alpine and dynamic part of the river sub-basin plus the central part of the Sava river sub-basin) to a semi-humid and partially semi-arid climate of the Drava and Mura rivers.

The Slovenian part of the Danube River Basin has borders with Italy, Austria, Hungary and Croatia.

11. Sava Sub-river Basin Area (SLO)

Among the countries major rivers, only the Sava has its source in Slovenia. With 11,734 km², it is the biggest Sub-river Basin Area. It embraces the following landscape units: a high mountainous region (mainly karstic alpine area), an extensive, mainly karstic subalpine region with the basins of Ljubljana and Celje, and a minor part of the sub-pannonian world. The major wetland “Ljubljanske Barje” is near the capital, Cerknica lake (intermittent karstic) is protected.

The population is over 1.2 million inhabitants (60% of the country, including the capital of Ljubljana) and the population density is at 77 people/km² (without the capital). Along the Sava River, 15 municipal and 6 industrial Hot Spots were identified.

The Sub-basin has borders with Italy, Austria and Croatia.

12. Drava Sub-river Basin Area (SLO)

The surface of the Drava river sub-basin, with the river originating in Austria, covers 3,253 km² or 16% of Slovenia. According to ecosystematic characteristics, the Slovenian part of the Drava river can be divided into the following parts: alpine and karst river basin, subalpine and non-karstic area of the smaller basins of Pohorje and Kozjak, subalpine and sub-pannonic river basins of Dravinjske, some smaller water stream river basins and the gravelled Drava-Ptuj field (groundwater area). The latter is a still very valuable river stretch and floodplain, even though it is affected by a river diversion.

With 415,000 inhabitants (21% of the state) and a population density of over 74 people/km² (without Maribor), the area is under the Slovenian average. The most polluting industries are old lead mines and storage of used batteries, aluminium producing industries and pesticide factories.

The Sub-river Basin Area has borders with Austria and Croatia.

13. Mura Sub-river Basin Area (SLO)

With only 7% (1,376 km²) of the Slovenian territory, this Sub-river Basin Area is the smallest of this country. The river again rises in Austria. It comprises mainly agricultural sub-pannonian landscape ecosystems of plains and hills. Large stretches of the Mura are still very intact floodplain areas (border lines with Austria and Croatia) but endangered due to river bed erosion (Austrian dams).

The population density in this part of Slovenia is above the average (87 people/km²), some human activities resulted in 3 municipal, 3 agricultural and one industrial Hot Spots – all listed under "High priority". Growing tourism in this region has become a very important social-economical

factor but also an expanding risk for the intact nature. Illegal industrial dump sites, inappropriate locations of dumpfills, insufficient water treatment on WWTPs and many other human activities (huge pig farm near the Austrian border) are pressures for the environment in the Mura Sub-basin.

The area has borders with Austria, Hungary and Croatia.

3.7. Croatia

The Croatian part of the Danube Basin is divided into two Sub-river Basin Areas with three sub-basins. It represents 61% (34,511 km²) of the total area of Croatia (56,540 km²). Most major rivers (except for the Kupa) rise and end outside of the country borders. Croatia is sub-divided into four geographical areas: Pannonia in the East (11,100 km²; 600-700 mm of precipitation), Central Croatia (19,700 km²; 700-900 mm, Mediterranean-continental), Mediterranean part (14,000 km², mainly mountainous, 1,000 mm) and Middle and Southern Dalmatia (11,740 km², more than 1,000 mm).

The Croatian part of the Danube River Basin has borders with Hungary, Yugoslavia, Bosnia & Herzegovina and Slovenia.

14. Danube – Drava Sub-river Basin Area (HR)

The Sub-river Basin Area consists of the Drava (323 km in Croatia) and the Danube (188 km in HR) rivers, covering 9,304 km² (16%) of the country. The relief consists mostly of lowlands and valleys; the western part of the Sub-basin, the mountain ridge of Bilogora, has the highest peak at 307 metres. The climate is mild-continental with an average annual temperature of 10,9° and an average rainfall of 600-700 mm/year.

These two typical lowland rivers influence the area, formed by large agricultural lands and the internationally important nature reserves of "Kopacki rit" (mouth of the Drava into the Danube with very rich floodplain forests) and of the floodplain forests and meadows along the Lower Drava river.

909,000 people live in the area (50% urban); Osijek as the centre is the only city over 100,000 inhabitants. The region is still under consequences of the war and the industries still work much below their capacity. Seven municipal and three industrial hot spots were listed in the reports.

The area has borders with Slovenia, Hungary and Yugoslavia.

15. Sava Sub-river Basin Area (HR)

The length of the Sava River in the country is 518 km, with a catchment area of 25,100 km². The landscape relief consists mostly of lowlands and valleys, especially downstream the city of Sisak. The climate is mild-continental with an average temperature of 19° in summer time. Rainfall is about 1,000 mm per annum. Certain river sections are still intact: The Lohjsko Polje/Mokro Polje nature reserve is the most valuable floodplain area of international importance; a wetland restoration potential exists also for other old riverine lowland forests.

This area includes large urban centres, on the top Zagreb with more than 900,000 inhabitants, which results in a number of municipal, agricultural and industrial Hot Spots.

Industrial activities contribute to pollution through discharges of insufficiently treated industrial wastewaters from industry. The region also hosts the largest producers and exporters of fertilisers.

The area has borders with Slovenia, Bosnia & Herzegovina and Yugoslavia.

3.8. Bosnia & Herzegovina

The Bosnian & Herzegovinian part of the Danube Basin is divided into one Sub-river Basin Area with five sub-basins. It represents 75,7% (38,719 km²) of the total area of Bosnia & Herzegovina.

16. Sava Sub-river Basin Area (B-H)

The main tributaries of the Sava, which is 355 km long in this country, are the Una (9,130 km² or 23,6 % of the whole Sava catchment area), Vrbas (6,380 km² or 16,5 %), Bosna (10,457 km² or 27%) and Drina (7,240 km² or 18,7%) rivers. The terrain ranges from mountain region in the south of the sub-basin (some 700 metres above sea level) to a hilly part in the middle and to lowlands in the north along the Sava river.

Regarding the climate the Sava river sub-basin has continental climate. Annual average precipitation is at 950 mm/year - increasing from the North with some 770 mm towards the South (about 1,100-mm). Average temperature varies from +12°C in lowlands to 9°C in mountainous regions.

A common characteristics of all Sava tributaries is a big altitude difference between their sources in mountainous regions and the mouths in lowlands. Large water quantities make it important for hydropower production.

2,95 million people (74%) live in the Sub-river Basin Area of the Sava River. With 129 people/ km², the population density of the Sava Sub-basin in the lowlands is much above the country's average of 57 people per km² (without the big cities Tuzla, Zenica, Doboj, Prijedor Banja Luka, and the capital Sarajevo - all with more than 100,000 inhabitants). Agricultural Hot Spots are mainly located in the north along the border with Croatia. Industrial and municipal Hot Spots of all categories are distributed along the whole Sub-river Basin Area. Various kind of industries can be found in the Sub-basin – food, textile, leather, chemical, wood, metal processing, mining and many more.

The Bosnian & Herzegovinian part of the Danube River Basin has borders with Croatia and the Federal Republic of Yugoslavia.

3.9. Federal Republic of Yugoslavia

The Yugoslavian part of the Danube Basin is divided into four Sub-river Basin Areas with four sub-basins. It represents 87% (88,919 km²) of the state territory of 102,173 km².

A wide range of terrestrial habitats (running and stagnant freshwaters, pit bogs and marshes, bushy, grassy and forest habitats, rocky, scree, sandy and glacier habitats) can be found in this region. The northern parts of the countries are still under continental influence and very dry.

The Yugoslavian part of the River Basin has borders with Hungary, Romania, Bulgaria, Albania, Bosnia & Herzegovina and Croatia.

17. Danube Corridor Sub-river Basin Area (YU)

This Sub-river Basin Area consists of the Danube River and covers 11,610 km² (12,5%) of the Danube Basin of the country. The total length of the Danube in the state is 583 km. It receives water from several large tributaries: Drava, Sava, Velika Morava, Mlava, Pek and Timok as right tributaries, as well as Tisa, Timis and Nera as left tributaries. It comprises lowlands, hilly and mountainous terrains as well as te famous Djerdap gorge (Iron Gate) where in the impounded river marshy and swampy ecosystems can still be found ("Djerdap" national park). Upstream of the mouth of the Tisa are still intact Danube floodplains.

The population density of 137 people/km² (without cities with a population over 100,000) is high above the state's average of 82 people/km². The capital Belgrade and the regional centre Novi Sad are located in this area, together with many municipal and industrial Hot Spots.

It has borders with Croatia and Romania.

18. Tisa Sub-river Basin Area (YU)

The Tisa Area covers 8,994 km² of the Danube Basin of the country. It is predominately lowland: the Tisa drains the Pannonian Basin which is the largest of the sediment-filled post-orogenic basins of the entire alpine region. Largely intact floodplain meadows exist along the Tisa's left banks.

Some 800,000 people live in this area which corresponds to a population density of 90 people/km² (without Subotica). Many municipal and some agricultural Hot Spots were identified in this area.

One "high priority" industrial Hot Spot was identified, due to different kinds of industries (metal, paper, textile and chemical).

The area has borders with Croatia, Hungary and Romania.

19. Sava Sub-river Basin Area (YU)

The Sava Sub-river Basin Area's surface of 31,046 km² in Yugoslavia includes a part of the Vojvodina region, a part of Montenegro and the western part of central Serbia. In this section, the Sava is typical lowland river which flows through large, partly intact alluvial valleys with large meanders.

Although no big cities (with a population over 100,000) are in this area, fifteen municipal Hot Spots were identified. The population density is with 43% very low. The main branches of industry are paper, chemical and food processing industries which endanger the rivers a lot.

The Sava Area has borders with Bosnia Herzegovina and Croatia.

20. Velika Morava Sub-river Basin Area (YU)

The surface of 37,269 km² within FRY represents nearly the whole basin area of the Morava and hosts over 4 million people. A diverse relief causes different types or streams, with intensive seasonal variations of river flows.

Various municipal Hot Spots were distinguished in this area. Again the following important branches of industry endanger the rivers in this area: metal, chemical, wood, pulp and paper.

This Sub-basin the area has borders with Bulgaria and Romania.

3.10. Bulgaria

The Danube constitutes the Bulgarian – Romanian border from the confluence of the Timok River to the town of Silistra. The river receives waters from 46,930 km² (= 42,3%) of the territory of Bulgaria (110,911 km²). The catchment belongs to the Carpathian – Balkan geomorphological region. With regard to the geological structure and morphology, the Stara Planina mountains (Danube catchment area in Bulgaria) were divided into three Sub-river Basin Areas – a western, central and eastern region.

The **fourth region**, the „**Danube River Course Sub-river Basin Area**", is a very narrow strip of land directly located along the Danube banks (average width 940 m). It covers the Danube bed, including the chain of Danube islands with partly important floodplain habitats and biodiversity, and the terrace up to the dikes. It has a size of 10,606 km² in the Bulgarian part of the Danube River Basin. Some 750,000 people live in this region, which fulfils an average of 70 people/km². Two cities over 100,000 inhabitants and five "Low priority" Municipal Hot Spots demonstrate mans' influence in this area. The river banks are subject to erosion processes. *As the area is very narrow and cannot be shown on basin-wide maps, it was not included as a distinctive fourth Bulgarian Sub-river Basin Area.*

The Bulgarian part of the Danube River Sub-basin has borders with Yugoslavia and Romania.

21. Western Region Sub-river Basin Area (BG)

This area covering the sub-basins of the Ogosta, Skat and Iskar rivers and of seven smaller rivers west of Ogosta has a total size of 16,712 km² in the Bulgarian part of the Danube River Basin, i.e. North-Western Bulgaria. The predominat relief is mountaineous and semi-mountaineous.

The Bulgarian capital of Sofia is situated in the sub-basin of the Iskar where the population density is quite low (44 people/km²) after substracting the capital. The Ogosta area is at 60 people/km². Altogether four municipal (two are „High priority"), three agricultural and three industrial Hot Spots were identified.

The Western region has borders with Yugoslavia and Romania.

22. Central Region Sub-river Basin Area (BG)

This area covers the sub-basins of the Vit, Osam and Yantra rivers and has a size of 15,236 km² in the Bulgarian part of the Danube River Basin. Again the predominating relief is mountainous and semi-mountainous. Some arable land lies in narrow river valleys along the lower riches of the rivers and along the Danube. The population density is quite low in this part of Bulgaria (55 people/km² – without the city of Pleven). Under the category „High priority" five municipal, two agricultural and one industrial Hot Spots were identified. There are enterprises of all branches of industry. Some oil processing enterprises and chemical works were built in the towns of Pleven and Svishtov. Machine-building and light industries are developed in the sub-basin of the Yantra river.

The central Region has just a border with Romania.

23. Eastern Region Sub-river Basin Area (BG)

This area of 3,978 km² in the Bulgaria covers the sub-basins of the Roussenski Lom river (national park) and of the smaller rivers of the east. Plains are the prevalent terrains. Again, the population density is quite low (48 persons/km²) – just one Hot Spot in the categories municipal and industrial („High priority") were identified.

The region has just one border with the country of Romania.

3.11. Romania

The Romanian part of the Danube Basin is divided into three Sub-river Basin Areas including eleven sub-basins. It represents 98% (237,500 km²) of the total area of Romania, out of which more than 60% are agricultural land. The remaining 2% are represented by direct discharge of a few smaller rivers into the Black Sea. The Romanian parts of the Delta belong to the driest regions of the entire Danube Basin.

The Romanian part of the Danube River Basin has borders with Hungary, Yugoslavia, Ukraine, Moldavia and Bulgaria.

24. Transilvania Sub-river Basin Area (RO)

This area represents 34,71% (82,000 km²) of the country and is composed by the sub-basins Somes-Tisa, Crisuri, Mures-Aranca-Ier and Bega-Timis-Caras-Nera. The varied relief includes mountains, tablelands, hills and very low floodplains - such as the Somes, Ier, Crisuri and Timis Plains. The climate varies according to the altitude and relief, but generally is tempered with oceanic and sub-Mediterranean influences.

The rivers Somes and Mures are two of the largest rivers of Romania. Altogether five cities over 100,000 and two over 250,000 inhabitants can be found within the area. The population density varies from 48/km² to 83/km² while the average of 65/km² lies under the Romanian figure of 70/km² (all density numbers without cities over 100,000 inhabitants). No less than 96 Hot Spots were identified in this region, including thirteen industrial and eight municipal "high priority" Hot Spots.

The area has borders with Hungary, Ukraine andYugoslavia.

25. Muntenia Sub-river Basin Area (RO)

This area represents 42,6 % (101,190 km²) of the total country area and is composed of the Sub-basins of the Jiu-Cerna, Olt, Vedea-Arges, Jalomita-Buzau and Danube rivers including the Danube delta. The relief again is very varied, descending from very high mountains (the Southern Carpathians are the highest in Romania), to high hills (Sub-Carpathians), tablelands, high and low plains, descending from the North to the South with the Danube River and the Black Sea. This hydrographic area includes the largest, very fertile plain of the country, the "Romanian Plain". Still intact Danube floodplains exist near the city of Calarasi and at the Big Braila island. Huge areas of former Danube floodplains have a big restoration potential, especially the area downstream of Calarasi.

The afforestation degree is high in the long river sub-basins (e.g. the Olt), or in rivers coming from high mountains (Jiu, Arges). The Jiu and the Olt are two very large rivers of Romania. The capital Bucharest lies in this area together with another six cities with more than 150,000 inhabitants, resulting in a population density of 74 people/km² (without cities above 100,000 inh.). The main Hot Spots ("high priority") can be found in the municipal category (four) and in the industrial category (eight). A very special sub-area is the Danube delta (5,800 km²) which in 1993, became a Biosphere Reserve and which has with its habitat and bio-diversity global importance. It is particularly important for the Black Sea coastal waters due to its filtering and cleaning function. The delta consist s of six parts: the delta itself (4,178 km², 82% on Romanian side) with the three Danube branches, the Razim-Sinoie lagoon complex (1,105 km²), the Black Sea coast, the river Danube east of Cotul Pisicii (the undivided stretch of 55 km), the Isaccea-Tulcea floodplain 892 km²) and the Murighiol-Plopul saline plains (including lake Saraturi).

The area has borders with Bulgaria and Ukraine.

26. Moldova Sub-river Basin Area (RO)

The area represents 22.7% (53,880 km²) of the total country area and includes just two sub-basins: Siret and Prut.

The relief descends from mountains to high hills and tablelands, and then decreasing from the NW to the SE with the very low Siret plain. Parts of the lower reaches of both rivers host still intact wetlands. Except for the high mountains, the average rainfall is quite low (450 - 600 mm/year), the climate therefore can be characterised as "temperate-continental dry".

The Siret is - with a catchment area of 42,890 km² and an average discharge of 210 m³/s - the largest inland river.

In this hydrographic area, the rural population dominates over the urban (61% to 39%); out of 4,32 million people, there are only four cities over 100,000 people. Hot Spots can be found under each category, especially to mention are under the "high priority" category the city of Iasi and five industrial problem zones.

The area has borders with the state of Moldova and Ukraine.

3.12. Moldova

The Moldovian part of the Danube Basin is divided into three Sub-basins Areas with three sub-basins.

It represents 35% (12,025 km²) of the state territory of Moldova. The relief is characterised by a vertical and valley-gully breakdown and active development of destructive geomorphologic processes. The average surface inclination follows from North-West to South-East.

The Moldovian part of the River Basin has borders with Romania and the Ukraine.

27. Upper Prut Sub-river Basin Area (MD)

The Upper part of the Prut sub-basin, which goes up to the confluence of the Jiji river, covers a territory of about 4.400 km² and includes the following districts: Briceni, Ocnita, Edineti, Rascani, Glodeni, Falesti and Nisporeni. Plains are the prevalent terrains in this area. The climate is of continental type, with moderate winters and warm summers.

Some 420,000 people live in this region which results in a population density of 95 people/km². In sum seven municipal and one agricultural Hot Spots were identified in this region.

Economic activities are predominantely agricultural and include large-scale crop production, especially sugar beet and tobacoo, some orchards and partly vineyards. Among industrial activities, the food processing industry (canneries, dairies, sugar and wine production) is especially widely spread, partly there is also manufacturing and production of construction materials.

The area has borders with Romania and Ukraine.

28. Lower Prut Sub-river Basin Area

This area, starting with the confluence of the Jijia River, covers a territory of 3,900 km² and includes the districts Hancesti, Leova, Cantemir, Cahul and partly Vulcanesti. 85% of this area are plains and approximately 15% are mountainous region. The average winter temperature is -3 to -5° C, the average summer temperature 23-24°C. The lowest river stretch hosts still intact floodplains.

The population density in this part of the Moldovian Sub-river Basin Area is with 100 people/km² the highest in the Moldovian part of the Danube basin. Three municipal and two industrial Hot Spots were described in the Moldovian reports. The main sector of human activity is – as in the upper part of the Prut – agriculture with mainly large-scale crop productions (vegetable, tobacco, orchards and wine).

The most significant industrial activities are food processing, manufacturing, leather production, mining and oil and gas exploration.

The area has borders only with Romania.

29. Yalpugh and Cahul Sub-river Basin Area (MD)

This area covers 3,785 km² and includes the districts Chimilia, Basarabeasca, Comrat, Chiadar-Lunga, Tarasclia and partly Vulcanesti. It is the catchment area of two large Danubian lakes, Cahul and Yalpugh. Again plains are the prevalent terrains.

This region has a population of 250,000 people, of which the share of urban population is 25%, that of rural population 75%. The population density therefore is 66 people/km², which is the lowest of the Moldovian Sub-basins.

Underground and shallow waters were not been studied over the last 15 years – taking into account amounts, types of the deposited material, ways of deposition and lack of information this region can be ranked as an industrial „high priority“ Hot Spot.

Again, similar human activities as in the other two Moldovian Sub-river Basin Areas are found and again lack appropriate wastewater treatment. Especially developed industries in this region are food-processing (dairies and canneries), wine and leather production and partly manufacturing.

The area has just a border with the Ukraine.

3.13. Ukraine

The Ukrainian part of the Danube Basin is divided into three Sub-river Basin Areas with three sub-basins. It represents only 5,4% (32,350 km²) of the total area of Ukraine.

Climate, landscape and geological structure of the Tisa, Prut and Siret sub-basins result in a rich and diverse vegetation. Forest covers 37% of the territory. Vegetation is represented mostly in diverse meadows, floodplains and highland meadows. There are also marshes in the sub-basins. The climate of Ukraine is temperate, mainly continental with average temperatures of –7,5° C in January and of 18,5° C in June.

The Ukrainian part of the River Sub-basin has borders to Poland, Hungary, Slovakia, Romania and Moldova.

30. Transcarpathian Sub-river Basin Area (UA)

This Sub-river Basin Area include the Uzh and Latoritsa rivers which flow through Slovakia, and the Tisa river which flows through Hungary. The area covers 12,800 km² or 2 % of the country's area. The mountainous landscape is the source for more than 9,000 rivers. Nearly all of them start in the mountains and flow mainly from the East to the South-West. Climate-soil conditions in the Transcarpathian Lowland favour the development of agriculture. The forests of the region have high water -regulating and -protecting function. The territory of this area is criss-crossed by 9,429 rivers. They are all characterised by floods. There are 137 lakes in the territory.

Some 1,2 million people live in this area which corresponds to a population density of 89 people/km² (without the city of Uzhgorod). The centre of the region is Uzhgorod (near the border of Slovakia) which is the only city over 100,000 inhabitants. From economic view, the Transcarpathian Region is of industrial-agrarian type (leading branch in industry: machine construction, metal processing), with Hot Spots mainly in the industry and municipal category.

The area has borders with Slovakia, Romania and Moldova.

31. Prut Sub-river Basin Area (UA)

This region covers the Upper Prut river which continues to Moldova and Romania, as well as the Upper Siret river, flowing into Romania. The area covers 11,600 km² or 1,8% of the country.

The Prut takes its rise in the North-Eastern slope of the Carpathians at an altitude of 1,600 metres and flows across the Ukrainian territory over about 230 km. With 1,3 million inhabitants and a density of 112 people/km², the Upper Prut Sub-river Basin Area is higher than the average of the Ukrainian Danube River Basin. The national economy in the considered river sub-basins is characterised by the development of industry branches based on local mineral and wood resources and on agriculture.

The area has borders with Romania and Moldova.

32. Lower Danube Sub-river Basin Area (UA)

This area belongs to the Odessa region and includes two sub-basins, the Danube river (Kilia arm of the Danube delta) and the Danube lakes ("limans" with freshwater) with some water intake from the territory of Moldova. The length of the Danube in this stretch is 174 km and the Sub-river Basin Area occupies an area of 6,300 km². The region is located within the South-Western part of the Black Sea lowlands. Common are steppe, sea-side and floodplain landscapes which are almost completely occupied by agricultural crops, orchards and vineyards. The Danube delta (Kilia arm), however, is still ecologically most valuable respectively has a big restoration potential.

The lakes' fish productivity has strongly declined in recent years. There are several big sea and river ports. Urban and industrial waste sites pose a severe pollution problem. With 490,000 thousand inhabitants and a population density of 78 persons/km² the landscape is quite sparsely populated.

The area has only a border to Romania.

4. Sub-river Basins (Transboundary Workshops)

One of the objectives of the "Transboundary Analysis" and the respective TDA Workshop in Hernstein/A in January 1999 was the aggregation of the already nationally defined Sub-river basin Areas on regional level. Purpose of this is the promotion and improvement of transboundary river management and the connected pollution reduction. The result, a list of 15 Danube Sub-river Basins, is given below and on **Map 2** (see page 11). A description of each of the Sub-river Basins is given in the following pages. A special question was the relation between Hot Spots and Sub-river Basins. The "Distribution of Hot Spots in the Danube Sub-river Basins" is shown on **Map 9** and also in the Annex 3 by the list of Hot Spots in the Danube Sub-river Basins.

Table 5 Danube Sub-river Basins

Danube Sub-river Basins	Countries	Size (km²)
1. Upper Danube	D - A	52,710
2. Inn	A - D -CH	26,130
3. Austrian Danube	A	24,170
4. Morava	CZ - A - SK - PL	26,660
5. Váh - Hron	SK - CZ - H - PL	28,060
6. Pannonian Central Danube	A - SK - H - HR - YU	57,250
7. Drava - Mura	A - SLO - H - HR	41,230
8. Sava	SLO - HR - BIH - YU	95,020
9. Tisa	UA - RO - SK - H - YU	157,220
10. Banat - Eastern Serbia	YU - RO	29,690
11. Velika Morava	YU - BG	36,710
12. Mizia - Dobrudzha	BG	43,180
13. Muntenia	RO	95,650
14. Prut - Siret	UA - MD - RO	76,060
15. Delta - Liman	MD - UA - RO	9,330
Sub-Total		799,070
Other Small Areas in CH,I,PL		8,360
Total Danube Catchment		807,430

4.1. Upper Danube (D,A)

Nearly the entire Sub-river Basin (estimated size: 52,710 km²) is located in Germany, only the sources of the two big tributaries (Lech and Isar) are in Austria. Munich (the capital of Bavaria with a population far over 1 million people) and Augsburg are the regional centres, followed by the cities of Ulm and Regensburg. The population density in this area is around 130 inhabitants/ km² which is one of the highest in the whole Danube basin area. Average precipitation is at 1,000 mm per year.

The Danube itself rises at the confluence of the two source rivers Brigach and Breg in the city of Donaueschingen. The character of the Danube in this region is only partly near-natural (with some wetlands and protected floodplain meadows), as almost the entire river stretch is impounded by small hydrodams. The character of the area is largely that of an inclined plain (with a mosaic of pastures, small spruce forests, arable land, numerous villages and small cities and some old glacial lakes), gently dropping towards the Danube in the North. The northern side of the German Danube is a hilly limestone landscape and has with the Bavarian Forest in the north-east a densely forested middle-mountain sub-area.

The Upper Danube economy is dominated by manufacturing industry, intensive agriculture (lifestock breeding) and many companies of the service sector. The sub-areas north of the Danube are dominated by forestry and extensive agriculture. Through the once natural Altmühl valley, the Rhine-Main-Danube canal provides a new navigation route towards the North-Sea. Special hop cultures are concentrated near Regensburg (Hallertau).

Seven municipal (WWTP) and one industrial (oil) sources of pollution were reported from this region. They are mostly located at small tributaries. Two priority wetlands for restoration were selected for this area: The "Ingolstadt Floodplain", which is located near the city on the Danube, as well as the mouth of the Isar tributary into the Danube. There are no SIA's nominated in this Sub-river Basin Area.

4.2. Inn (D,A)

The Inn Sub-River Basin (estimated size: 26,130 km²) is mainly located in Austria – a smaller part (about one quarter) reaches into the German province ("free state") of Bavaria and the source section of the Inn into Switzerland. Especially the Austrian part is a high mountain alpine landscape within the Northern Alps, with some mountains reaching over 3,000 metres (Tauern region). The rivers Inn and Salzach are the main direct tributaries into the Danube.

The Inn drains in a large valley most of the northern Alps (Austrian province of Tirol; capital Innsbruck) and leaves the Alps at the Bavarian border at Kufstein. From there, it flows through south-eastern Bavaria (pre-alpine ground moraine landscape) until it receives the Salzach which forms the Austrian – German border downstream of Salzburg (over 100,000 inhabitants).

The Salzach as the second biggest Danube tributary of this region comes from the Central Alps (High Tauern). Before it reaches Salzburg, it is impacted by two pollution sources (paper and chemical industry).

In the upper and middle river reaches, only the valley bottoms are more densely populated while the often steep mountain slopes are dominated by protective forests and alpine pastures with very sparse population. Apart from agriculture and forestry (including attached manufacturing industries), the service sector with intensive winter and summer tourism and recreation is the main economy. The Inn valley serves also as a very important transalpine transit route.

There are two major sources of pollution (a municipal WWTP and chemical industry) needing upgrading of WWTP performance at the middle Inn. No SIAs or priority wetlands were nominated for this area.

4.3. Austrian Danube

The "Austrian Danube" Sub-River Basin (estimated size: 24,170 km²) is one of two non-transboundary areas. It includes three provinces (Salzburg, Upper and Lower Austria) and receives water both from the central and Eastern Alps (southern tributaries Traun and Enns) and from the old "Bohemian massifs" (tributaries from the north).

All tributaries are characterised by a big altitude difference between their sources and the mouths at the Danube. The alpine areas are sparsely populated (important winter and summer tourism), with mountain forests and alpine pastures allowing primary industries. The low mountains in the north are sparsely populated with short, near-natural tributaries in a mainly continental climate) and the "Vienna forests" in the south-east is densely forested.

In the lower lands along the Danube, narrow river valleys (impounded by chains of hydrodams) change with high plains and small basins. Especially the greater Linz region is one of Austria's biggest primary and secondary industry areas (iron, steel and chemical factories since World War I). The Linz-Asten WWTP and the Vienna WWTP are considered major sources of pollution needing further upgrading of WWTP performance.

Intensive and extensive agriculture change with the landscape, the Eastern Danube section is dominated by wine cultures (Wachau, Weinviertel) and orchards (Mostviertel). Danube floodplain areas in the east are impounded up to Vienna, allowing intensive agriculture.

There are neither SIAs nor priority wetlands nominated for this area.

4.4. Morava (CZ, A, SK)

The Morava Catchment Area (estimated size: 26,660 km²) is mainly located in Eastern Czechia; only small parts belong to Austria (3,670 km²), Slovakia (2,283 km²) and even Poland. The relief of the Morava mainly consists of lowlands, (Bohemian) high lands, limestone hills and extended valleys; hosting in the middle and lower Morava and Dyje river reaches some of the largest floodplain meadows and best floodplain forests in Central Europe. The rivers Thaya/Dyje (origin in Austria), Becva (from eastern Moravia) and Jihlava (origin in middle Moravia/Czech Republic) are the most important tributaries. The length of the Morava in Czechia is 353 km. The altitude of the territory fluctuates between 140 and 1,491 metres above sea level. Average precipitation is 635 mm, fluctuating between 450 mm (Breclav/CZ) and 1,150 mm (Beskydy Mountains).

The flow amounts to 109 m^3/s (downstream the Czech border). Spring floods which are increased by weak water retention capacities of the mountain slopes can have transboundary impact to Slovakia and Austria. Some 54% of the Czech area are made up by agricultural land (half of it arable soils), forests cover 34%, 12% include urban areas and water-covered regions (many reservoirs in the Dyje sub-catchment). The area is affected by relatively high erosion, mainly caused by intensive agriculture which is also the typical land use for the fertile Austrian and Slovak territories of this area. Most streams are regulated (only 4% natural); more than 50% of the Czech hydro-power capacity is concentrated in the Morava river sub-basin. Important old and recent central-European transport routes lead through this region.

With a population over 2,78 million people (Czechia), the average population density in the Morava river area is 108 persons/km² (without big cities!). 14% (390,000) of the population are concentrated in the largest city, Brno. 14 towns are below 55,000 people but dominating are rural settlements. The only other large city is Olomouc (105,000 inhabitants) at the middle Morava where most of the Czech Hot spots can be found. The insufficient WWTPs of most cities are important pollution sources.

Mechanical engineering and chemical industries, complemented by the processing of local resources (food, leather and wood), by the manufacturing of building materials and by mining (coal, uranium, lignite, oil etc.) are typical for the Morava river sub-basin.

About 14% of the Czech area is protected – as the most important parts of the regional and supra-regional systems of ecological stability (one national park, two biosphere reserves and three major Ramsar Wetlands in the territory, including very valuable floodplain forests). The same applies for the Austrian and Slovak border wetlands (Ramsar areas and partly strictly protected). The newly discussed project of a “Danube-Oder-Elbe navigation canal” would go through the Morava valley, dissecting and seriously altering many of these reserves.

The Austrian and Slovak parts of the area are the lowest reaches of the Morava, dominated by farmland, floodplains, old terraces and foot-hills of the Small Carpathians. Slovak river side is characterised by large floodplain meadows (partly damaged by improper agrotechnical methods), the Austrian by a mixture of arable land, floodplain meadows and forests. Slovak pollution sources are the small cities Senica, Myjava, Malacky and Devinska Nova ves as well as some industry plants (cement, fiber, food production). Austria contributes through a sugar factory with biological WWT.

Within the UNDP/GEF PRP, the Drösing Forest in Lower Austria and the Hodonin Floodplains in the South-Western Czech Republic were identified as priority wetlands for restoration. They are located in the SIA (Significant Impact Areas) “Middle Morava” and “Lower Morava”.

4.5. Váh - Hron (SK,CZ,H)

The biggest part of the Sub-River Basin (estimated size: 28,060 km²) is located in Slovakia, small parts of Hungary (Ipel river) and even the Czech Republic and Poland complement the this Sub-River Basin which is characterised by the Váh and Hron rivers.

Most of the region is under high mountain influence (High Tatra) and sparsely inhabited. Precipitation varies from 2,200 to 540 mm. The upper river stretches are characterised by largely forested mountains with intensive uses (different industries, civilised, etc.) in the valleys.

The Váh as Slovakia’s biggest river (403 km) is situated in a mountainous area (source in 2,494 m), but ends in the Pannonian low plain (mouth at 107 m) with a discharge of 152 m³/sec. Many water reservoirs serve electricity production. The area is characterised by a very low population density. This area has the highest employment rate in the industrial sector (chemical, heavy and food-processing). Vah and the main tributary Nitra are heavily polluted from industrial, municipal and agricultural waste waters.

Approaching the Danube, both rivers flow through a hilly landscape which is much higher populated and also characterised by intensive agriculture. The Nitra River rises on the Southern slopes of Malá Fatra mountains (Small Carpathians) and confluences with the Vah River just before running into the Danube.

The Hron River rises in the Slovenské Rudohorie mountains (Inner Carpathians) at an altitude of 934 meters and reaches after 284 km the Danube at 103 metres. The Hron sub-basin is much more industrialised (mainly heavy industries: aluminium, iron and chemical) than the Ipel river sub-basin which, for most of its length, forms the border with Hungary. On the Ipel, agricultural production and food industry prevails.

4.6. Pannonian Central Danube Region (A, SK, H, HR, YU)

The biggest part of this Sub-River Basin (estimated size: 57,250 km²) is located in western and central Hungary, consisting largely of the small Hungarian plain and the Hungarian low mountains. Westwards, the area also contains eastern parts of lower Austria including its capital Vienna. The plain reaches also the south-eastern region of Slovakia with the capital Bratislava. In the south, the Pannonian Central Danube Region includes along the Danube small parts of Croatia and Yugoslavia. Nearly the whole region stands under Pannonian climatic influence with very cold winters and hot summers. Only the southern parts of this area are partly already under Mediterranean influence.

The region is characterised by the shortage of water and of forest covers (e.g. in the Hungarian part of the region only 23%) while agrarian land use dominate (e.g. in Hungary 61 % arable land).

The Danube flows as the main river through this region, the Raab (origin in Austria) is the only bigger tributary. While the area is quite sparsely populated, it includes few big cities (Györ and Székesfehérvár) but three capitals: Vienna (1.7 million people), Bratislava (400,000 people) and Budapest (2 million people).

Characteristic economic activities include industry (chemical, machinery, oil, paper) at the big cities and agriculture (irrigation, fruit production) in rurual regions. This includes special cultures of wine (lakes Neusiedl and Balaton, the south of Vienna) as well as fisheries (lower Hungarian Danube).

A big list of municipal and industrial Hot Spots was identified around Györ, Budapest and lake Balaton.

Several internationally important wetlands are located along the Danube e.g. downstream of Vienna (since 1996 national park area), in the Szigetköz/NW Hungary (affected since 1992 by the operation of the Gabcikovo power plant) and in the Gemenc-Béda-Karapancsa – Kopacki Rit area (nature park in Croatia and, also since 1992, national park area in Hungary).

Two steppe-lakes (Neusiedlersee in Austria/Hungary as transboundary national park and Lake "Balaton" in Hungary) are characteristic for the region. Both are very shallow and expected to develop into marshes (pollution from agriculture, food industry and tourism). Both are known as intensive tourism and recreation area. Especially lake Neusiedl is a very important for water birds.

The UNDP/GEF PRP includes a proposal for the restoration of the wetlands around the Gemenc-Kopacki Rit area which is also recognised as a SIA (Significant Impact Area). Another three SIAs were identified in the Szigetköz, at the Danube Bend before Budapest (drinking water supply) and in Novi Sad.

4.7. Drava-Mura (A, SLO, HR, H)

This Sub-River Basin has an estimated size of 41,230 km². While the Mura rises in the central parts of the Alps in Austria, the Drava has its origin in the southern Alps in Italy (South Tirol), right on the border with Austria. Both rivers are at their source and in the upper reaches under alpine influence but they flow in their lower reaches through the Pannonian region (continental climate).

Mean flows of Austrian origin are at 425-450 m³/sec into this basin. The Austrian river stretches are dominated by high mountains with forests and alpine pastures. The Drava flows in a rather wide valley along large post-glacial lakes (city of Klagenfurt: 90,000 inhabitants), the Mura touches inner-alpine industrial zones (around Leoben) and leaves the Alps near Graz (240,000 inhabitants; WWTP is a major source of pollution needing upgrading of the WWTP performance).

The Slovenian part of the Drava river changes from alpine and karst to subalpine, non-karstic and sub-pannonian landscapes The latter is a still very valuable river stretch and floodplain, even though it is affected by a river diversion. The Mura just crosses Slovenia at the three countries border (SLO, A, H) before following the border line Croatia – Hungary, where it flows into the Drava. Large stretches of the Mura are still very intact floodplain areas (border lines with Austria and Croatia) but showing bed erosion (Austrian dams) and the impact of many industrial and agricultural pollution sources.

The relief of the Lower Drava consists mostly of lowlands and valleys. The climate is mild-continental with an average annual temperature of 10,9° and an average rainfall of 600-700 mm/year.

The lowland river is quite untouched due to its long-years function as strict border line (today H-HR) which, today, is subject of contradicting hydro dam and nature conservation plans. The mouth of the Drava into the Danube is a huge wetland triangle with the internationally important nature reserve of "Kopacki rit" (very rich floodplain forests). Just upstream few hot spots create pollution problems which led to its identification as both a Significant Impact Area and a priority wetland for restoration.

4.8. Sava (SLO, HR, BIH,YU)

Within the whole Danube catchment, the Sava river is the biggest tributary by volume and one of the biggest by pollution loads thanks to a big chain of hot spots along its entire stretch. The catchment area is 95,020 km² which is some 12 % of the Danube basin.

A common characteristics of all Sava tributaries is a big altitude difference between their sources in mountainous regions and their mouths in lowlands. Large water quantities make it important for hydropower production – especially in the upper parts, where also cities with high population accumulations (Ljubljana, Zagreb, Banja Luka and Sarajevo) and very weak sewage treatment are located.

The Sava river itself is mainly characterised by a continental climate (southern end of the Pannonian basin), while tributary rivers from the south (like Kupa, Una, Vrbas and Bosna) stand already under the influence of Mediterranean climate. The valleys along these rivers are high populated – centres of population are often located along these valleys or even small tributaries.

The Croatian and Yugoslavian parts of the Sava river are lowland plain with large meanders, some protected wetlands and old forests (e.g. old oak forests). Just before flowing into the Danube the Sava passes Belgrade.

A number of Significant Impact Areas were identified: at the Upper and Lower Sava as well as along almost its entire middle stretch at the confluences with the tributaries Sotla, Kolpa, Una, Vrbas, Bosna and Drina in the Sava as well as Tara Canyon were identified as SIA's. Five priority wetlands suitable for restoration are mostly found at the confluences with tribuatries where they overlap with SIAs.

4.9. Tisa (SK, UA, RO, H, YU)

The Sub-River Basin (estimated size: 157,220 km²) of the Tisza encompasses the largest river sub-basin (148,973 km² = some 18.5%) within the Danube catchment, including parts of Slovakia, Ukraine, Romania, Hungary and Yugoslavia. The area is the second largest tributary area for the Danube with an average water quantity of 794 m³/s.

More than 2,9 million people (without the five cities with a population over 100,000) live alone in the Hungarian area, which corresponds to more than 70 people per km². The upper Tisza region and its Romanian (especially Somes and Mures) and Slovak (Sajo, Hornad, Bodrog) tributaries are mainly under industrial use, agricultural hot spots were listed in the Banat area (FR YU). This pollution load is reflected by a big number of SIAs in the entire region. The area contains a concentration of heavy industry, especially mining, iron and steel makers and petrochemical and fertilisers manufactures.

The abundant precipitation in the mountain stretches secures high discharges even in the summer when the dry plainland (low rainfall, high evapotranspiration) depends with its water balance from the river. The aquifer located at the Sajo-Hornad confluence is one of the most productive in Hungary and it represents one of the primary water supply sources. Still, water scarcity is typical for the lowlands and poses supply problems.

The upper parts of the tributaries and of the Tisa itself are with a high percentage forested and less impounded by hydro power stations than other mountain tributaries. After some way through lower mountains regions, the Tisa flows, as a regulated river, through the big Hungarian and Yugoslavian which is characterised by its intensive agricultural land use (especially in Hungary 75% but only 13% forests).

The following areas were chosen as priority wetlands for restoration: apart from the lower Bodrog (northern Hungary), only three more wetlands are recommended at the Lower Tisza.

4.10. Banat – Eastern Serbia (YU, RO)

The Sub-River Basin (estimated size: 29,690 km²) of Eastern Serbia encompasses the countries Yugoslavia and Romania. It is located at the southern part of the mountain massif of the Carpathians. The biggest Danube tributary in this area is the Timis which has its origin in the foothills. The whole area comprises mostly hilly and mountainous terrains as well as the famous Djerdap gorge (Iron Gate) where, along the impounded Danube, marshy and swampy ecosystems can still be found ("Djerdap" national park). The Lower Banat is under intensive agricultural use in Yugoslavia. Forests have a low percentage, only the southern slopes of the foot hills of the Carpathians and the region around the Danube at the Iron Gate is covered with mainly coniferous forests.

The Yugoslavian plain and the Timis valley with its tributaries are highly populated (population density at 130 inhabitants/km²). With the capital of Belgrade (1.1 million inhabitants), half of the city is located in this Sub-river Basin, a very big centre can be found in the region.

Significant Impact Areas are the so-called Middle Banat – Bega & Birzava (located mainly along the river Birzava and its mouth into the Timis), the Area along the Iron Gates and, third, the SIA region around the Lower Timok.

4.11. Velika Morava (YU, BG)

Nearly the entire area of this Sub-river Basin (estimated size: 36,710 km²) is part of the Yugoslavian territory, only a very small corner in the south-east belongs to eastern Bulgaria.

The Morava is the only direct Danube tributary in this area. A diverse Balkan mountain relief causes different types of streams, with intensive seasonal variations of flows. A big number of various municipal and industrial Hot Spots were distinguished in this area. Especially along the "Western" and the "Southern" Morava the important branches of metal, chemical, wood and pulp & paper industry endanger the water quality in this area. Therefore, the significant impact area "Western and Southern Morava" is one of the biggest in the entire basin. The population density in the Morava region is with 100 inhabitants/km² high, also the economic and administrative centres Nis, Pristina and Kragujevac with their population of each over 100,000 have to be mentioned.

Along the Morava and the middle and lower parts of its tributaries, agriculture is the most important land-use form. Forests can only still be found in the higher mountainous regions in the south west and south east of Yugoslavia.

No priority wetlands for restoration were identified.

4.12. Mizia - Dobrudzha (BG)

This Sub-river Basin (estimated size: 43,180 km²) covers the entire area of the Danube's Bulgarian territory (catchment of 46,930 km² = 5.7% of the Danube basin). It is characterised by a low mountainous (up to 2,376 m) or hilly profile and by many quite small rivers. The climate is continental and particularly dry in the lowlands. Due to the limited availability of water, over 800 reservoirs were built to secure water supply. The average annual stream flow of 47 m3/sec varies seasonally, with consistently low flows from August through November. Some arable land is found in the narrow river valleys along the lower reaches of the rivers and along the Danube In the east of the area, plains are the prevalent terrains.

The most important Danube tributaries in this area are Iskam, Ossam and Yantra. After substracting the capital Sofia and other big cities with more than 100.000 inhabitants Rousse, Pleven and Dobritsch), the population density is at only around 50 inhabitants/km². The land use is characterised by a high percentage of agriculture (over 50% arable land – main cultures are wheat,

maize, sunflowers and wine) and some forests in the south of the Bulgarian Danube river basin area. Industries in this sub-basin include electroplating, metal finishing, food processing, sugar refining, alcohol production, textiles and leather tanning.

Many small Significant Impact Areas due to municipal pollution hot spots were identified in the Bulgarian region (from west to east): A small region at the Ogosta at Vratza, secondly an area north of Sofia along the Iskar, another three are located directly a the Ossam (at Troyan, at Lovetch) or nearby (Rositza at Sevlievo). Another two SIA's cover the Middle Yantra and the Lom Rivers.

Along the Danube identified priority wetlands for restoration can be assigned to both Bulgaria and Romania: The "Balta Potelu" – mainly on Romanian side between the Jiu (RO) and Isker (BG) rivers. Also, the Danube islands at Svitstov and Balta Greaca – impacted by Bucharest - were chosen.

4.13. Muntenia (RO)

This Sub-River Basin (estimated size: 95,650 km²) represents nearly half of the total country area of Romania which includes six river sub-basins (Jiu: 10,080 km², Olt: 24,050 km², Vedea: 5,430 km², Arges: 12,550 km² Ialomita: 10,350 km² and Buzau: 5,264 km²) of the Danube but none is of transboundary character. A common characteristics of most of the Romanian tributaries is a big altitude difference between their mountain sources and the mouths in lowlands: The relief varies from very high mountains (the Southern Carpathians are with over 2,500 m the highest in Romania) in the north to high hills (Sub-Carpathians), tablelands, high and low plains in the south with the Danube River and the Black Sea. The Romanian plain includes the largest, very fertile area of the country. Average yearly precipitation is 1,000-1,400 mm for mountain areas, 600-800 mm for hilly lands and 350-450 mm for the plain.

Industry dominates economic activity in the municipalities, placing a notable burden on the surface water quality by discharging organics and nutrients into the municipal systems and directly into the rivers**.** Still intact Danube floodplains exist near the city of Calarasi and on the Big Braila island. Huge areas of former Danube floodplains have a big restoration potential, especially the area downstream of Calarasi.

The afforestation degree is high in the long river sub-basins (e.g. at the Olt), or in rivers coming from high mountains (Jiu, Arges). The Jiu and the Olt are two very large rivers of Romania. The capital Bucharest lies near the Arges area which, together with other six cities with more than 150,000 inhabitants, results in a population density of 74 people/km² (without cities above 100,000 inh**.).** It is one of the largest source of pollution in the sub-basin due to untreated sewage.

Three Significant Impact Areas were identified in Muntenia: The river Ialomita near Ploiesti, the Arges (and its tributaries in and around Bucarest) and parts of the Lower Danube region with its tributaries Siret and Prut. Three of identified priority wetlands in Muntenia (Balta Potelu, Bulgarian islands and Balta Greaca**)** were already addressed – as they are transboundary with Bulgaria (Mizia – Dobrudzha). In addition comes the restoration area near Calarasi.

4.14. Prut - Siret (UA, MD, RO)

The Sub-River Basin (estimated size: 76,060 km²) encompasses the north-eastern part of Romania, western Moldavia and south-western Ukraine where the rivers Prut and Siret dominate. The relief descends from mountains (up to 2,000 metres in the East-Carpathians) to high hills and tablelands, and decreases from the NW to the SE with the very low Siret plain. Parts of the lower reaches of both rivers host still intact wetlands. Except for the high mountains, the average rainfall is very low (450 - 600 mm/year), the climate is temperate-continental dry.

Plains are the prevalent terrains in the Prut area. Economic activities are predominantly agricultural and include large-scale crop production, especially sugar beet and tobacco, some orchards and partly vineyards. Among industrial activities, the food processing industry (canneries, dairies, sugar and wine production) is especially widely spread, partly there is also manufacturing and production of construction materials. The Prut valley is densely populated both on Romanian and on Moldavian side.

The mouth of the two rivers into the Danube includes two big cities (Braila and Galati) which are important pollution centers and upper end of the Lower Danube SIA.

The following regions were identified as further Significant Impact Areas: A long stretch along the Upper Siret in Ukraine, a big area at the middle Siret at the cities Bacau and Onesti (industry hot spots), another three at the Prut under impact of mainly municipal hot spots (Upper Prut near Cernivci, Middle Prut at Iasi and Lower Prut) and one more area at the Yalpugh-Cahul lakes.

4.15. Delta – Liman (MD, UA, RO)

This very special Sub-river Basin (estimated size: 9,330 km²) is composed by the Danube delta (5,800 km²) and the Liman lakes, located at the trilateral border. This south-western part of the Black Sea lowlands includes the Danube river forking with three arms into the Danube Delta, and the Danube lakes ("limans" with freshwater), with some water intake also from the territory of Moldova. The delta is particularly important for the Black Sea coastal waters due to its filtering and cleaning function. The climate is continental dry with very little rainfall.

The delta (since 1993 biosphere reserve) has with its habitat and biodiversity global importance. It consists of six parts: the delta itself (4,178 km², 82% on Romanian side) with the three Danube branches, the Razim-Sinoie lagoon complex (1,105 km²), the Black Sea coast, the river Danube east of Cotul Pisicii (an undivided stretch of 55 km), the Isaccea-Tulcea floodplain 892 km²) and the Murighiol-Plopul saline plains (including lake Saraturi).

Typical delta habitats are reed beds, inner lakes (between 500 and 2,200 ha large), forests and sand dunes, steppe, sea-side and floodplain landscapes which are partly occupied by agricultural areas.

Large parts of the delta were turned into agricultural land (mostly unsuccessful) which damaged both its biodiversiyt and its filtering function. Pollution from nitrogen and phosphorous is delta problem due to the uncontrolled use of fertilisers by farms

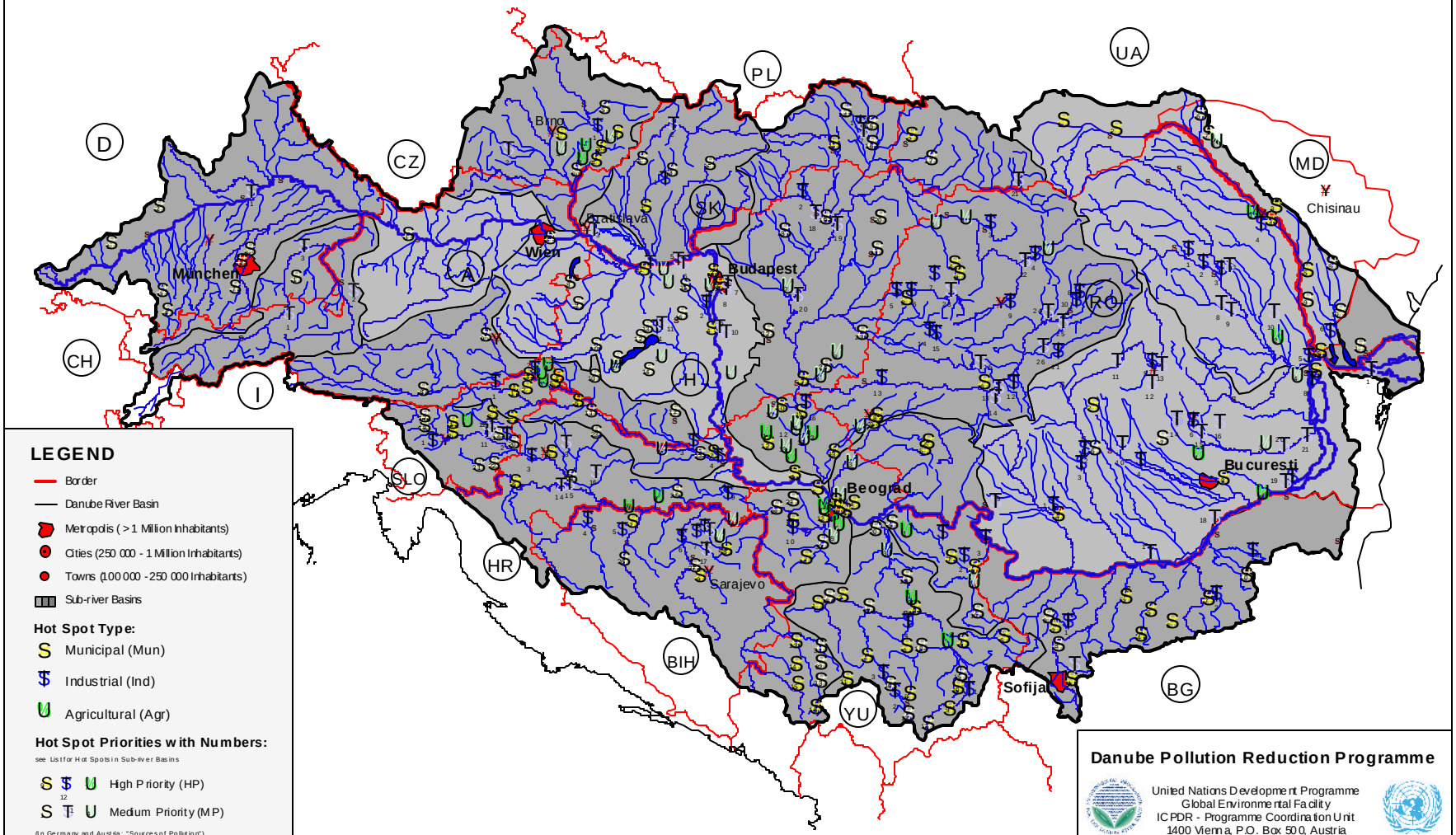
In recent years, the liman lakes' fish productivity has strongly declined. Also, the recreational value, human health and the biological productivity decreased.

The SIA includes several big sea and river ports (urban and industrial waste waters).

Chilia arm, however, is still ecologically most valuable and has a big restoration potential (first projects already succeeded). Therefore, the polder Pardina (RO) and the Ukrainian delta banks are on the UNDP/GEF wetland priority list.

Map 9: Distribution of Hot Spots in the Danube Sub-river Basins

Based on National Planning Workshop Reports 1998, Updates March 1999



LEGEND

- Border
- Danube River Basin
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)
- Sub-river Basins

Hot Spot Type:

- S Municipal (Mun)
- $ Industrial (Ind)
- U Agricultural (Agr)

Hot Spot Priorities with Numbers:

see List for Hot Spots in Sub-river Basins

- S $ U High Priority (HP)
- S T U Medium Priority (MP)

(In Germany and Austria: "Sources of Pollution")

50 0 50 100 Kilometers

Scale: 1: 4 500 000

N

Danube Pollution Reduction Programme

United Nations Development Programme
Global Environmental Facility
ICPDR - Programme Coordination Unit
1400 Vienna, P.O. Box 500, Austria

Produced by ZINKE ENVIRONMENT CONSULTING
for Central and Eastern Europe, Vienna, 1999
(Cartography by U.SCHWARZ)

5. Description of the Significant Impact Areas in the Danube River Basin

One of the results produced at the Hernstein Workshop in January 1999 was the identification of "***Significant Impact Areas***" (SIAs) which are both most intensively affected by water pollution and valuable from an environmental and/or conservation point of view.

Altogether, 51 SIAs were determined. They are described in the table and text below as well as in Map 10 and in Annex 2. The "Overlay of Hot Spots, SIAs and Wetlands" (**Maps 10 and 11**) facilitated the needed selection and ranking of pollution reduction projects within the PRP.

Table 6 Significant Impact Areas in the Danube River Basin

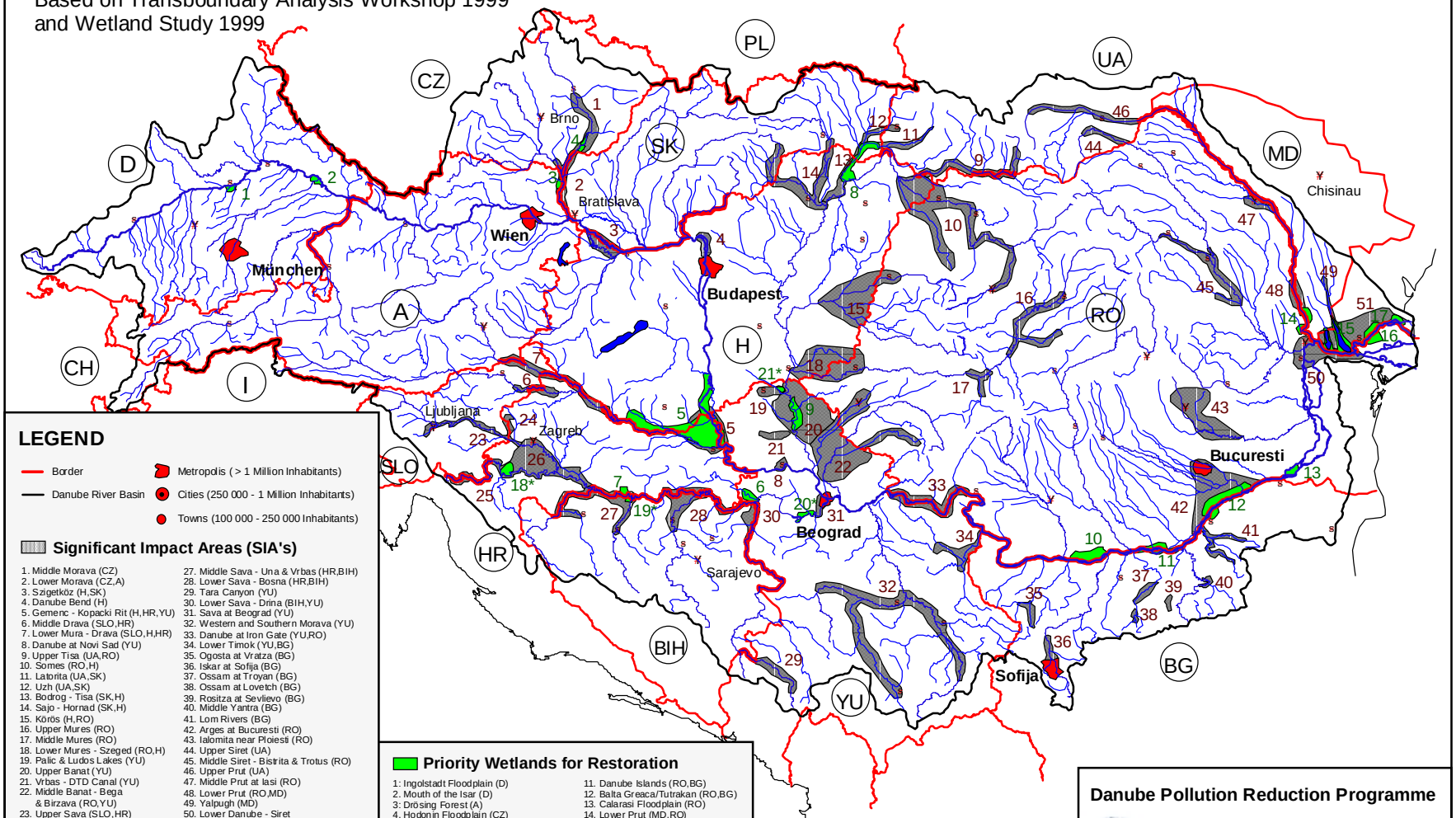
Significant Impact Area	Size (km²)	Countries
1. Middle Morava	1,370	CZ
2. Lower Morava	380	CZ-SK-A
3. Szigetköz	750	H-SK
4. Danube Bend	350	H
5. Gemenc – Kopacki Rit	1,980	H-HR-YU
6. Middle Drava	450	SLO-HR
7. Lower Mura - Drava	1,410	SLO-H-HR
8. Danube At Novi Sad	160	YU
9. Upper Tisa	1,230	UA-RO-H
10. Somes	4,980	RO-H
11. Latorita	410	UA-SK
12. Uzh	380	UA-SK
13. Bodrog - Tisza	610	SK-H
14. Sajo - Hornad	2,210	SK-H
15. Körös	3,160	H-RO
16. Upper Mures	1,560	RO
17. Middle Mures	410	RO
18. Lower Mures - Szeged	2,860	RO-H
19. Palic - Ludos Lakes	330	YU
20. Upper Banat	3,290	YU
21. Vrbas - DTD Canal	290	YU
22. Middle Banat – Bega & Birzava	3,680	RO-YU
23. Upper Sava	670	SLO-HR
24. Sutla	230	SLO-HR
25. Kupa	500	SLO-HR
26. Middle Sava - Kupa	2,820	HR
27. Middle Sava - Una & Vrbas	1,770	HR-BIH
28. Lower Sava - Bosna	1,320	HR-BIH
29. Tara Canyon	660	YU
30. Lower Sava – Drina	960	BIH-YU
31. Sava at Beograde	260	YU
32. Western & Southern Morava	5,029	YU
33. Danube at Iron Gate	1,500	YU
34. Lower Timok	780	YU-BG

Table 6 continued

35. Ogosta at Vratza	300	BG
36. Iskar at Sofija	330	BG
37. Ossam at Troyan	300	BG
38. Ossam At Lovetch	100	BG
39. Rossitza at Sevlievo	20	BG
40. Middle Yantra	120	BG
41. Lom Rivers	620	BG
42. Arges at Bucuresti	3,180	RO
43. Ialomita near Ploiesti	2,350	RO
44. Upper Siret	380	UA
45. Middle Siret – Bistrita & Trotus	1,360	RO
46. Upper Prut	1,000	UA
47. Middle Prut	370	RO
48. Lower Prut	520	RO-MD
49. Yalpugh	259	MD
50. Lower Danube - Siret & Prut	1,590	RO-MD-UA
51. Ukrainian Delta & Liman Lakes	2,470	UA
Total area of all SIAs	64,018	59

Map 10: Significant Impact Areas and Priority Wetlands for Restoration

Based on Transboundary Analysis Workshop 1999
and Wetland Study 1999



LEGEND

- Border
- Danube River Basin
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)

Significant Impact Areas (SIA's)

1. Middle Morava (CZ)
2. Lower Morava (CZ,A)
3. Szigetköz (H,SK)
4. Danube Bend (H)
5. Gemenc - Kopacki Rit (H,HR,YU)
6. Middle Drava (SLO,HR)
7. Lower Mura - Drava (SLO,H,HR)
8. Danube at Novi Sad (YU)
9. Upper Tisa (UA,RO)
10. Somes (RO,H)
11. Latorita (UA,SK)
12. Uzh (UA,SK)
13. Bodrog - Tisa (SK,H)
14. Sajo - Hornad (SK,H)
15. Körös (H,RO)
16. Upper Mures (RO)
17. Middle Mures (RO)
18. Lower Mures - Szeged (RO,H)
19. Palic & Ludos Lakes (YU)
20. Upper Banat (YU)
21. Vrbas - DTD Canal (YU)
22. Middle Banat - Bega & Birzava (RO,YU)
23. Upper Sava (SLO,HR)
24. Sutla (SLO,HR)
25. Kupa (SLO,HR)
26. Middle Sava - Kupa (HR)
27. Middle Sava - Una & Vrbas (HR,BIH)
28. Lower Sava - Bosna (HR,BIH)
29. Tara Canyon (YU)
30. Lower Sava - Drina (BIH,YU)
31. Sava at Beograd (YU)
32. Western and Southern Morava (YU)
33. Danube at Iron Gate (YU,RO)
34. Lower Timok (YU,BG)
35. Ogosta at Vratza (BG)
36. Iskar at Sofija (BG)
37. Ossam at Troyan (BG)
38. Ossam at Lovetch (BG)
39. Rositza at Sevlievo (BG)
40. Middle Yantra (BG)
41. Lom Rivers (BG)
42. Arges at Bucuresti (RO)
43. Ialomita near Ploiesti (RO)
44. Upper Siret (UA)
45. Middle Siret - Bistrita & Trotus (RO)
46. Upper Prut (UA)
47. Middle Prut at Iasi (RO)
48. Lower Prut (RO,MD)
49. Yalpugh (MD)
50. Lower Danube - Siret & Prut (RO,MD,UA)
51. Ukrainian Delta & Liman Lakes (UA)

50 0 50 100 150 Kilometers

Scale: 1: 4 500 000

N

Priority Wetlands for Restoration

1: Ingolstadt Floodplain (D)
2. Mouth of the Isar (D)
3: Drösing Forest (A)
4. Hodonin Floodplain (CZ)
5. Gemenc - Béda - Karapancsa (H), Kopacki Rit (HR,YU) & Ormánság (H)
6. Mouth of the Drina River (BIH,YU) & Bosut Forest (YU)
7. Floodplain next to Mokro Polje (HR)
8. Lower Bodrog (H,SK)
9. Lower Tisa (YU)
10. Balta Potelu (RO,BG)
11. Danube Islands (RO,BG)
12. Balta Greaca/Tutrakan (RO,BG)
13. Calarasi Floodplain (RO)
14. Lower Prut (MD,RO)
15. Liman Lakes (UK,MD)
16. Polder Pardina (RO)
17. Ukrainian Danube Delta (UA)
18. Kupa Floodplain (HR)*
19. Mouth of the Vrbas River (BIH)*
20. Obedska Bara (YU)*
21. Palic and Ludos Lakes (YU)*

* added on Transboundary Analysis Workshop

Danube Pollution Reduction Programme

United Nations Development Programme
Global Environmental Facility
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1400 Vienna, P.O. Box 500, Austria

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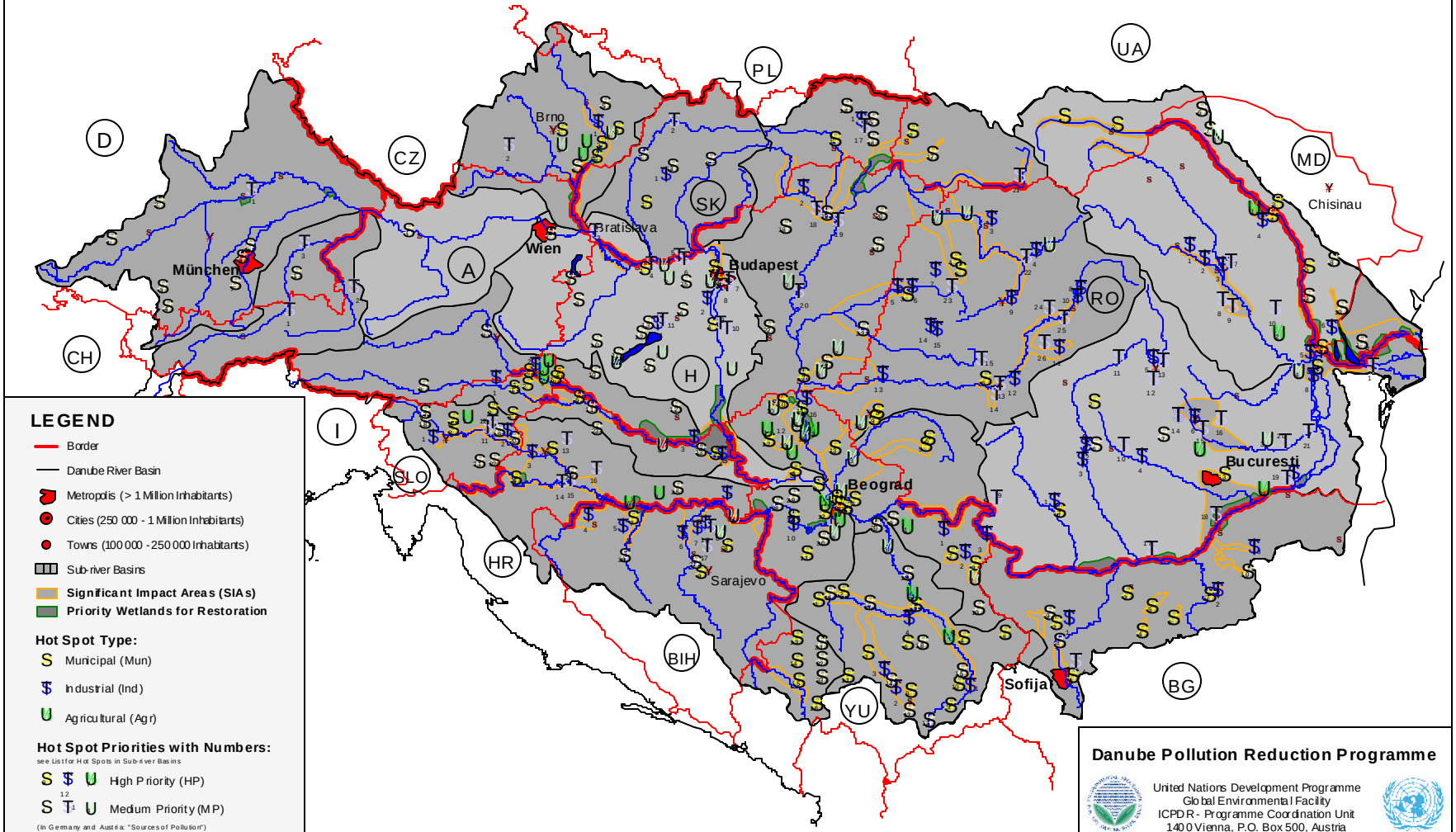
Map 11: Overlay of Hot Spots, SIAs and Wetlands in the Danube Sub-river Basins

Based on National Planning Workshop Reports 1998, Wetland Study 1998 and Transboundary Analysis Workshop 1999



LEGEND

- Border
- Danube River Basin
- Metropolis (> 1 Million Inhabitants)
- Cities (250 000 - 1 Million Inhabitants)
- Towns (100 000 - 250 000 Inhabitants)
- Sub-river Basins
- **Significant Impact Areas (SIAs)**
- **Priority Wetlands for Restoration**

Hot Spot Type:

- S Municipal (Mun)
- $ Industrial (Ind)
- U Agricultural (Agr)

Hot Spot Priorities with Numbers:

see List for Hot Spots in Sub-river Basins

- S $ U High Priority (HP)
- S T U Medium Priority (MP)

(In Germany and Austria: "Sources of Pollution")

50 0 50 100 Kilometers

Scale: 1: 4 500 000

N

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5.1. Middle Morava

The Morava river basin, located mainly within the territory of the Czech Republic, is a physical unit at the crossing point of the Bohemian Highlands, the Carpathians and the Pannonian Province, and it includes important transport communications, connecting north-eastern, central and south-eastern Europe. The Morava river basin represents 27% area (21,145 $km^{2)}$ of the Czech Republic, with a population of 2,78 million (27% of total population of the country).

The Significant Impact Area (SIA) has an estimated size of 1,370 km² which includes the river stretch between Olomouc and Hodonin as well as the Lower Dyje downstream of the Nove Mlyny reservoirs.

The major tributaries of the Morava river, a left-hand tributary of Danube, are the Dyje and Becva rivers. The length of the Morava river is 353 km (284 km on Czech territory). The flow amounts to 109 m^3/s (downstream the Czech border). The altitude of the territory oscillates between 148 and 1,491 m above sea level. Average precipitation is 635 mm, fluctuating from 450 mm (Breclav) to 1,150 mm (Beskydy Mts.). About 54% area is made up by agricultural land (45% of it being arable land), forests cover 34%, 1.5% are urbanised areas and 1.4% is covered by water.

This basin's part is ecologically partly very valuable, with a high diversity of species and landscape types of the western Hercynian, eastern Carpathian and of the Pannonian (sub-)provinces. Reservoirs for floods retention have been constructed in the Dyje part of the basin, while in the rest of the area, the rate of water storage is still low. Groundwater is limited and concentrated in the floodplains.

There are new efforts to build across this area (as well as through the **Lower Morava SIA**) a major transeuropean waterway, the "Danube-Oder-Elbe Canal", designed to provide a navigable link between the Black Sea and the North and Baltic Seas. Its route would go from Vienna/Austria through Slovakia, the Czech Republic (Morava valley, upper Elbe and Oder valleys) to Germany (Elbe) and Poland (Oder). The canal would need some 20 dams and ship lifts within this SIA, affecting the hydro-regime and biodiversity of many protected wetlands along the Morava.

During the transition period, the industrial production in many enterprises has decreased while high development of small industrial plants, middle business services and also transportation has caused uncontrolled local pollution. The typical industries in the region (machinery, foodstuff, tanneries, wood processing and building) are mostly located in towns. The industrial enterprises are frequently connected to the small municipal sewerage system and wastewater treatment plants.

Water courses are polluted by receiving untreated wastewater from four key municipal hot spots in the middle Morava: Brno (via Svratka and Lower Dyje tributaries), Zlin, Uhereske Hradiste and Hodonin. The pollutants from the *municipalities* of Brno (390,000). Olomouc (105,000) and Zlin (83,000), the rural settlements and from *industries* include BOD_5 (about 4,000 tonnes per year), insoluble substances, NO_2, NH_4, phosphorus, zinc, mercury and organic substances. About 80% of population are supplied from the public water supply system and 71% of inhabitants are connected to sewerage systems but the waste water treatment plants are usually not equipped by efficient technologies for removal of nitrogen and phosphorus.

The area is affected by relatively high erosion caused mainly by intensive *agriculture*.

About 14% of the area are protected within the regional and supra-regional system of ecological stability: transfrontier national park Podyji/Thayatal (upper Dyje), seven protected landscape areas (the Palava and the White Carpathian Mts. PLA are also biosphere reserves), and 530 other protected areas and three Ramsar wetlands. Water recreation is concentrated on impounded reservoirs (Vranov, Brno and Nove Mlyny are most important). The wetland upstream of Hodonin was selected as for priority wetland restoration within the UNDP/GEF PRP. The wetlands of the Lower Dyje were already subject to GEF and EU-Phare restoration programmes.

5.2. Lower Morava

The lowlands of lower Morava SIA (380 km² between the mouth of the Dyje and the mouth into the Danube) represent the most fertile part of Slovakia. Untreated effluents of wastewater from the cities Senica, Myjava and from the upstream part of the Morava River Basin affect the quality of the lower Morava.

Significant municipal pollution sources are the waste water treatment plants of Malacky and of Devínska Nová Ves. Water pollution from *industrial* activities are the cement works in Rohožník, Slovhodváb Senica (fibre production: a high priority hot spot), the canneries in 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.

Intensive *agriculture* has significant impacts on the landscape and on the water management (pollution of soil and water or extreme soil erosion), due to excessive use of chemical substances, concentrated livestock farming, inappropriate use of land, and extensive forestry.

Improper agricultural, forestry and land management practices led to a lowering of the land retention capacity, to a high rate of land exposed to erosion, and to a reducing and straightening of the once meandering river bed. Considerable industrial consumption of water (including cooling water) which is not returned into water streams as well as landscape changes provoked by mining and quarrying further changed the complex water regime. That has a very negative impact on the quantity of groundwater and influences also the local climate (dry atmosphere, losing of fertility).

The predominant problem for surface waters in the Morava River Basin is the presence of nutrients (e.g. nitrogen and phosphorous compounds) that are transportable over long distances and cause eutrophication in stagnant surface waters. Only few lakes and short sections of upper water streams are suitable for bathing during the summer period, from others allergic reactions from bathing are known.

Biodiversity is also negatively affected because of the content of oxygen depletion due to eutrophication.

High concentration of nitrates in groundwaters made many wells and springs unsuitable for drinking. Though the quantities of applied fertilisers decreased over the last years due to their high costs, the concentration of nitrates at some groundwater resources for drinking water supply stagnated, locally it even increased. Organic pollutants - both biodegradable and chemically degradable - are also abundant. Some streams are polluted by heavy metals (zinc and mercury). Due to ecologically unsound agriculture, harmful substances like PCBs, nitrates, heavy metals etc. accumulate in the agricultural products and human food. Concentration of some of these substances locally exceeds national limits for concentration in food. Groundwater is affected by old industrial risks (toxic organic substances, oil, etc) that make some ground water resources unsuitable even for treatment.

The Morava river at Karlova Ves has also a significant impact (0,05%) on the salinity of the Danube. One major source of soluble substances is the viscose and polyethylene fibre production in the Slovak town of Senica (Slovhodvab company), affecting the water quality of Myjava river and its downstream reaches and users. Although the Myjava is a tributary to the lower Morava catchment area, an already polluted area, the loads coming from Slovhodvab company significantly increase the soluble solids concentration of the Morava. This hot spot brings also pollution due to the sludge disposal which causes transboundary effects (drainage water is recycled in the treatment plant) and because of highly corrosive features of the wastewater, through leakage of sewer pipes.

Large parts of the Morava floodplains belong to the Zahorie protected landscape area and Ramsar site. They were recently subject of GEF and EU-Phare restoration programmes. Similar activities are undertaken on Austrian side for nature protection (including the WWF floodplain forest nature

reserve at Marchegg with a big stork colony) and through a EU-Life wetland restoration programme. The Drösing forest was suggested for priority wetland restoration within the UNDP/GEF PRP.

5.3. Szigetköz

The Hungarian "Szigetköz" (together with the neighboring Slovakian "Zitny ostrov/Csalloköz") represents an area of about 29,000 ha, which comprises an exceptional, former Danube meandering zone around the low water bed. Until today, it is an internationally important wetland located along both banks of the regulated Danube, located in the very northwest of Hungary and only a few km south-east of Bratislava. The SIA is highly affected by the Gabcikovo power plant system with its diversion of more than 80% of Danube waters into the sealed Gabcikovo power canal since October 1992. This project is subject to a long-years bilateral conflict which is also being argued at the International Court of Justice in The Hague (no final decision taken yet; new bilateral negotiations are going on).

The SIA (total estimated size is 750 km²) is also subject to polluted waters stemming from upstream hot spots (Morava basin; Vienna and Bratislava municipalities and industry zones). The filtering capacity of the Danube riverbed and adjacent floodplain determines the quantity and quality of the water held in the huge alluvial cone of the Szigetköz/Zitny Ostrov, a floodplain area of some 30 km length and several km width, with a big layer of gravel and sand sediments several hundred metres thick. It represents one of the largest natural drinking water reservoirs in Europe and the supply area of cities and villages along both sides of the Danube. In order to preserve the role of the riverbed/floodplain in filtering and decomposing organic matter and toxics, it would be necessary to restore former river dynamics. Today, the main bed only receives 20% of the Danube discharge which is too little to enter into the side-arm system to allow large-scale infiltration and natural purification (only fluctuating waters ensure the required oxygen supply, the physical and biological self-purifying processes and the uptake of nutrients into biomass production).

The Impact Area includes small private drinking water wells and the agricultural production even several km away from the river which cannot benefit anymore from natural river and groundwater fluctuations but need public supply from deep wells and more irrigation. Under the hydro-geological conditions specific to the SIA, some scientists further predict large contamination to take place in the area around the Gabcikovo reservoir after the ongoing deposition of polluted silt with its anaerobic dynamics, the activation of iron and manganese, and the seeping in of toxic organic compounds.

The forests of the Szigetköz are an important source of timber. As a result of the Gabcikovo operation and river diversion, the belt of forest on the river banks is decaying and its productivity has decreased. The Szigetköz is also very rich in wetland species; including 60 protected species of plants and 80 % of Hungarian fish species, making it a traditional recreation and a new touristic area. Over the past years since the diversion of the Danube, signs of serious ecological degradation were reported both from the Szigetköz and the Zitny Ostrov. Since 1995, the artificial water input into the wetlands, which became fully disconnected from the river, could reduce the progress of damages, as bilateral monitoring showed. However, alien weeds and species favouring a distinctly drier climate are spreading and a number of animal wetland species (crustaceans, dragonflies) have already disappeared.

5.4. Danube Bend

The SIA (total estimated size is 350 km²) covers the direct catchment area along the river between Budapest and Nagymaros where the river turns from its eastern into a southern direction (Danube bend) and where the main bed is divided into two arms by the 30 km long, narrow Szentendre

island. The area is densely populated and partly urbanised region, ending in Budapest with 38% of population of Hungary. The Danube river has a medium flow in this stretch of approximately 2,300 m^3/s. The Danube gravel terrace serves as an important drinking water resource (series of bank-filtered wells). Already for over a century, water for drinking and industry in Budapest has been obtained in this way.

The upper end of the SIA was selected repeated times as site for the second dam of the Gabcikovo-Nagymaros Barrage System. Its construction would very much affect the downstream wells along the Danube banks. However, in December 1997, the area around Nagymaros became part of the new Danube-Ipel national park.

Main problems for the SIA stem from the upstream domestic (Györ, Komarom) and foreign pollution sources (Bratislava, tributaries Morava, Vah, Nitra and Hron) and contributes to the supply problems of the drinking water in Budapest

5.5. Gemenc - Kopacki Rit

This SIA (total estimated size is 1980 km²) forms, apart from the delta, probably the internationally most important, interconnected wetland along the entire Danube. It is subdivided into the Gemenc-Béda-Karapancsa area in the north and the Kopacki Rit which forms the confluence between the Drava and the Danube rivers. This area was selected under the UNDP/GEF PRP as priority wetland for restoration and it is of transboundary character, as being located between southern Hungary, eastern Croatia and north-western Serbia (Federal Republic of Yugoslavia).

The 24,000 ha area in Hungary is already a focal point for an initial wetland project involving restoration, management and conservation for the largest remaining floodplain forest along the Danube. White-tailed Eagles, Black Storks and numerous fish depend on this important area for survival. A WWF campaign in the 1990s helped to gain designation of the area as a national park, to start necessary rehabilitation of original river dynamics (reconnection of former meanders), and to improve habitat and species diversity. In 1996, WWF started to reintroduce the beaver into the sie-arms and oxbow-lakes.

The Gemenc floodplain forest is located near the Hungarian city of Baja and forms an area larger than the size of Liechtenstein. After river regulation and subsequent bed erosion, Gemenc is suffering from a lack of water. A proposal for national park management plan for the 18,000 ha Gemenc area was tabled by WWF in 1995. The Béda-Karapancsa area (6,000 ha) near the city of Mohacs forms the link between Gemenc and the Kopacki Rit.

The Danube-connected part of the SIA is impacted by various Hungarian hot spots: The biggest is Budapest where the existing two biological treatment plants can cope only with 16% of the total dry weather wastewater flow, i.e. 84% of the waste-waters collected by the sewer system go into the Danube, 40% of this sewage comes from industry (mainly chemical, machinery, leather, paper and food industry, as well as power generation plants). An additional river pollution effect happens when the storm-water overflows the sewer system. The Danube water downstream of Budapest is not suitable for recreational purposes because of IV class microbiological quality.

Other big pollution sources are the cities of Dunaújvaros (40,000 inhabitants; paper industry and iron works), Százhalombatta (oil industry plant), Paks and Mohács as well as - via Sio and Kapos rivers and Sárviz canal - by Vesprem, Székesfehévár, Siófok (Balaton tourism and recreation industry), Szekszárd and Kaposvár.

The Kopacki Rit is the adjacent and next, internationally important nature reserve (mouth of the Drava into the Danube). It is also a very rich floodplain forest with various vauable water bodies which further upstream includes precious floodplain meadows along the Lower Drava.

The Drava is impacted by hot spots (lack of sewage treatment) in the cities of Pécs (Hungary) and of Osijek, Belisce and Bilje (Croatia). 909,000 people live in this area (50% urban); Osijek as the centre is the only city over 100,000 inhabitants. The region is still affected by the war; typical traditional industries (mostly based on local mineral and wood resources) still work much below their capacity.

5.6. Middle Drava

The Slovenian part of the Drava river can be divided into the following parts: alpine and karst river basin, subalpine and non-karstic area of the smaller basins of Pohorje and Kozjak, subalpine and sub-pannonic river basins of Dravinjske, some smaller water stream river basin and the gravelled Drava-Ptuj field (groundwater area). The latter is a still very valuable river stretch and floodplain, even though it is affected by a river diversion.

The Sub-river Basin Area consists of the Drava (323 km in Croatia) and the Danube (188 km in Croatia) rivers, covering 9,304 km^2 (16%) of the country. The relief consists mostly of lowlands and valleys; the western part of the sub-basin, the mountain ridge of Bilogora, has the highest peak at 307 metres. The climate is mild-continental with an average annual temperature of 10.9^oC and an average rainfall of 600-700 mm/year.

The SIA (total estimated size is 450 km²) stretches from Maribor down beyond the border with Croatia.

With 415,000 inhabitants (21% of the state) and a population density of over 74 people/km^2 (without Maribor), the area is below the Slovenian average (with Maribor it is with 121/km² above average). The most polluting industries are old lead mines and storage of used batteries, aluminium producing industries and pesticide factories. Intensive agriculture (mineral fertilisers and mis-use of pesticides, waste water from fish farms and regular farms etc.) lead to water pollution.

Maribor is the second largest city in Slovenia with a population of 160,000. It was one of the largest industrial centres of former Yugoslavia, having major environmental problems in the 1980s and 1990s. As the city has yet not built a waste water treatment plant, all wastewater is drained into the Drava. The city sewage system is in a very poor state, and refuse is drained into the Drava River at 20 major sites. Both in Maribor and Ptuj, near the Croatian border, less than half of the inhabitants are connected to a sewage system. Pollution originating from Slovenia may have effect on water supply in Croatia (from underground sources).

On Croatian side, Varazdin is a municipal pollution high priority hot spot.

The Drava is extensively used in Croatia for hydropower (accumulation of heavy metals in reservoir sediments), commercial fisheries and for urban and industrial water supply. The river also has important amenity and conservation value with the Kopacki Rit wetland at its confluence with the Danube.

5.7. Lower Mura - Drava

The Mura and Drava both rise in Austrian Alps and pass through Slovenia into Croatia. With only 7% (1,376 km^2) of the Slovenian territory is the Mura sub-basin the smallest of this country. It comprises mainly agricultural sub-pannonian landscape ecosystems of plains and hills. Large stretches of the Mura are still very intact floodplain areas (along the borderlines with Austria and Hungary).

The Mura in Slovenia, Croatia and Hungary, and the Drava in Croatia and Hungary face interrupted sediment transport and erosion of the river bed as a result of hydropower dam operation in Austria, Slovenia and Croatia, and of canalisation of the rivers. The water level went down by 1-

2 m, gradually reducing the amount of water flowing in old and disconnected river branches. This reduced the neighbouring groundwater levels and increased the risk of eutrophication in these branches, it also reduced their capacity to provide irrigation water and for natural purification and dilution of waste waters.

Diffuse sources of pollution are major problems in the Mura and Drava catchments. In Austria, Slovenia and Croatia, the main contaminants are nitrate and pesticides (atrazine) from agriculture, and heavy metals from old solid waste disposals. Limits on the application of fertilisers and pesticides are only partly effective. In Croatia, some aquifers as sources of public supply were even lost. Here, diffuse sources contribute 37% of the N load, 14% of phosphate, 46% of oil and 25% of BOD.

The SIA has a total estimated size is 1410 km² and goes from the Austrian border downstream of the confluence with the Drava.

The main uses of the **Drava and Mura in Austria** are power generation and recreation. Water for public supply and irrigation are obtained from other surface and groundwater resources. Peak power generation on the middle Drava (SLO, HR) results in surges which can have a damaging effect on river habitats. Water quality considerably improved after construction of WWTP.

The population density along the **Slovenian Mura** is with 97 inhabitants/km^2 below the average, some human activities resulted in 3 municipal, 3 agricultural (farms Podgrad, Nemscak and Jezera) and 2 industrial high priority Hot Spots (Paloma pulp & paper plant; Pomurka food industry). Rapidly growing (spa) tourism in this region has become a very important social-economic factor but also an expanding risk for the intact nature (e.g. disposal of thermal waters). Illegal industrial dump sites, inappropriate locations of dump fills, insufficient water treatment in the waste water treatment plants (only 23% of people are connected; Murska Sobota, Lendava, Ljutomer) and many other human activities (e.g. pig farm Podgrad near the Austrian border; inappropriate slurry disposal; food processing industry) are pressures for the environment along the Slovenian Mura and its shallow groundwater. The Mura then briefly follows the border between Slovenia and Croatia and then the Croatian-Hungarian border up to its confluence with the Drava. The Drava follows the border with Hungary for some 150 km before leaving it and joining the Danube some 50 km further downstream at rkm 1383. The Drava is categorised as a high-mountain catchment.

There was an interest in exploiting the Mura for hydropower but at present there is only one plan to exploit the Drava border river (project “Novo Virje”, to be located on Croatian territiory) in this way, which is disputed from Hungary and by environmentalists.

The **Slovenian Drava** is used for hydropower, water supply via bankside infiltration and for recreation and amenity. At certain places, the river cannot safely be used for bathing due to microbiological contamination from urban wastewater discharges.

The **Hungarian Drava** is used for urban and industrial water supply, control of groundwater level, for nature protection and nature development (i.a. “Duna-Drava national park”). Nitrate and ammonia from arable farming and animal farms in Hungary heavily contaminate the groundwater and the Drava tributaries; in some cases, waste leachate is seeping into the groundwater. Hungary considers the Drava a very important future source of water (through bankside filtration) which it does not use at present.

The **Croatian Drava** is near the confluence with the Danube subject to municipal (Osijek) and industrial (Belisce paper industry; Osijek sugar factory) high priority hot spots.

For along time, the entire border line between Hungary and former Yugoslavia was protected as a restricted area. It has therefore remained relatively unspoiled by development. Today, land (re-)privatisation means that some important wetlands will fall into private hands but there is as yet no law to oblige private owners to take the necessary steps to protect conservation areas.

All the Mura and Drava wetlands face threats that include river regulation, planned hydro-electric power plant schemes, drainage, pollution and reduced rainfall leading to lower water levels in recent years but growing public concern has helped to preserve many wetlands.

The major transboundary issue on the Drava is hydropower generation and its effect on flow dynamcis, ex- and infultration of waters and sediment transport. Other power plants demonstrate negative impacts like the deepening of the riverbed, damages from surges and low flows and the consequences particularly on wetlands, groundwater and river corridor ecology. Trans-boundary pollution is not perceived as a serious problem. Under the initiative of "Euronatur", a transboundary working group prepared alternative plans to establish a big "Mura-Drava biosphere reserve" between Austria and the Kopacki Rit which wants to promote and establish sustainable economic activities (ecotourism, biological farming).

In Slovenia, the Verzej-Gibina wetland and the Crni log wetlands are threatened by rising water levels following the construction of a reservoir nearby.

5.8. Danube at Novi Sad

The total watercourse of the Danube in the Federal Republic of Yugoslavia is 583 km. On this territory it receives water from several large tributaries: Drava, Sava, Velike Morava, Mlava, Pek and Timok as right tributaries, as well as Tisza, Timis and Nera as left tributaries. The Danube Corridor River Basin Area extents on 11,610 km^2 in Yugoslavia. It comprise lowlands (Voijvodina region), hilly and mountain terrain (watersheds of rivers Timok, Pek and Mlava) as well as Djerdap gorge (Iron Gates). Danube enters Yugoslavia with average of 2,263 m^3/s and leaves it with an average discharge of 5,500 m^3/s (main contributors are Sava and Tisza).

The left bank of the Danube is fully embanked, in addition to a part of the right bank, since these regions were often flooded in the past (total length of embankments is 1,328 km). Regulation of the river has also cut the main stream from the former branches, stagnant, swampy and marshy areas which had an adverse effect on the biodiversity.

The Novi Sad SIA (total estimated size is 160 km^2) is the city's water resource zone which is affected by pollution loads from the Danube's upstream reaches. In addition, the municipality lacks sufficient waste water treatment (high priority hot spot). Thus, the water supply and recreational use are limited.

5.9. Upper Tisa

The upstream part of the Tisa/Tysa/Tisza river basin, located on the territory of the Rakhiv district/Zakarpatsky region of Ukraine, covers an area of about 200 km^2 and it is characterised by a ramified hydrographic net, a mild climate with large precipitation (1,000-1,600 mm/year) and a considerable steepness of the mountain slopes. Ecosystems of the riverheads are very vulnerable to erosion; the change of the ecological balance here leads to a destabilisation of the whole river system.

The SIA (total estimated size is 1230 km^2) is marked by intensive forest fellings, a transformation of forests into agricultural lands, a lowering of the upper forest line and a degradation of mountain meadows. During the last decades, the wooded portion of the mountain slopes in the Upper Tysa basin went down to 55%, changing the centuries-old forest structure. Today, 40% of the forested area is covered with saplings (young growth), 33% with mid-aged plantations and 14% with mature and very old trees.

The southern slope of the Ukrainian Carpathians is characterised by strong erosion. All rivers of the Transcarpathian water management region are subject to many floods (8-10 per year), including catastrophic floods, mud flows and considerable erosion. This lead to great losses in many areas in Zakarpattya (about 98% of the agricultural lands of Rakhiv district erode), northern Romania and Hungary.

Biggest cities are Beregovo (31,000 inhabitants) and Vinogradov (26,000 inhab.) with multi-branch industries in the lowlands. Hot spots are the timber processing industries in Rakhiv, Velyky Bychkiv and Teresva in the mountain river stretch (source area) where the Tisa forms over some 60 km the border with Romania (affected city is Sighetu Marmatiei with 45,000 inhabitants). They emit phenolic and chlorinated compounds and nutrients, affecting both human health (drinking water supply) and biodiversity.

5.10. Somes

The SIA (total estimated size is 4,980 km²) is very large, starting at the upper Somes at the city of Cluj-Napoca in the central Eastern Carpathians and ending in northern Hungary at the confluence with the Tisza. The SIA also includes the lower Crasna tributary downstream from Zalau.

The **Somes** (Hungarian name: Szamos) River is an important tributary for the Tisza and one of the largest rivers in Romania (376 km; average annual discharge: 121 m^3/s). The catchment area is 15,740 km^2 which starts in the Eastern Carpathians (city of Cluj-Napoca with 330,000 inhabitants; industrial hot spots are Terepia and Clujana) and crosses hilly lowlands which is an important mining area, including the two large cities Baia Mare and Satu Mare with each over 125,000 inhabitants. Baia Mare is the largest processing centre for non-ferrous minerals (producing electrolytic copper, lead, sulphurous acid and inorganic compounds) and has an important chemical (sulphuric acid) and mining industry(Phoenix). All three cities mix industrial and municipal waste waters.

On the **Crasna** tributary, the biggest municipal hot spot is Zalau (71,000 inhabitants) where the river water quality varies from I to III. Food industry on the river adds organic pollution.

The water quality of the Tisza suffers drastic changes due to the tributaries Tur (heavy metals in untreated mine waters), Somes and Crasna, endangering the drinking water supply and intensive fruit production in Hungary. Domestic Hungarian pollution includes intensive agriculture (manure), municipal and chemical waste waters (Borsodchem; high priority hot spot Somes Dej).

The Romanian stretch of the Somes river carries heavy metals and salts from industrial and mining activities. Urban waste and agricultural runoff discharge (pig farms) straight into the river. The water quality of the Somes river is influenced by organic contents, i.e. various forms of nitrogen and phosphorus, and by dissolved iron and sodium. Further, the area is frequently subjected to accidental pollution incidents, mainly caused by mineral oil and its products. The level of pollution and the seasonal discharge variation play a major role for the water quality downstream of the confluence. Major emissions: SO_2, SO_3 aerosols with a high concentration of lead, arsenic, cadmium are dissipated in the air and affect the ambient air (the national standards are exceeded in 50% of the samples). The water quality is affected by suspensions, which contain heavy metals and inorganic compounds.

Aerosols, acid rains and heavy metals in an area of 70 km² affect the soil and forest. River biodiversity (especially fish stocks) is also heavily impacted. The flood regime is also greatly influenced by large reservoirs built in the upper area of Tisa basin (Ukraine, Slovakia, Romania).

The Firiza non-ferrous metallurgical factory (at a tertiary tributary of Somes) is specialised in producing the lead concentrates manganese and grey iron foundry, and the Zlatna non-ferrous metallurgical factory in foundered copper, sulphurous acid and inorganic compounds.

5.11. Latorita

The Transcarpathian Sub-river Basin Area in Ukraine (Zakarpatsky region) is formed by the Uzh and Latorycja rivers which further flow into Slovakia and via Bodrog river eventually into the Tisa river in Hungary. Climate-soil conditions in the transcarpathian lowland favour the development of agriculture. The forests of the region have high water regulating and protecting functions. All rivers are characterised by heavy floods. 1.2 million people live in this Sub-river Basin Area which corresponds to a population density of 89 people/km^2 (without considering the city of Uchgorod).

From economic viewpoint, the Transcarpathian Region is of industrial-agrarian type (leading branches are machine construction and metal processing), with Hot Spots mainly in the industry and municipal category.

Main problem of the SIA (total estimated size is 410 km²) is the WWTP of the city of Mukachevo (90,000 inhabitants). The causes for the weakness in waste water treatment are the poor operation of the existing plant and the difficulties in funding an extension of its insufficient treatment capacity. Waste waters with hazardous substances and chemicals from frequent accidental oil spills are discharged into the Latorita and affect its water quality and biodiversity. The existing lack of rural waste treatment largely contributes to the deterioration of the ecosystem and to increased health risks. Moreover, inappropriate forestry practices, including artificial deforestation, cause problems to the water balance and produce severe economic losses.

5.12. Uzh

The SIA (total estimated size is 380 km²) stretches from the greater Uzhgorod area downstream the Uzh river into eastern Slovakia (confluence with the Latorita). The Uzh river belongs to the Transcarpatian Water Management Region (Tisa river basin) with floods mainly in winter. The area is an industrial-agrarian region with a high developing level of the recreation industry.

The largest town is Uzhgorod (125,000 inhabitants). The capacity of its municipal wastewater treatment plant cannot ensure the treatment of the wastewater amounts and therefore discharges millions of m^3 of untreated wastewaters annually via Uzh river into Tisa and Latorytsya. The sewer system is in poor condition but collects discharges of e.g. chemical, machine construction, food and metal processing plants which are connected to the municipal waste waters treatment plants, which leads to uncontrolled discharges of waste waters with severe environmental and transboundary effects, including nutrient and bacteriological pollution.

The already operational oil pipelines poses a direct threat of oil pollution to the Uzh River, with repeated severe transboundary water contamination. Moreover, the air pollution represents another concern. These effects are quantified in relation to the ecosystem deterioration, aquatic life damaged and recreation and sport fishing affected.

5.13. Bodrog - Tisa

The Bodrog-Tisa SIA (total estimated size is 610 km²) is located in the northern part of the Tisa river basin, on the Slovak and Hungarian territory extending from the confluence with the Latoriza down the beyond the confluence with the Tisza (= Hungarian name). Bodrog river has a catchment of 11,356 km² (40% in Slovakia) in the Carpathian mountains which is dominated by highlands and lowlands and which is subject to spring and summer floods. Bodrog is formed by the confluence of the Latorica and Ondava rivers which makes its actual length on Slovak territory very small (16 km). It is a homogeneous unit largely affected by anthropological activities, including intensive agricultural activities (fertilisers or pesticides), and subsequent pollution of groundwater and surface drinking waters.

Bodrog belongs to the most polluted rivers, as a result of municipal and industrial waste waters. The waste water treatment plant Bukocel-Hencovce wood industry and the chemical plant Chemko Strazske are hot spots discharging into the Ondava stream. Several WWTP are still under construction (e.g. Bardejov, Svidnik and Humenné). Untreated waste waters cause severe transboundary impacts on downstream users on Hungary.

Railway reloading places in Slovakia (Cierna and Tisou), Hungary (Zahony) and Ukraine (Cop Mukacevo) pollute surface waters and groundwater with oil products. Main industry are mining activities and ore processing. The chemical industry and thermal power plants also cause contamination. The whole area (90%) needs ample interventions for ecological restoration and revitalisation.

The environmental problems include high health hazards, soil degradation, reduced biodiversity, affected forest ecosystem and wetlands and decreased water level. Some parts of this significant impact area are seismically active.

The lower Bodrog and its confluence with the Tisza is suggested as a priority area for wetland restoration.

5.14. Hornad – Sajo

The border region in eastern Slovakia and northern Hungary is characterised by medium high mountains (Inner Carpathians) and plains with summer rainfall and upper river discharge maxima in spring. Hornad is the biggest tributary (catchment area of 5,436 km²) of the Slana/Sajo river (catchment area of 11,900 km²).

Municipal infrastructure in Slovakia is much less developed than in other countries of middle Danube region. Economic condition in this part has resulted in the closure of factories and a reduction in the use of fertilisers with measurable improvements in water quality. One example is given by the closure of paper mill Gomorhorka, Slovakia, near the state border at the Sajo river, a Tisza tributary, where water quality improved. However, a significant portion of Hornad and Sajo (Slana) rivers are in class III or IV quality.

The SIA (total estimated size is 2,210 km²) includes the river stretches of the Hornad downstream from Kosice and of the Slana downstream from Roznava, and ends at the mouth into the Tisza (Tiszújváros).

Most of the pollution on **Hornad** river is coming from urban and industrial wastewater discharges, waste dumps, agriculture, erosion and accidents. The part on Slovakian territory includes the second largest city, Kosice (250,000 inhabitants). Main source of pollution of the Kosice area is unsatisfactorily treated waste water, discharged into Hornad river from the WWTP, due to overloading of biological treatment, insufficient sludge disposal capacities, an inefficient sewerage system and simultaneous treatment of phenol waste water from VSZ Kosice. Two WWTPs in Kosice and Krompachy are still under copnstruction due to lack of financial means.

Other municipal discharges are the WWTP of Spisska Nova Ves and Presov. Other industrial pollution comes from mine and ore processing activities (Krompachy and Kosice stellf plant) as well as from food processing (Sabinov and Presov). Furthermore, agriculture is an important pollution source for the Hornad waters.

Over the last years **Sajo** river carried considerably less pollution than in the past, apart from some peak concentrations of ammonium, nitrit and phosphate ion and hydrocarbon concentration. Water quality is affected by Slovak ore mining and processing and by sugar and paper plants. At the entrance in Slovakia, Sajo river has class III for oxygen and of class IV for nutrient parameters. Major direct sources of pollution in the Sajo valley are towns Kazincbarcika (31,500 m^3/d, including Borsodchem industry) and Miskolc (66,600 m^3/d). Large chemical industry is at

Sajóbábony and at Tiszaujváros (at confluence). Untreated waste waters are discharged from food industry. Below the town of Miskolc the communal effluents cause drastic drops in the DO and O saturation levels. The water classifies as class V in terms of oxygen parameters and nutrients.

The natural runoff regime of the Slana in Slovakia is affected by the Hnilec power plant.

5.15. Körös

The Körös River Basin covers an area of 27,537 km^2 with about half in western Romania (Romanian name: Cris) and one half in eastern Hungary. The catchment and the SIA (total estimated size is 3,160 km²) has a fan shaped outline with the rivers Barcau, Rapid Cris, Black Cris and White Cris in Romania merging after the border into a triple Körös in Hungary. Although the head waters are in the Carpathian mountains, rising to an elevation of 1,849 m, half of the catchment in Romania (crossing mining areas) and all of the Hungarian part are low agricultural plains, including a part of what used to be the Hungarian Puszta.

The Romanian part of the basin faces severe pollution problems in four areas: the city of Oradea (221,000 inhabitants), with fifteen industrial enterprises (e.g. high priority hot spot Sinteza) connected to the municipal treatment plant; Suplacu on the upper Barcau river (one refinery and one petroleum extraction plant), Brad on the upper reach of the White Cris (non-ferrous mining) and the high priority hot spot „Beius-Stei" uranium mines on the Rapid Cris rivers. The Romanian arms of the Cris river carry heavy metals and salts from industrial and mining activities. Urban waste and agricultural runoff discharge straight into river.

The area is frequently subjected to accidental water pollution incidents mainly caused by mineral oil and its products (Barcau plant).

On the Hungarian part of the basin, three principal pollution sources have been identified. These are: the municipalities of Debrecen, and, on the Körös river, Bekescaba and Gyula, all with substantial industrial discharges into the municipal network. In the whole-defined SIA the biodiversity is seriously being affected.

5.16. Upper Mures

Mures is with 761 km the longest river in Romania (except for the Danube) and the third biggest in annual discharge (157 m³/s). The catchment of 27,890 km² (2nd after Siret river) stretches from the springs in the Eastern Carpathians and, after crossing the Transilvanian Tableland and bypassing the South Carpathians, ends in the Tisa plain. The river connects four big cities (Targu Mures, Arad, Alba Iulia and Deva) with significant industrial activities and important agricultural lands. The Mures is also a very important water resource for many uses alongside its course up to the Tisza.

The Upper Mures SIA (total estimated size is 1,560 km²) goes from Tg. Mures downstream to Alba Iulia-Sebes.

Targu Mures is an important city (165,000 inhabitants) located in the upper Mures river. An important source of pollution in the Tg. Mures area is the AZOMURES SA chemical company (High Priority Hot Spot; also Manpel leather industry). Major emissions are ammonia, NOx, and chemical fertiliser powder which, together with urea, chlorides, sulphates and arsenic affect the downstream water quality.

The same situation exists near the settlement of Ocna Mures where similar chemical activities are developed.

SC Sometra SA, located in the city of Copsa Mica at the Tarnava tributary, is a High Priority Hot Spot. This enterprise produces zinc and lead obtained from mining concentrates, with revaluation of accompanying metals (cadmium, bismuth, antimony, copper, gold and silver) and production of derivatives (copper powder, zinc sulphate, sodium antinomies etc.), and also Waltz oxide and sulphuric acid. The enterprise was set up in 1939 for zinc production; between 1948-1960 a development process was undertaken, increasing the productivity.

These pollution sources, together with animal farms, affect human health and biological productivity of the area.

5.17. Middle Mures

The SIA (total estimated size is 410 km²) identified includes several hot spots around the city of Hunedoara (81,000 inhabitants) and the confluence with the Siret tributary. The population density varies from 48/km^2 to 83/km$^{2.}$ The water quality of the Mures river is influenced by the various pollution sources: Untreated or partly treated waste waters (partly high priority hot spots!) coming from industry (Siderurgica-Hunedoara; Abroad and Diva mining exploitation industry; Favior Orastie leather industry) together with the low performance of the waste waters treatment plants of municipalities (Abrud, Deva, Hunedoara, Calan, etc) pose a significant and constant risk to Romania and Hungary.

In small localities within this area, contamination of surface and groundwaters used for abstraction was mainly due to the lack of appropriate methods for disposal of liquid and solid industrial wastes. The link between population and health hazards comes from inadequate water treatment and supply processes, including improper and ineffective operation of the waste water treatment plants,. This was worsened by the lack of pre-treatment facilities at industrial units, with increased loads of nutrients and toxic pollutants for the river. The environmental effects include losses of biodiversity; depreciation of water quality and economic losses.

5.18. Lower Mures - Szeged

This SIA (total estimated size is 2,860 km²) marks the last stretch of the Mures when passing through the big city of Arad (190,000 inhabitants) at the border into the Tisza plain and to the city of Szeged (180,000 inhabitants) at the confluence with the Tisza in southern Hungary. This is the warmest region in Hungary with the highest number of sunny hours and little rainfall (500-700 mm). Only 20% of the watershed of the Mures River are in Hungary, 80% is in Romania and the river has extremely variable discharges. The rivers have lower basin characteristics in this region. Subsurface waters are of good quality.

The polluted conditions of the Mures River also determine the water quality of the Tisza in this region. The pollutants of Mures are ammonia, nitrite-nitrate, high heavy metal loads and high salinity. Arad has fertiliser and food industry (high priority hot spot “Indagrara”), leading to high nutrient loads and oxygen depletion.

Characteristic for the agricultural production in this region are fruit production (with chemicals) and livestock farming (liquid manure). Significant units of food industry are located in this region, i.e. canning factories (untreated wastewater) as well as light industry (textile, rope). Petrol industry is also important. Large municipal wastewater discharges from the town of Szeged are mixed with industrial wastewater (after a simple mechanical treatment). At present, no wastewater treatment plant is operating in Szeged but it is under construction.

The Szeged effluent (34,700 m^3/day) from the public sewer system represents high emission loads for the lower Tisza (5,130 t/a COD_{cr}, 469-t/a oil compounds and 307 t/a NH_4-N).

The special local condition with the confluence of the highly polluted Maros/Mures river from Romania into Tisza just upstream of the town increases the unfavourable situation. The quality of the Tisza river deteriorates to the worst V quality class (microbiological parameters) and IV class (nutrient compounds) downstream from Szeged. This emission represents in Hungary the only direct and permanent transboundary pollution impact towards a downstream riparian country.

5.19. Palic & Ludos Lakes

The absence of an appropriate legal framework, the collapse of historical market and lack of environmental knowledge and awareness led to serious environmental consequences in areas of industrial concentrations, including Subotica and Keres creek. Now, as the country is in a process of economic transition, and the industry is under restructuring and rehabilitation, it can be expected that many industrial sectors will be privatised. This process has to be undertaken in such manner to allow smooth transition to environmentally friendly industrial, mining and energy production activities. The value of wetlands in reducing pollution inputs from agricultural sector and municipality of Subotica was underestimated so far. As a consequence, the nutrient level increased, the ecosystem was damaged (birds reserve), and the river water quality was affected.

The SIA (total estimated size is 330 km²) of the Palic and Ludos lakes is a Ramsar-protected wetland downstream of the city of Subotica. The municipal sewage and sludge is deposited in theses lakes, leading to extreme nutrient levels and anoxia (anaerobic conditions in sediments). This also limits the recreational availability and damages the bird sanctuary. The outlet of the lakes is connected by the Keres creek with the Tisza.

5.20. Upper Banat

This SIA (total estimated size is 3,290 km²) including Banat and Bačka counties downstream of the Hungarian border is predominantly a lowland with low precipitation (<600 mm) and very high evapo-transpiration. Here, the Tisza with an average discharge of 794 m³/s drains the Pannonian Basin which is the largest of the sediment-filled post-orogenic basins of the alpine region.

Human interference includes intensive flood protection embankments (269 km long) – cutting off former river branches, floodplain meadows and other wetlands from the main bed. Due to excessive abstraction, ground water reserves are continuously declining in the region of northern Banat – the groundwater level of the second water-bearing stratum fell at some points by 10 to 27 m over the past ten or so years. Therefore, the pollution of the Tisza, which can potentially be used for domestic water supply, poses a serious problem in the region. Estimated water quantity abstracted for water supply along the Yugoslav Tisa during 1997 was 93 million m³/yr in urban and 19 million m³/yr in rural areas. Municipal wastewater discharge was estimated on 84 million m^3/yr for 1997. Less then 50% of urban population is connected to public sewer systems while septic tanks are widely used. Furthermore, open dumps for municipal and industrial solid waste are general characteristics of this area. The environmental effects include limited water supply, increased soil pollution and reduced biodiversity (fish kills, algal blooms), mainly as a result of the cumulative impact of upstream located hot spots.

Part of the area was included in the list of priority wetlands for restoration under the GEF/UNDP PRP programme.

5.21. Vrbas - DTD Canal

This SIA (total estimated size is 290 km²) is characterised by an agricultural hot spot (high priority) at Vrbas (western Banat), which is linked further downstream with the important artificial irrigation and drainage system , the “Danube – Tisza-Danube Canal”. The total length of waterways along

channels is over 600 Km. DTD provides an east-west flow of irrigation waters in this area which naturally has a north-south drainage direction. Thus, the DTD canal dissects the hydrological system and even provides near the city of Zrenjanin a link with the Romanian city of Timisoara (via Bega canal). At Novi Becej, the Tisza is dammed to allow the passing of the DTD canal and its irrigation system. This dam slowed down the Tisa flow and changed the physical, chemical and biological characteristics of the region. Transport infrastructure is also well developed over the 168 km of waterways on the Tisa.

The Banat is dominated by large pig and cattle farms, intensive agriculture and carp ponds. Major non-point sources of wastes include urban and agricultural runoff. The absence of wastewater treatment facilities at the six large capacity farms (over 20,000 fatlings per cycle), the biggest at the community of Vrbas (DP "Carnex Farmakop"), brings a high risk for water quality in this significant impact area. Effects of surface water quality on sensitive ecosystems are influenced by cumulative contribution of various municipal and industrial waste waters.

Modifications in water flow regime and quality have the greatest effect on wetlands which are sensitive ecosystems and who depend on water. The wastewater discharges have dramatic effects on the population of fish and other aquatic species, and plants. Nutrients form the municipalities and agricultural runoff accelerate the pollution process, making significant demands for dissolved oxygen. Salting of soils is another negative effect of intensive land uses. Finally, the oxygen depletion create anoxic conditions in the deeper part of the water bodies in the area, affecting many types of fish.

5.22. Middle Banat - Bega & Birzava

The Middle Banat SIA (total estimated size is 3,680 km²) in north-western Yugoslavia is mainly impacted by two Romanian zones, one around Timisoara and the other further south at Resita. Frequent accidental and regular pollutions with organic substances affect the water supply.

The town of Timisoara (340,000 inhabitants) is located in the western part of Romania in the area called Banat.. The Timis, Bega, and Poganis rivers as well as Bega canal (coming from the city area) drain south-westward towards Serbia. Timisoara has machinery, textile, chemical, food and leather industry. Deta and Manastur are timber centres, and other building materials are manufactured in Carpinis and Jimbolia. Textiles and foodstuffs are produced in Lugoj, Sînnicolau Mare and Buzias. Lignite mines operate in Sinersig. Agricultural activities consist of livestock raising and cereal and vineyard cultivation.

While the **Timis** River is springing from Southern Carpathians and flows directly into the Danube, downstream Belgrade, the **Bega** canal goes into the middle Banat into the Yugoslav Tisa river just few km upstream of ist mouth into the Danube. Timisoara is affecting the Bega and Timis rivers mainly by diffuse pollution from pig farms and agricultural activities; COMSUIN Birda, COMTIM-Timisoara, SUINPROD-Berzevoia, SUINPROD Gataia representing the main sources of pollution.

The city of Resita (95,000 inhabitants) in south-western Romania is connected by the **Birzava** river with Yugoslavia and the Middle Banat where it flows into the Timis river. The Resita county's agricultural activities include livestock raising, cereal and fruit cultivation. Also, iron, manganese, feldspat, pyrite, coal and anthracite mines operate in the county, and marble is quarried near Ruschita. Resita has also metal-products and machinery industries. The ironworks and steelworks of Resita were modernised, and there are several associated heavy-engineering works and a factory producing diesel engines for railway locomotives. The city is close to the coal field centred on Anina and uses local iron ore from Dognecea and Ocna de Fier. Manganese mined in the area produces a small margin for export.

Water quality of the Birzava river decreased from I river class to II due to industrial pollution and from the municipalities (bacteriological, COD and heavy metal loads), with impact down to the Yugoslav Banat area.

5.23. Upper Sava

With a length of 861 km and a catchment of 87,996 km^2, the Sava river is the only important river having its sources in the mountains of Slovenia. It passes through Croatia before forming the border between Croatia and Bosnia Herzegovina, and then shortly between BIH and FR-YU before it joins the Danube at Beograd.

The Upper Sava SIA (total estimated size is 670 km²) includes the Slovenian river stretch between Ljubljana and the Croatian border. All Slovenian Sava landscapes units include high mountains (mainly karstic alpine area), an extensive, mainly karstic sub-alpine region with the basins of Ljubljana and Celje (Savinja tributary), and the a small part of the sub-pannonian region. The catchment area is 11,734 km² (58% of Slovenia) hosts 1.2 million people, the average runoff is 290 m³7s with spring/autumn maxima and winter minima. The major wetland "Ljubljanske Barje" is close to the capital Ljubljana. The population is over 1.2 million inhabitants (60% of the country including the capital: 103 people/km²) and the population density is at 77 people/km^2 (without the over 300,000 people of Ljubljana). 84% of the inhabitants are connected to public water supply but only 19% are connected to – mostly combined - waste water treatment.

The Sava is a vital resource for Slovenia, but the water quality is affected by several hot spots. Surface and groundwater are the final recipient of the pollution transported by municipalities (Ljubljana, Domzale, Novo Mesto, Celje and Vedenje) located in this Significant Impact Area, with inadequate treatment of wastewater. The lack of nutrient removal and disinfecting capacities in the waste water treatment cause transboundary effects of eutrophication up to the hydropower impoundments near Croatia, or the absence of treatment facilities in the municipality of Celje (50,000 inhabitants) which affects the water users of Savinja and Sava rivers (including the water supply of Zagreb) represent main causes of pollution in this area. Industrial activities with little or no treatment of waste and production waters are Vrhnika (leather industry), ICEC Krsko (paper factory) and the breweries in Ljubljana and Lasko.

The planned construction of new Sava hydropower plants will increase the water temperature (cooling waters from Krsko nuclear power plant) and catch contaminated sediments. Adverse effects will further include a more damaged river ecosystem, especially for fisheries and recreation.

5.24. Sulta

The Sutla SIA (total estimated size is 230 km²) refers to the middle Sava's border tributary between Slovenia and Croatia, entering just upstream the city of Zagreb.

The Suta (Slovene name: Sotla) river basin belongs to the pannonic world. Its average runoff is 20 m^3/s. 10% of the dynamic stores of groundwater in the Sava river basin are also located in Sutla river basin.

The lack of waste water treatment plant in Rogaska Slatina (SLO), the absence of any nutrient removal and of disinfecting facilities cause sanitary pollution, increased levels of BOD and COD in the receiving waters Sutla, Sava and in the lake Vonarska. Increased concentrations of phosphorus and nitrogen result in latent eutrophication of the Sotla River, Vonarska Lake and Sava river. The water supply of Zagreb is also affected by the water quality of Sutla river. Agricultural pollution is slightly less important in this area, but the influence of Dubravica farm (HR) should be taken into consideration – also with respect to a proposed protected area on Slovenian side.

5.25. Kupa

The Kupa (Slovene name: Kolpa) SIA (total estimated size is 500 km²) extends over protected areas along the Slovenian-Croatian border of this middle Sava tributary. Dinaric-karstical land can be found in the Kupa river basin on the territory of Slovenia. Kupa has the characteristics of a mediterranean variant of the pluvial-nival regime with more emphasised autumn maxima and distinctive summer minima. Increased concentrations of phosphorus and nitrogen result in a latent eutrophication of the Kupa.

The pollution of water affects the protected ecosystems and the soils which will also be polluted after floods, leading to pollution of groundwater and a wider impact downstream in the valleys of Kupa and Sava.

5.26. Middle Sava – Kupa

The SIA (total estimated size is 2,820 km²) extends from the lower Kupa downstream of Karlovac and from the middle Sava downstream of Zagreb up to the Lonjsko Polje wetlands (Sava). The relief consists mostly of lowlands and large valleys. The climate is mild continental with high rainfalls (1,000 mm/year). The Sava is therefore subject of controlled handling of floods, using existing natural retention areas. The Sava is the largest Croatian river with wide economic and environmental importance. It includes the cities of Zagreb, Karlovac, Sisak and Slavonski Brod but also large agricultural areas and one third of the Croatian industrial output. In Croatia, the Kolpa river becomes Kupa river, strongly influenced by pollution from the cities of Karlovac (60,000 inhabitants: high priority hot spot) and Petrinja (industry hot spot Gavrilovic), where no wastewater treatment is provided for and which have respective water supply constraints.

The other, nearby main polluters responsible for the deterioration of surface and groundwater are the municipalities of Zagreb (710,000 inhabitants) and Sisak (oil refinery with accidental pollution), with inadequate treatment facilities for waste water, and the industry in Kutina and Vrbovec, with unsatisfactory disposal of contaminated solid waste and no treatment for industrial waste water.

Agricultural pollution is an important pollution source only in Karlovac. Further pollution hot spots are the industries like Sisak Foundry (metal industry), chemical industry INA in Kutina (fertiliser), which degrade the water quality before it enters Bosnia Herzegovina.

The important Sava wetlands of Lonjsko Polje are threatened by changes in water regulation, by pollution and proposals to build new hydropower stations. The major effects caused by the natural and man-made pollution in this Significant Impact Area include limited water use, reduced biodiversity and wildlife habitats (Crna Mlaka ornithological reserve) as well as affected water quality.

5.27. Middle Sava - Una & Vrbas

The main tributaries of the Sava, with a length of 355 km long in Bosnia-Herzegovina, are Una (9,130 km² catchment), Vrbas (6,386 km² catchment), Bosna and Drina rivers. The terrain ranges from a mountain region in the south of the sub-basin (some 700 metres above sea level) to a hilly part in the middle and to fertile lowlands in the north along the Sava river, with big altitude differences between the sources and the mouths which equals to a bid hydropower potential. The Sava river has continental climate, with annual average precipitation at 950 mm/year - increasing from the north with some 770 mm towards the south (about 1,100-mm). After the war, about 80% of people in the Bosnia-Hercegovinian Sava region live in urban settlements, about 50% are connected to public water supply (with 30-70% losses) and 35% are connected to sewerage systems. 90% of urban sewage is directly discharged into the water courses.

The SIA has a total estimated size is 1,770 km² which starts at the lower Una river and Prijedor (Sana tributary), and includes the lower Vrbas downstream of Banja Luka as well as the Sava between the confluence with both tributaries. The key cause of pollution in the area is heavy pollution of surface and groundwater from sewage and untreated wastewater of the municipalities Banja Luka (140,000 inhabitants), Bugojino, Jace, Prijedor and Bihac (200,000 people), of two pulp factories (Incel in Banja Luka and Celpak in Prijedor) and of the huge Nova Topola pig farm (90,000 animals!).

The area is highly industrialised (food, textile, leather, chemical, wood, metal processing and mining) but only 15-20% of factories restarted production; most factories have no treatment plant. Organic substances and ligno-sulphonates from wood pulp production processes bring adverse impacts. Wood pulp and paper factories as well as viscose plants produce significant quantities of very polluted waste waters. On Vrbas river in Banja Luka there are wood pulp, paper and viscose factories with certain wastewater pre-treatment but not always with satisfactory results. Agricultural Hot Spots are mainly located in the north along the border with Croatia. The use of pesticides at the locations of Una-Sana valley (Nova Topola farm) and in the Vrbas valley brings adverse effects.

For flood prevention, several hydraulic control structures were built along both Una and Vrbas rivers, and draining and road network systems on Vrbas river. Finally, the reduction of water pollution as a result of reduced industrial activities during the war has improved the quality of the living world in water and, consequently, of biodiversity. The relaunching of industry would again make the situation worse and affect the biodiversity of waters of the Sava basin.

5.28. Lower Sava – Bosna

Bosna river, one of the four main tributaries of the Sava river basin (besides Una, Vrbas and Drina in the lower course), catches 10,457 km² of the territory of Bosnia-Herzegovina. The SIA has a total estimated size of 1,320 km².

The lowlands in the north 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. Pollution of water is caused by the use of pre-treated liquid waste from farms in the Bosna valley

The human activity with the biggest negative impact on environment is industry. All kinds of industry can be found in this area – 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 wastewater treatment plants (even before the war only 27, out of a total of 122 industrial wastewater treatment facilities, operated with satisfactory results). The major industrial pollution sources in this SIA include HAK in Tuzla and the pulp & paper factory Natron in Maglaj (has a wastewater treatment plant but with unsatisfactory results), and various industries in Koksara, Zenica and Teslic. Waste waters and solid waste from urban areas present a 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, all of which cause further pollution of water and soil and present health risk for the population. The list of municipalities includes Sarajevo (400,000 inhabitants), Travnik and Zenica (145,000 inhabitants) on upper Bosna river, Tuzla (230,000 inhabitnts) on Spreca tributary, and Doboj and Brod on the lower Bosna.

Flood protection is achieved on a length of 55.7 km in the Bosna valley. Large quantities of silted mud at the unrestrained parts of the catchment areas of Sava and Bosna contribute to the clogging of water reservoirs.

5.29. Tara Canyon

This area in the upper reaches of the Drina catchment (Yugoslav tributary at the Bosnia-Herzegovinian border) is a unique gorge, characterized by high biodiversity and highly protected ecosystems (World Heritage Site). A number of relict and endemic species are concentrated on the territory of national parks „Durmitor“ (with glacial Crno Jezero lake, river Tara watershed and river Tara Canyon), „Biogradska gora“ (with glacial Biogradsko lake), and „Tara“ (with river Drina Canyon) with several strictly protected bioreserves.

Main pollution sources located in this SIA (total estimated size is 660 km²) incorporate the cities of Mujkovac and Kolasin and a mining dump. The environmental effects include microbiological pollution and excess nutrients and a loss of biodiversity of the Tara canyon.

5.30. Lower Sava - Drina

This Significant Impact Area (total estimated size is 960 km²) is located at the mouth of the Drina into the Sava. It has a catchment of very different relief: from lowlands (Srem and Macva, alongside the Sava watercourse) to hilly and mountainous terrains (river Drina watershed).

In this section, the **Sava** is a typical lowland river which flows throughout a large alluvial valley, forming large meanders at the southern edge of Pannonian basin. Its discharge pattern is strongly influenced by the tributaries which cover 86.7% of the total watershed.

The **Drina** forms for most of its course the border between Bosnia & Herzegowina and the FR Yugsolavia. As the largest Sava tributary it brings more than 20% of the total discharge. The average discharge (Q_{av}) of Sava river together with Drina is 1,570 m^3/s at the border with Yugoslavia, the minimum ($Q_{min\ 95\%}$) is only 278 m^3/s. In the upper part of the Drina watershed, the river has a torrential characteristic (very high runoff), with high risk of floods for the downstream regions. Therefore, embankments of total length of 771 km protect the river banks.

The Drina river watershed is characterised by a high biodiversity and surface waters of highest quality in the whole Danube watershed in Yugoslavia. A number of relict and endemic species are concentrated in the national parks ‘Durmitor’ (with glacial Crno Jezero lake, Tara river watershed and Tara river canyon), ‘Biogradska gora’ (with glacial Biogradsko lake), and ‘Tara’ (with Drina river Canyon) with several strictly protected reserves. Other important characteristics of this region are pronounced erosion in upstream parts of the watershed, numerous dams for hydropower and significant groundwater resources along the Sava river.

The population density is low (64.6 inhabitants/$km^{2)}$, due to very scarcely inhabited regions in the upper parts of the Drina watershed.

The SIA is particularly impacted by the following hot spots: Most polluting municipalities are Brcko (Sava), Gorazde (upper Drina) and Bijeljina (lower Drina), main industry problem is a drywood sheet factory at Foca (upper Drina) and agricultural point sources are farms at Brcko (Sava) and Bijeljina (lower Drina). Several transboundary effects are recorded, including decrease of flow rate due to water use in upstream parts, floods due to inappropriate upstream reservoir operation, accidental pollution from petrochemical and metallurgy industry coming from upstream.

Intensive agriculture in downstream parts of the watershed (Srem and Macva), large pig and cattle farms, and, mainly in the Drina watershed, trout ponds and intensive forestry bring adverse impacts. In the upper parts of the watershed, land is also used as pastures and grazing area.

The industrial activities include pulp and paper, chemical, food processing, mining and thermal power plants. Open coal mines, gravel abstraction, tourism and recreation were also well developed. The most significant impacts of pollution in this SIA refer to the loss of biodiversity and degradation of water quality.

5.31. Sava at Beograd

The Sava shows a big diversity of river streams typical for lowlands, hilly and mountainous regions. There is a significant difference between upstream, poorly developed area and territory that surrounds the main streams of Sava watershed. The average discharge (Q_{av}) of Sava river together with Drina is 1,570 m^3/s at the entrance into the Federal Republic of Yugoslavia, while minimal discharge ($Q_{min\ 95\%}$) is only fifth part - 278 m^3/s.

The SIA (total estimated size is 260 km²) is located upstream Belgrade (mouth of the Sava into the Danube) and consists of a former floodplain which is used as the city's drinking water resource zone. It receives the cumulative effects of the Sava's upstream hot spots, this limiting ist use for water supply and recreation. In addition, the backwaters of the reservoir Djerdap I on the Danube slowed down the lower course of the Sava river.

More than 80% of the urban population is connected to public water supply systems. Municipal wastewater discharge of Belgrade was estimated at 114 million m^3/year for 1997. About 60% of urban population are connected to public sewer systems. Unfortunately, open dumps for municipal and industrial solid waste are general characteristics of this area. The water quality is mostly of class IV or worse. There are also several industrial hot spots (Pancevo, Baric-Belgrade, Sabac, Prahovo, etc.) with possible transboundary effects in downstream section of Danube watercourse. Activities on rehabilitation of areas endangered by mining activities are especially important at open coal pits from the vicinity of Belgrade. Inadequate treatment of wastewater coming from the large capacity farm (over 20,000 fatlings per cycle) in Belgrade (DP "Surčin") represent another cause of pollution in the area.

5.32. Western & Southern Morava

The Velika Morava River Basin has a surface of 37,269 km^2 within the Federal Republic of Yugoslavia and a diverse relief with hilly and mountain areas as well as with wide river valleys. Diverse types of streams with intensive seasonal flow variations are found. The average discharge (Q_{av}) reaches 232 m^3/s, while the minimum is almost seven times lower ($Q_{min\ 95\%}$ = 35 m^3/s). Therefore, river banks are protected by embankments on a total length of 1,182 km. Other river characteristics include numerous reservoirs for water supply and hydropower, important groundwater resources along the Velika Morava and numerous thermal springs. Erosion is pronounced in the upstream parts of the watershed. Some 4 million people live in the basin area, 56% is rural (mainly low intensity farming; 40% of arable land properties are smaller than 2 ha). More than 80% of urban population is connected to public water supply systems and 60% to sewer systems. Typical are various processing industries; energy production, transport infrastructure (roads and railroad corridors), gravel abstraction, tourism and recreation are other important activities. Industrial and mining wastewater discharge was estimated at 190 million m^3/year in 1997.

The SIA (total estimated size is 5,030 km²) includes starts at the confluence of western and southern Morava and reaches up these river stretches to the main municipal polluters, i.e. the cities of Leskovac and Nis (165,000 people) at the Juzna (southern) Morava; Krusevac (Zapadna = western Morava) as well as Cacak and Pristina (110,000 inhabitants) at tributaries of the upper Zapadna Morava catchment. Polluted rivers which enter the Yugoslavia from Bulgaria (rivers: Nisava, Jerma, and Visocica) represent a another perceived transboundary effect.

Due to great inequality in spatial distribution of water resources and water users in settlements, large regional systems of water supply are necessary. About 60% of the urban population are connected to public sewer systems. Pronounced problem is the conversion of a number of wells in rural settlements into septic tanks after the construction of a central water supply. This significantly increased the degree of ground water contamination. Only 6% of the population are connected to wastewater treatment. Open dumps for solid waste are also typical for this area.

The untreated waste water of municipalities result in a deterioration of the water quality (surplus of nutrients, disturbed oxygen balance, pollution by microbes and heavy metals) and in a limitation of any use and an endangering of the river ecosystem.

5.33. Danube at Iron Gate

Along the border between Romania and the Federal Republic of Yugoslavia, the Danube winds its way through the 107 km long canyon (Djerdap gorge) of Iron Gates. Along this distance, the river acquires an exceptionally high hydropower potential as a result of the rich flows (average 5,500 m³/sec) and an overall drop of 34 m out of which 7 m are concentrated within the Gura Vaii-Sip area. The dams centre-lines were chosen at km 942 and 950. The river's overall width in the dam section is at 1,100 m. The dam creates a reservoir which flooded land, the towns of Orsova and Doni-Milanovac, the Ada-Kaleh isle, roads, railways, bridges, telecommunications, industrial enterprises, historical monuments, etc. The new places were built near the old ones, immersed by water. The new roads and railways were traced parallel to the old ones with improved technical and functional features. The gorge also includes the "Djerdap" national park with 142,376 ha and pre-historic sites.

The Iron Gate system has transboundary effect; the SIA has a total estimated size is 1,500 km². The sediment load carried further down by Danube decreased after 1970 when the hydraulic structures and hydropower plants of Iron Gate started to operate. Huge masses of sediments (inert particles on which organic matters are absorbed) are trapped in the upper reservoir (Iron Gate I) which serves both as an important nutrient sink and a deposit of hazardous and toxic matter for many pollution sources from the upstream Danube catchment area. Therefore, the water quality of exit water is better compared with the upstream water.

Erosion problems identified by Bulgarian experts on the downstream Danube riverbank are attributed to the operation effects of the Iron Gate I and II dams.

5.34. Lower Timok

The total watercourse of the Danube in the FR Yugoslavia is 583 km. On this territory it receives water from several large tributaries, including the Timok as a right tributary, coming from a hilly and mountain terrain.

The perceived transboundary effects in this SIA (total estimated size is 780 km²) is caused by pollution manly from CS_2 and heavy metals from the copper ore processing center in Bor with the mining and smelter complex "RTB Bor". Another pollution source is the town of Zajecar.

Fast development without the appropriate legal framework, under-priced resources, lack of environmental knowledge and awareness led to serious environmental consequences in this SIA. The consequences of eroded soils in the Timok river basin imposed several urgent measures to reduce erosion in the area.

5.35. Ogosta at Vratza

Located in the western region of Bulgaria, the basin of Ogosta river has an average of 1,390 m^3/inhabitant annually. The predominant relief is mountainous and semi-mountainous.

The SIA (total estimated size is 300 km²) is strongly urbanised but has a negative population growth rate. Crop cultivation is the major agricultural activity in the region but fertiliser and pesticide treatment have diminished substantially. Moreover, the water resources used for irrigation have also greatly decreased: only 20% of the equipped irrigable land is irrigated.

Due to the untreated wastewater discharges of Vratza town (77,000 people) and the significant adverse impacts of the Himco fertiliser plant, the whole aquatic ecosystem is disturbed. The stockbreeding farms are not sufficiently equipped with treatment plants and most of them discharge their effluents directly into the natural receivers.

The pollution is shown by increased levels of BOD_5 and of suspended solids that make the water unsuitable for use. Strong ammonia odour is observed in the summer months. The presence of ammonia in the surface water can be toxic for fish. The discharge of polluted water into the river causes severe eutrophication of the river ecosystem. It also affects the shallow groundwater resources and resulted already in a shortage of fresh water. The health risk for the population is considered to be high.

5.36. Iskar at Sofija

Iskar river, located in the western part of Bulgaria, is the longest and largest of the Danube tributaries with a river basin area of 8,600 km^2, and a population of 1.6 million people, including the city of Sofia (1,2 million inhabitants). Compared to most other Danube tributaries, it is one of the smallest and most densely populated and urbanised regions of the country.

The SIA has a total estimated size of 330 km². Water is used for both domestic and industrial supply and for irrigation. In recent years the demand for water, for the city of Sofia in particular, has risen; dry periods resulted in a supply shortage and very reduced river flows.

Pollution in the Iskar catchment is dominated by two major sources: wastewater from the city of Sofia and effluents from the Kremikovsti steel plant. Other significant sources include a copper mine, a copper smelter and a number of small towns. Indicators reflecting the pollution level include BOD_5, $N\text{-}NO_2$, $N\text{-}NH_4$, and oil products.

During dry periods, the river right downstream of Sofia is severely polluted, the river consists almost totally of effluents. The high diversion of river waters have to satisfy the high demand for the city (recording huge losses within the distribution network). The water losses raise the already high groundwater levels and increase the infiltration into the old and damaged sewer system. This in turn results in a dilute effluent, which is difficult to be treated effectively, and a hydraulically overloaded treatment plant. The water resources are in a great proportion unsuitable for the supply purposes, including irrigation, animal breeding and recreation.

5.37. Ossam at Troyan

Osam River flows from the middle part of the Balkan Mountains in northern direction towards the Danube, with a total length of 314 km. The average discharge at the confluence with the Danube is 15 m^3/s. The total population in this basin is 185,000 inhabitants; major settlements along the river are Troyan (26,000 inhabitants) in the upper reach, Lovetch (49,000 inhab.) in the middle and Levsky (14,000 inhab.) in the lower reach. None of the towns has a wastewater treatment plant, so presently all untreated effluent is discharged into the river, with a total BOD-load of 21,053 kg/day.

The SIA has a total estimated size of 300 km². In Troyan, the industrial effluent greatly exceeds the municipal one. Municipal solid waste is collected on disposal sites; little is known about quantities and quality of these wastes. At the Plama oil refinery, 100,000 tons of oil sludge is currently stored in open reservoirs, constituting a potential environment danger. Also, insufficient information is available about the - possibly poisonous - effluents of the pharmaceutical industry in Troyan,.

Drinking water is mostly obtained from groundwater sources. Troyan has a combined sewerage system where the existing industrial plants are discharging high BOD pollution load (food industrial plants with large emissions of organic and suspended solids, especially during low flow months).

The absence of treatment facilities contribute to a periodical coloration of the receiving waters and to a high health risk to 30,000 people who use the terrace waters for irrigation and as drinking water.

5.38. Ossam at Lovetch

Ossam River belongs to the central region of Bulgaria where plains are the prevalent terrain. The water resources are insufficiently distributed and hardly can provide 475 m^3/cap. per year. There is a negative demographic trend, especially in the area of the city of Lovetch (49,000 inhabitants).

The SIA has a total estimated size of only 100 km². The river and terrace waters are used for water supply, irrigation and animal breeding. Only 25 km below the discharging point of the untreated, combined industrial and municipal waste waters (near Omarevtzi village), 80-100l/s are extracted for the water supply of Lovetch. The vicinity of Troyan town and its industrial plants, together with the absence of treatment facilities contribute to the selection as a Significant Impact Area. There is no significant dilution by the water receivers during low runoff seasons. Moreover, in the same periods, the industrial plants (leather, foodstuff industry, canning industry, milk and meat processing) discharge large quantities of organic and suspended solids. This results in a big health risk for more than 60,000 people and even for animal breeding.

5.39. Rositza at Sevlievo

This SIA has a total estimated size of 100 km². Sevlievo is situated on a relatively flat, somewhat hilly terrain in the upper part of the Rositza River, the largest tributary to the Yantra River. Urbanisation and real estate development are typical mainly for the left bank.

The town of about 26,000 inhabitants hosts fifteen large industrial enterprises. Evidence of studies shows that the untreated waste waters from households and industry discharged into the Rositza River are the largest point sources of pollution. The concerned industries are those currently connected to the municipal system as well as a tannery and a meat processing facility which currently discharge directly into the river at three different points after insufficient or missing treatment. The Sevko tannery is the largest contributor through organic and other tannery-specific pollutants, such as heavy metals.

Reservoirs on the upper reaches of the Yantra mountains supply a large portion of the population with safe water, while the Alexander Stambolijski Reservoir (222 million m^3, located about 10 km downstream of Sevlievo on the Rositza River) was built to provide irrigation for the lower basin and for electricity production (very small proportion). Due to the polluted state of its waters, their direct use as drinking water supply is impractical at present without very costly treatment.

The high organic loads and other specific polluters have a negative affect on the environment in the region, including eutrophication of the reservoir waters. The proposed intervention in Sevlievo area would reduce industrial and domestic contamination to make the Stambolijski reservoir useable for drinking water supply. The project includes extension of the existing sewer system and tertiary treatment of municipal wastewater. Also, Sevlievo needs industrial waste reduction and improved pre-treatment of industrial wastes but the primary financial concern is if domestic users can afford to pay for the improved wastewater system

5.40. Middle Yantra

The Yantra River Basin is situated in the centre of northern Bulgaria, covering 7% of the country's territory (7,865 km^2) with a population of about 540,000 inhabitants. The river Yantra (Bulgaria's second-largest Danube tributary) originates from a spring at 1,340 m in the Balkan mountains and

flows for 285 km through major residential and industrial centres. The main towns are Gabrovo (80,000 inhabitants), Veliko Tarnovo (74,000 inhab.), Gorna Oriahovitza (45,000 inhab.), Sevlievo (28,000 inhab.) and Pavlikeni (15,300 inhab.). The river's average water flow is 47 m^3/s. Forests cover 28% of the basin, primarily in the foothills and mountain areas upstream of the mouth of Lefedga River. The arable land lies in narrow valleys along the lower reaches of the rivers and along the Danube. Most of the groundwater lies beneath the river terraces, directly connected with the surface water, while irrigation water is tapped from the river throughout its length.

Both the Yantra River and its tributaries are strongly affected by human activities through their use as a multi-purpose water source and as recipients of various waste waters - domestic, industrial, animal farm and rain. Industrial waste water varies greatly in quantity and quality. Most significant are machinery and textile manufactures, electrical appliance industries, tanneries, dairies, meat processing and canning industries, wineries and sugar refineries. Some small villages rely on groundwater wells, which have high concentrations of nitrates due to fertilisers and river pollution.

The national team of experts identified Gorna Oriahovitza as a Significant Impact Area (total estimated size is 120 km²), with pollution originating from population and industry. The adverse influence of untreated waste waters of both towns Gorna Oriahovitza and Liaskovetz with a total population 49,800 inh., and the pollution coming from sugar refineries and from the alcohol factory in Gorna Oriahovitza contribute to the increase of health hazards in the area. Only 68% of the population of Liaskovetz are connected to the sewerage system. The contribution from the industry (sugar and alcohol factories) to the BOD pollution load is 85-91%, making the Yantra water unsuitable for irrigation purposes. The river and its terrace water are used for the water supply of the villages which poses a high risk in the region.

The proposed intervention in Gorna Oriahovitza would decrease organic and nutrient loading to the lower Yantra. That project includes extension of the existing sewer system and tertiary treatment of municipal wastewaters. Moreover, Gorna Oriahovitza needs reduction and improved pre-treatment of industrial wastes but the primary financial concern is if domestic users can afford to pay for the improved wastewater system.

5.41. Lom Rivers

The two source rivers of the Lom cover a catchment area of 3,978 km^2 in eastern Bulgaria, ending in the meandering Roussenski Lom River which is a national park near the Danube. The population density in the hilly landscape is quite low (48 persons/km^2); moreover there is a negative demographic trend. Industry is less developed with a prevalence of light industry.

The SIA (total estimated size is 620 km²) is located downstream of the city of Razgrad where inadequate waste water treatment from the city and from the "Antibiotic" Co.- Pharmaceutics Plant pose the main problems, together with some food industry plants with high emissions of organic, suspended solids and nutrients, especially during low flow months.

The water is unsuitable for irrigation purposes (high organic load) and for the drinking water supply of the cities Razgrad, Gecovo and Drjanovec: river bank filtration poses a health risk.

The proposed intervention (adopting sustainable industrial practices) will lead, by the end of 2010, to a reduction to 0.03% of the organic-2-chlorine-containing solvent in the waste waters of the pharmaceutical factory.

5.42. Arges at Bucharest

This SIA (total estimated size is 3,180 km²) includes a complex of three adjacent impact areas: one in the Arges basin including the capital of Bucharest, the second at the industry center Giurgiu and the third near the city of Calarasi.

The Arges River, flowing in the southern and central part of Romania, is highly regulated for hydropower, water supply, irrigation and flood control purposes, and it is seriously polluted from industrial and municipal wastewaters of the cities Pitesti, Curtea de Arges and Cimpulung. These impacts adversely affect the rivers biodiversity as well as the quality of the drinking water supply for Bucharest, the Romanian capital. The Arges Basin contains 4 million inhabitants; an estimated 90 - 95 % of the urban population (2.5 million) is served by public water supply systems (mostly treated surface water), but approximately 1 million people in rural areas are served by shallow wells.

The largest source of pollution in the basin is the untreated sewage of Bucharest, followed by industrial wastewater from the Arpechim petrochemical complex. Other polluters are the treated wastewaters from Pitesti, Cimpulung, and Curtea de Arges which cause eutrophication to the Bucharest water supply intake. Industries place a significant burden on the surface water quality in the basin by discharging organic compounds and nutrients into the municipal systems as well as directly into the rivers. In the lower basin (fertile plain), shallow wells are highly contaminated with nitrates, primarily from agricultural sources.

The Danube area of Giurgiu (Romania) - Ruse (Bulgaria) is comprised between the two towns on the river banks. VERACHIM SA, which is one of the concern spots in Giurgiu, produces epichlorhydrine and vulcacites . The plant is situated approximately 5 km from the Danube in South Romania.

The metallurgical SIDERCA SA plant is situated approximately 13 km's from the Danube in South Romania, near the city of Calarasi. It causes high priority hot spot with transboundary pollution (including phenols and H_2S in the ambient air) to the town of Silistra (Bulgaria.) at the opposite shore of the Danube.

The biggest source for dust emissions (2,000-4,000 tons annually) is the Electrical Arc Shop. These emissions are easily observed on great distances, also in Calarasi. The city is near some of the most important wetland restoration areas of the entire river basin.

5.43. Ialomita near Ploiesti

The Ploiesti region is located in the Prahova River Sub-basin which drains an area of 3,738 km^2 at the confluence with the Ialomita River, a main tributary of the Danube. The Prahova river, originating in the Carpathians mountains range at the town of Predeal, runs down to the south-east into the Prahova flood plain which includes at ist edge the city of Ploiesti (260,000 inhabitants). After the Teleajen and Cricovul Sarat rivers join to the left bank, it finally enters the Ialomita River (a) at Patru Frati. The SIA (total estimated size is 2,350 km²) is mainly caused by the petroleum-refining factories (High Priority Hot Spot SC PETROBRAZI SA, SC PETROTEL SA, SC ASTRA ROMANA SA, SC STEAUA ROMANA SA, SC VEGA SA). Major emissions are oil substances (pollution from extraction and processing), residual gases containing phenols SO_2, CO, sulphate hydrogen, etc.

These emissions pollute the soil and water in an area of 8-10 km^2 around these industrial sites, including five small localities and the Prahova River. National standards of above-mentioned pollutants are frequently overpassed. The water quality (Prahova and Teleajen rivers) is further affected by wastewater with high concentrations of organic substances, oil products, suspended matters, and fluorides.

5.44. Upper Siret

The Siret River Basin covers an area of some 45,000 km^2 of which 94 percent lies in Romania and 2,200 km² in Ukraine. It is one of the largest tributary basins in the Danube watershed, covering around 5% of the total. The Siret River rises in the Ukrainian Carpathians and flows for over 700 km to join the Danube at Galati, not far upstream of the Danube Delta. The population of the basin is around 4.3 million of which more than 2.5 million live in communities of less than 10,000 inhabitants.

This Basin is one of the most seriously polluted major sub-basin of the Danube and wide range of problems exist, related to water, soil, solid waste and air. With exception of the Ukrainian town of Storozhinets, the major sources of pollution are all located in Romania. The changes in flow regime as a result of various activities (such as deforestation) contribute to frequent floods, erosion, life and economic losses.

This SIA (total estimated size is 380 km²) is located in the upper reaches of the Siret around the Ukrainian town of Storozynec/Storozhinets which lacks a waste water treatment plant (resulting in water diseases and damaged recreation). Industry is based on local mineral and wood resources as well as on multi-branch agriculture (diffuse pollution!). The majority of people live in rural areas.

The Siret plain has temperate-continental climate with summer rains. They may result in frequent floods which are connected to deforestation and erosion.

5.45. Middle Siret – Bistrita & Trotus

This Significant Impact Area (total estimated size is 1,360 km²) includes the Siret river under the impact of two tributaries: The **Bistrita** river with the city of Bacau (several industrial units: SOFERT SA Bacau specialised in fertilisers such as ammonia, urea, sulphuric acid; 3 high priority hot spots Letea Bacau and Pergodur: both pulp & paper industry; Fibrex Savinesti chemicals).

The **Trotus** river including the city of Onesti and the industry of CELOHART SA Zarnesti, produces chemical pulp for viscose and nitration, paper, fodder yeast and lignosulfonic products. Major emissions are SO_2, NH_3, ammonia, and chlorine.

The water quality is affected by ammonia, phosphorus urea, suspended and organic matters. As a result, the Galbeni reservoir (on Siret downstream of Bacau) and Bistrita River cannot be used for industrial water supply.

The forest and the agricultural land are affected on an area of 90 km^2. Effects on the ground- and surface water are shown by a frequent exceeding of national standards for some of the above-mentioned pollutants, including emissions from animal farms and agricultural activities. Industrial activities have also effects on the ambient air (the national standards for SO_2, ammonia and chlorine are exceeded).

5.46. Upper Prut

The Prut's sources are in the high Carpathian mountains on the Ukraine-Romanian border. From there it runs northwards into Ukraine (Bukovina) before it turns south-east and forms a natural border, first between Ukraine and Romania and then between Romania and Moldova. It enters the Danube downstream of the city of Galati, as the last major tributary river before the Danube empties into the Black Sea. The Prut is 967 km long, out of which 251 km are on Ukraine territory, 21 km form the border between Romania and Ukraine and 695 km the border between Romania and Moldova. The total catchment area is 27,540 km^2.

Several heavily industrialised cities are located in the upper Ukrainian portion of the Prut tributary. The total population is 1.3 million people and the density is 112/km². The most important hot spot in this SIA (total estimated size is 1,000 km²) is the town of Chernivtsy/Cernovsk, which, among other polluters, has several large chemical industry complexes. The insufficient capacity of wastewater facilities and poor conditions of the sewer system in the cities of Kolomya and Cernovsk contributed to the selection as a significant impact area. Little information is available on the pollution load from this region, but Romanian monitoring results from the station at the Ukrainian border show very high figures for phosphate and phenol. Further downstream, water quality improves until the river reaches the discharge point of wastewater from the city of Iasi on the Romanian side and Ungheni on the Moldovian bank. Water quality in the Prut River in Ukraine is reported as satisfactory for all uses.

5.47. Middle Prut

The SIA (total estimated size is 370 km²) around Iasi has an important impact on the Prut River's water quality. It is one of the biggest cities in Romania (about 400,000 inhabitants) with important industry, in particular chemical (pharmaceutical) factories (high priority hot spot "Antibiotice"), heavy industry and power generation. A significant concern is related to the municipal wastewater treatment plant which is now under the renovation. The treated wastewater is discharged into the nearby **Jijia** River which affects the downstream quality of the Prut River on an important part of its lower course.

The pollution effect is amplified by the fact that the Jijia river collects also the waste water from Botosani city (on Sitna tributary) and, especially, from the big pig farm COMTOM Tomesti (high priority hot spot*)*. The effects of environmental pollution in this area include disturbances on the biodiversity, as well as on the overall functioning of the ecosystems. Also, it creates health risk for the population living in this area.

5.48. Lower Prut

This border area between Moldova and Romania starts (total estimated size is 520 km²) at the confluence of the Jijia River and covers a catchment territory of 3,900 km^2, including the districts of Hancesti, Leova, Cantemir and partly Vulcanesti. 85% of this area are plains and ca. 15% are mountainous. The average winter temperature is -3 to -5^o C , the average summer temperature 23-24^o C. The lowest rivers stretch has some still intact floodplains. The population density in this part of the Moldavian Sub-basin is at 100 people/km^2, the highest in the Moldavian part of the Danube basin. Three municipal and two industrial Hot Spots were listed in the Moldavian reports. The main sector of human activity is - as in the upper part of the Prut river- agriculture with mainly large-scale crop productions (vegetable, tobacco, orchards and wine).

The most significant industrial activities are food processing, manufacturing, leather production, mining, oil and gas exploration.

The water quality of Prut river upstream the confluence with the Jijia is generally quite good. This tributary drains the north-western part of the catchment area within Romania and collects industrial, agricultural and municipal effluents, including those coming from the municipalities of Iasi (450,000 inhabitants) and Botosani (130,000 inhabitants). The cumulative effect of the Jijia pollution contributes to the worsening of the water quality of the Lower Prut river. The permitted limits are exceeded for several indicators: BOD, ammonium, nitrite and orthophosphate. The level of bacterial pollution is also very rich which affects the drinking water quality for several localities in Moldova, including Leova, Cantemir and Cahul, which entirely rely on the water supply from the Prut river. Moreover, the biodiversity is reduced to a large scale.

5.49. Yalpugh

This SIA's (total estimated size is 259 km²) Sub-river Basin Area covers 3,785 km^{2,} i.e. the catchment area of two large Danubian lakes (Cahul and Yalpugh) and includes the Moldovian districts of Chimilia, Basarabeasca, Comrat, Chiadar-Lunga, Tarasclia and partly Vulcanesti. It represents. The prevalent terrains are plains.

This region has a population of 250,000 people, 25% of which are urban population and 75% rural. The population density therefore is at 66 people/km^2 which is the lowest of the Moldovian sub-basins. The annual average flow of the Yalpugh River is 0.9 km^3/year, while the annual average flow of the Cahul River is 0.09 km^3/year.

With respect to the amount, types of the deposited material, the ways of deposition and lack of information, this region can be ranked as an industrial "high priority" Hot Spot.

Intense human activities and lack of appropriate waste water treatment for the municipal effluents of Comrat and Taraclia contributed to the depreciation of water quality of Yalpugh River. The water quality in the three reservoirs located on the river is also affected, making it unsuitable for irrigation and recreation purposes. Especially developed industries in this region are food processing (dairies and canneries), wine and leather production and partly manufacturing. The Significant Impact Area has a border with the Ukraine.

5.50. Lower Danube – Siret & Prut

The SIA (total estimated size is 1,590 km²) includes the mouth of two big tributaries, the Siret and Prut, as well as three polluting urban areas along the Romanian Danube: Braila, Galati and Tulcea. Their impact is reflected in reduced fish stocks and biodiversity and increased water diseases in the Danube before and in the delta.

Non-point sources of pollution occur mainly from agriculture but with the strongly varying rainfall pattern the severity of groundwater pollution also varies widely. Nevertheless the large aquifers which underlie much of the lower part of the basin are already being threatened from pollution from both non-point sources (mainly nitrates and pesticide derivatives) and from infiltration from rivers and streams.

The city of Braila (248,000 people) is located at the Danube quite upstream the Delta and houses several major polluting industries. The town has no treatment plant and all waste waters are directly discharged into the Danube. Braila has two industrial zones - one of them discharging directly into the town's sewer system. The main non-urban pollution sources are pig farms, a power plant, two pulp & paper and cellulose fibre plants (high priority hot spot Celohart Donanis), and metallurgy industries. The industry area further includes as other, significant sources a furniture factory with small pre-treatment units, a brewery and a refractory materials plant that is also a big source of air pollution.

Galati (328,000 people) is located only 20 km downstream the Danube at the Danube bend and in between the mouths of the Siret and the Prut rivers. There is no municipal treatment plant and the sewer system is combined. An upstream and downstream comparison of BOD levels shows an average increase of 5 percents. The city hosts the priority hot spot "Sidex steel mill" which, in the past, employed 50,000 workers. Wastewater from the plant's chemical section goes through treatment and is then combined with wastewater from the metallurgical section before being discharged into lagoons from where the effluent is discharged into two tributaries. The mill is highly integrated and one of the ten largest in the world (capacity of 4 to 4.5 million t/year). Major pollution sources are the coke plant followed by the cast iron plant, the steel plant and the final-products plant. Each of these and other plants comprising the steel mill is designed to have its own treatment plant.

The municipality of Tulcea (97,000 people) is located in the same significant impact area but right at the head of the delta (upstream the Sulina and Sf. Gheorghe arms). The main polluter is considered to be ALUM SA which produces roast alumina and alumina hydrate. Major emissions are aluminium powder, alkaline aerosols, sulphuric acid (aerosol) and ammonia. The Danube water is polluted mainly by alumina, magnesium, sulphates (dissolved solids) and suspended matter. Effects: the health local authority reports frequent respiratory diseases.

5.51. Ukrainian Delta & Liman Lakes

This south-western part of the Black Sea lowlands in the Odessa region (Ukraine) includes two sub-basins, the Danube river (Chilia arm of the Danube Delta) and the Danube lakes ("limans" with freshwater), with some water intake also from the territory of Moldova. The length of the Danube in this stretch is 174 km and the Sub-river Basin Area occupies an area of 6,300 km^2. Typical habitats are steppe, sea-side and floodplain landscapes which are almost completely occupied by agricultural crops, orchards and vineyards. The Danube Delta (Chilia arm), however, is still ecologically most valuable and has a big restoration potential.

In recent years, the lakes' fish productivity has strongly declined. Also, the recreational value, human health and the biological productivity decreased.

The SIA (total estimated size is 2,470 km^2) includes several big sea and river ports; urban and industrial waste waters pose the other severe pollution problem. In general, nearly all the industry on the Ukrainian Danube dispose their waste without adequate treatment. "Hottest Spot" is a cellulose-paper factory in Izmail, which, in 1995, discharged 12.3 m^3 (99 %) of its wastewater with insufficient treatment into the river.

The biggest threat to the Ukrainian stretch of the Danube delta is pollution from oil products and heavy metals. This type of pollution is particularly dangerous in the Ukrainian section, where the water flow slows down, thereby contributing to an accumulation of heavy metal particles on the river bottom. According to official measurements, the concentration of these elements in the river sediments is between 100 and 10,000 times higher than in the water itself. Apart from the Ukraine itself, other Danube countries also contribute to this high concentration: the faster flow of the upstream Danube prevents local settling of particles with heavy metals and other dangerous substances.

Similarly, the concentration of oil products is in the Ukrainian part of the river among the highest along the entire river: they were carried down from upstream reaches. Oil concentration near the Ukrainian port of Izmail, for example, is three times higher than the level found near Belgrade and twice the level than at Budapest. Ukraine's own contamination of the river may soon go up as the port of Reni is gradually turning into a large transit point for shipments of Kazakh oil.

Pollution from nitrogen and phosphorous is another Ukrainian problem in this part of the Danube as well as in other Ukrainian rivers due to the uncontrolled use of fertilisers by farms. About 55 % of the over 500 m^3 of fresh Danube water consumed in Ukraine in 1995 were used for agricultural purposes, compared to 13 % by industry on the Danube.

6. Major Hydraulic Structures and Description of Rivers in the Danube Basin

Most rivers in the Danube River Basin are impacted by the installation of dams, dyke and irrigation systems which improve their economic useability for flood protection, transport, power production, water supply and recreation. Free-flowing sections where river dynamics like natural water level fluctuations, side erosion (e.g. meandering) and open migration for fish are not controlled by man, are restricted to usually short stretches and two and small tributaries. Only very few rivers in the Danube Basin are still pristine from their source to the mouth. The following table and **Map 12** illustrate the status of „Major Hydraulic Structures and Description of Rivers in the Danube Basin". In addition, **Annex 4** gives the National Tables with detail information on the lengths of free-flowing, regulated, impounded and navigable sections, as well as on the name, size and use of dams.

Hydraulic works in form of dams and reservoirs are found in all mountainous areas of the Danube basin, while most navigation channels, dyke and irrigation networks concentrate on the lowlands along the central and lower Danube.

The building of large dike systems for flood protection started in the 16th century in Hungary. Old networks of drainage/irrigation systems exist all basins, for instance in the Banat (northern YU) and in southern Romania. The first major Danube regulation works started in 1830 in Upper Austria; the first Danube hydro dam was built in 1927 at Vilshofen (lower Bavaria). Today, hydro-power utilisation and energy production varies substantially from country to country.

The biggest hydropower dam and reservoir system along the entire Danube is located at the Djerdap (Iron Gate) gorge (117 km long). It is a peak operation system with two dams, jointly operated by Romania and the Federal Republic of Yugoslavia (average Danube flow: 5,500 m³/sec, overall drop: 34 m; installed capacity: 1,266 MW, annual production: 6,490 GWh.

Main environmental impacts and effects of hydraulic works in the Danube basin are:

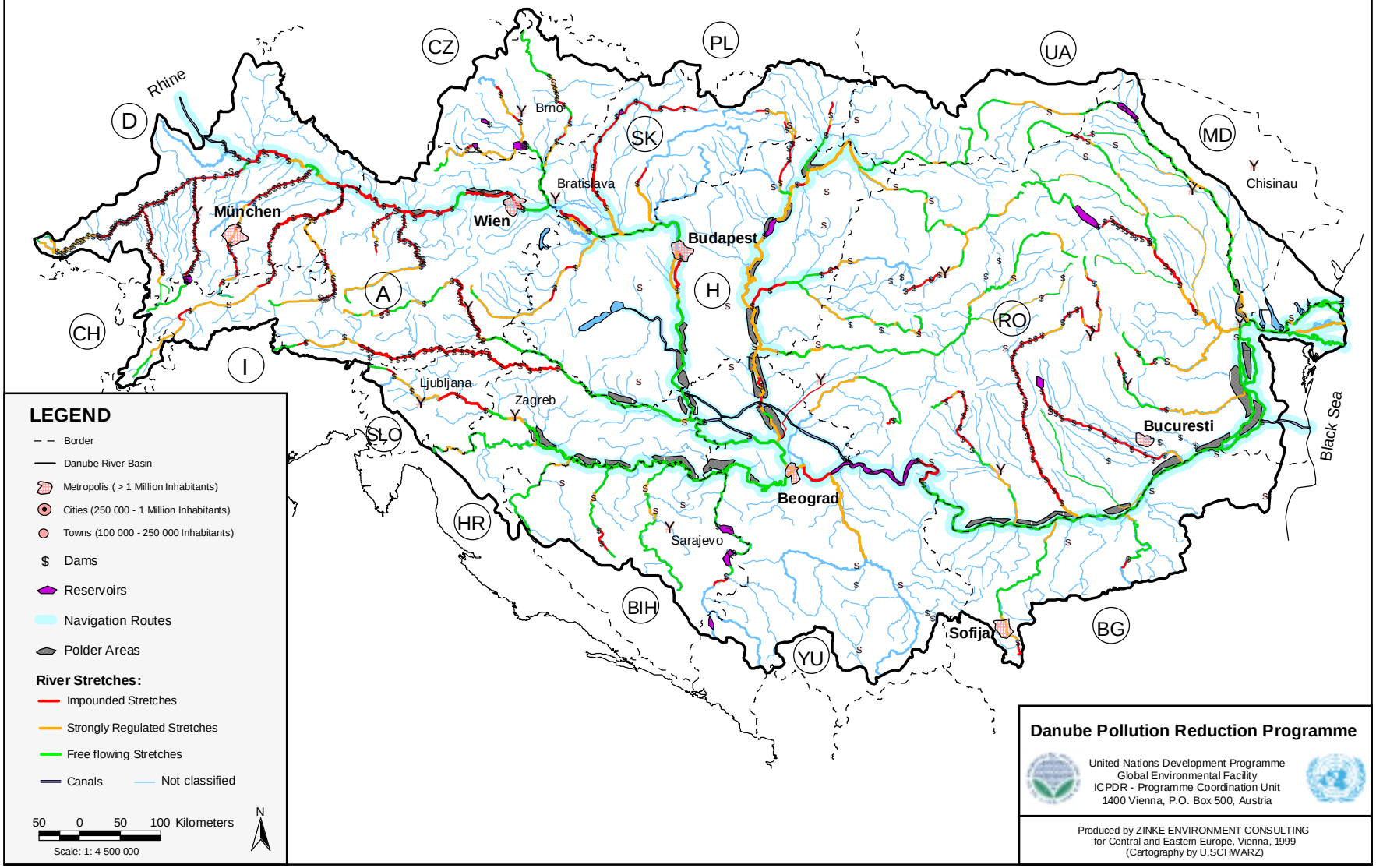
Environmental Impact of a Dam	Lasting Effect for the River Environment
Alteration of the hydrological regime of surface and groundwaters	Impoundment ("from a river to a chain of ponds") Loss of regular soil ventilation and moistening, of soil fertility Need for artificial wetland and back-country irrigation and drainage
Change of the sediment regime (natural balance of erosion and sedimentation processes)	Filling-up of the upstream reservoir with silt and toxic substances Bed erosion of downstream river sections and subsequent drying up of surrounding landscapes (need for irrigation) Reduced economic productivity (no free nutrient input) for forestry, agriculture and fisheries Loss of pioneer habitats (gravel / sand banks, islands); ageing of ecosystems
Reduced flood retention capacity	Increased flood hazard and damages downstream of the dam
Reduced self-purification capacity	Reduced water quality Increased need for technical water purification
Dissection of the river continuum (longitudinal and lateral)	Barrier for migrating plants and animals Loss of shelter, feeding and reproduction habitats Loss of typical, rare riverine habitat and species diversity Isolation of populations; spreading of monotonous landscapes, invasion of "ordinary" and alien species Reduced recreational value

The Questionnaire which was sent out in June 1999 to all Danube Basin countries provided more detail information about the most important rivers in the region. As the information collected is the result of a very short-term international assessment, the desired details were not always available at national level and the figures provided are not always perfectly compatible with each other on regional level. The following main results can be found:

- The Western and the Eastern parts of the Danube basin (Alpine and Carpathian mountains with their pre-mountain zones) are dominated by chains of dams and hydropower stations both along the tributaries of the Upper and the Lower Danube (**Iller, Lech, Isar, Inn, Enns, Mur, Drau; Somes, Crisuri, Jiu, Olt, Arges, Ialomita or Siret/Bistrita**); the same applies for the **Upper Danube** itself. Natural, free flowing sections are hard to be find.
- The hydropower dams Iron Gate I and II represent the largest single impounded stretch in the entire basin.
- The largest polder and dyke systems are concentrated along the central Danube between Budapest and Belgrade and downstream of the Iron Gates as well as on the middle and lower Tisza.
- The navigation routes are restricted to the Danube between the Rhine-Main-Danube canal near Regensburg and the Black Sea (including the Danube-Blak Sea canal), to the lower and middle Tisza and to the lower sections of Sava, Drava and Vah. Smaller navigation routes exist in northern Yugoslavia (DTD Canal), at the lower Körös and between lake Balaton and the Danube (Sio river).
- New river regulation projects are presently being planned for the upper Danube between Straubing and Vilshofen, at the middle Sava near Zagreb, at the middle Drava and in some Romanian rivers.

Map 12: Major Hydraulic Structures and Description of Rivers in the Danube Basin

Based on Information from National Level and Additional Research 1999



Danube Pollution Reduction Programme

United Nations Development Programme
Global Environmental Facility
ICPDR - Programme Coordination Unit
1400 Vienna, P.O. Box 500, Austria

Produced by ZINKE ENVIRONMENT CONSULTING
for Central and Eastern Europe, Vienna, 1999
(Cartography by U.SCHWARZ)

Table 7 Major Hydraulic Structures and Description of Rivers in the Danube Basin – OVERVIEW TABLE

River/ Country	Total lenght of the river *rkm-rkm (from source to mouth)*	Total Free-flowing sections *rkm-rkm*	Total regulated sections *rkm-rkm*	Total impounded sections *rkm-rkm*	Total Navigable sections *rkm-rkm*	Number of dams/ reservoirs	Number of dams/ reservoirs > 15 m	Number of Hydropower dams
Danube D	2,780 – 2,200	183	139	332	2,411-2,200	49		**27**
Danube A	2,200 – 1,873				2,200-1,880	9		
Danube SK	1,880 – 1,700				1,880 – 1,700	2	1	2
Danube H	1,850 - 1,433	417	383	8	1,850 - 1,433	1		
Danube HR	1,433 – 1,300							
Danube YU	1,433 - 845	1,433-1,215	414		1,433-845	2	1	2
Danube BG	845 – 375			0	845- 374	0	0	0
Danube RO	1,075 – 0		863	212	1,075 - 0	2/2	2/2	2
Danube MD	145 – 144		1		145-144			
Danube UA	144 – 0	144	25 km	None	144-0	6 lakes/ reservoirs along the main river bed		
Iller (D)	147	58	44 (diverted)			15		
Lech (A)	82	67	12 km	3 km		2		
Lech (D)	167.5	15		153,5	/	32	3	29
Naab (D)	98	98						
Isar (D)	263.3	59	86 (+55 diverted)	63		10	1	10
Inn (A)*	277	70	133 km	74 km		4		
Inn (D)	217.6	22		195,6	/	15		15
Salzach (A)						11		
Traun (A)	120 km	40	40 km	40 km	/	4		
Enns (A)	250 km	123	30 km	97 km		14		
March (A)	66 km	66	0	0				
Morava (CZ)	354-271.6	100	183		28	27	0	8

* including Austrian-Bavarian border stretch

Dyje (CZ)	207	136.5	71	57	0	31	2	3
Svratka (CZ)	171	130	41	21	0	30	2	3
Raba (A, H)	211-0	200	81	11				
Vah (SK)					71-0			
Bodrog (SK, H)					65-50			
Hron (SK)								
Ipel (SK, H)	172-75; 43-0	140	77					
Sio (H)	121-0	121	92		Balaton-Danube			
Mura (A) **Mura (SLO)** **Mura (HR)**	44	 51 46				13		
Mures (H)	50-0	50	25		25-0			
Drava (A) **Drava (SLO)** **Drava (HR)**	264	104 0	20 142 95	140	 0-150	12		
Drava (H)	237-228, 199-70	138	104		128			
Sava (SLO) **Sava (HR)**	 207- 725	126	92		 0-593			
Tisa (RO)	79-140	19	42	-	-	-		
Tisa (H)	745-160	472	450	57	685-160			
Somes (H)	50-0	50	42					
Somes (RO)	0-376	248.5	127.5	-	-	-		
Körös (H)	138-0	37	126	101	115-0			
Crisul (RO)	0-234	147.5	82	0	-	-	-	
Mures (RO)	0-761	682	79	-	-	4		
Hernád (SK, H)	118-0	104	65	14				
Sava (B & H)	563 – 207	92	264 km		356 (rkm 563-207)			
Drina (B & H)	346 – 0	214 km (346-290 rkm, 200-116 rkm, 92 – 18 rkm)	18 km (rkm 18 – 0)	114 km (rkm 290 – 200 rkm 116 – 92)	/	3	3	3
Vrbas (B & H)	240 – 0	197 km (rkm 240 – 136, 131 - 128, 110 – 20)	20 km (rkm ~20 – 0)	23 km (rkm 136-131, rkm 128 - 110)	/	2	2	2
Bosna (B & H)	271 – 0	264.5 (rkm 271-6.5)	6,5 (rkm 6,5 – 0)		/			

Una (B & H)	214 – 0	194 km (rkm 214 – 20)	20 km(rkm 20-0)					
Morava (YU)								
Tarnava (RO)	0-246	157	80	9		4/2		
Timis (RO) **(YU)**	0-244 0-118	110,5	131	2.5		1 2 in YU		
Timok (YU, BG)		Total	/	/	0	0	0	0
Jiul (RO)	0-339	105	211	23		7/3	3/3	
Iskar (BG)	0-368				0	80	8	6
Lom (BG)								
Ogosta (BG)	0-144				0	55	4	7
Ossam (BG)	0-314				0	92	3	1
Vit (BG)	0-188.6				0	67	3	3
Olt (RO)	0-615	152	152	***463***		26/26	26/26	25
Yantra (BG)	0-285.5				0	178	7	2
Arges (RO)	0-350	280	7.5	62.5		13/13	13/13	13
Vedea (RO=	0-224	191	33	-	-	-	-	-
Ialomita (RO)	0-417	212.5	192	12.5		3/3	3/3	3
Buzau (RO)	0-302	162.5	128	11.5		2/2	1/1	2
Siret (UA)	122.5	122.5	76					
Siret (RO)	167-726	230	267	62.5		7/6	5/5	6
Moldova (RO)	0-213	164	49					
Bistrita (RO)	0-283	212	13	58		10/10	8/8	8
Trotus (RO)	0-162	147	15					
Barlad (RO)	0-207	33	174					
Jijia (RO)	10-285	222	51	4		1/1		
Prut (UA)	0-289	289	5					
Prut (RO)	241-983	384	288	70	-	1/1	-	-

Annexes

Annex 1 Danube Sub-river Basin Areas – National Tables

(Population, Hot Spots, Land Use and Agriculture)

Germany
Austria
Czech Republic
Slovakia
Hungary
Slovenia
Croatia
Bosnia & Herzegovina
Yugoslavia
Bulgaria
Romania
Moldova
Ukraine

Annex 2 Sequence of Significant Impact Areas (PRP Workshop in Hernstein/A)

(Revised results of the working groups, Danube, January 1999)

Annex 3 Hot Spots in the Danube Sub-river Basins

(see also Maps 8 and 9)

Annex 4 Major Hydraulic Structures and Description of Rivers in the Danube

Germany
Austria
Czech Republic
Slovakia
Hungary
Slovenia
Croatia
Bosnia & Herzegovina
Yugoslavia
Bulgaria
Romania
Moldova
Ukraine

Annex 1

Danube Sub-river Basin Areas – National Tables

Germany

Sub-river Basins & and Sub-river Basin Areas	Population						Sources of Pollution***									Land Use in km² ****						
	km²	Population	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
1. Upper Danube Sub-river Basin	48.190							7						1								
				1	1	3																
2. Inn Sub-basin Area	8.050							1						1								
Total Germany Sub-river Basins	56.240	9.135.000	130	1	1	3		8						2		28.200	16.300	11.900		18.408	1.202	5.389

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without München, Regensburg, Augsburg, Ingolstadt and Ulm.

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Instead of "hot spots", the German Ministry for Environment indicated ten "Sources of Pollution" in Germany.

Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Germany

Sub-river Basins & and Sub-river Basin Areas **Agriculture 28.200 km²**

	Lifestock				Fertiliser			Pesticides	Main Cultures		
	cattle	pigs	poultry	sheep	Nitrogen	Phosphate	K2O		Maize	Wheat	Barley
1. Upper Danube Sub-river Basin											
2. Inn Sub-river Basin											
Total Production in t/y									3.733	3.665	3.176
Total number of Lifestock	3.948.000	2.804.000	10.044.000	292.800							
Total number of Lifestock/km²	91	140	356	10							
Total Fertiliser in kg/ha (1997)					78	25	36	3			
Total Fertiliser in kg/ha (1988)					107	49	57				
Total Application Fertilizer/country in t/y											
These data indicate only the use of mineral fertilizer! (no data available on manure fertilizer)					219.163	70.244					

Austria

Sub-river Basins & Sub-river Basin Areas	Population			Sources of Pollution***												Land Use in km²****					
3. Austrian Sub-river Basins	km²	Inhabitants	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Other
				XL	L	M	HP	MP	LP	HP	MP	HP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other		
3.1 Inn Sub-river Basin																					
3.1.1 Lech	2.419	49.448	20																		
3.1.2 Inn (upper part)	8.366	534.305	50			1										6.522	161	6.351	10	6.484	5.255
3.1.3 Salzach	5.510	459.366	57			1								1							
3.1.4 Inn (Lower Part)	1.966	198.569	101											1							
3.2 A. Danube Sub-river Basin																					
3.2.1 Danube (Inn - Traun)	2.502	225.059	90					1													
3.2.2 Traun	4.268	631.060	148																		
3.2.3 Enns	6.185	169.736	27													15.247	9.192	5.567	488	11.423	4.981
3.2.4 Danube (Traun - Kamp)	7.442	583.128	51			1															
3.2.5 Danube (Kamp - March)	7.527	2.289.726	100	1				1													
3.2.6 March	3.727	183.551	49																		
3.3 Pan. Centr. Danube Sub-river Basin																					
3.3.1 Leitha	1.998	159.800	80													4.233	3.051	897	285	2.963	1.546
3.3.2 Rabnitz and Raab	6.744	483.174	72																		
3.4 Drava-Mura Sub-river Basin																					
3.4.1 Mur	10.333	876.165	62			1		1								7.039	1.540	5.446	53	11.225	3.905
3.4.2 Drau	11.866	592.679	50					1													
Total Austrian Sub-river Basins	**80.853**	**7.435.766**	**92**	**1**	**0**	**4**		**4**						**2**		**33.041**	**13.944**	**18.261**	**836**	**32.095**	**15.687**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Wien, Linz, Graz, Innsbruck and Salzburg.

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Instead of "hot spots", the Austrian Ministry for Agriculture and Forestry indicated six major "Sources of Pollution" in need of upgrading the WWTP performance (nutrient removal).

**** Data from the Austrian Statistical Yearbook 1998 and the "Grüner Bericht"!
Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Austria

Sub-river Basins & Sub-river Basin Areas **Agriculture 33.936km²**

3. Austrian Sub-river Basins	Lifestock			Fertiliser		Pesticides	Main Cultures		
	Cattle	Pigs	Poultry	Nitrogen	Phosphate				
3.1 Inn Sub-river Basin									
3.1.1 Lech									
3.1.2 Inn (Upstream)									
3.1.3 Salzach									
3.1.4 Inn (Downstream)									
3.2 Aust. Danube Sub-river Basin									
3.2.1 Danube (Inn - Traun)									
3.2.2 Traun									
3.2.3 Enns									
3.2.4 Danube (Traun - Kamp)									
3.2.5 Danube (Kamp - March)									
3.2.6 March									
3.3 Pan. Centr. Danube Sub-river Basin									
3.3.1 Leitha									
3.3.2 Rabnitz und Raab									
3.4 Drava-Mura Sub-riverBasin									
3.4.1 Mur									
3.4.2 Drau									
Total Production in t/y							3.011.921	1.840.955	1.351.891
Total number of Lifestock *	2.208.700	3.646.400	12.054.100						
Total number of Lifestock/km² *	62	104	355						
Total Fertiliser in kg/ha (1997) *				32	15	2,3			
Total Application Fertilizer/country in t/y				113.000	25.080				

These data indicate only the use of mineral fertilizer! (no data available on manure fertilizer)

* The data given here were taken from the FAO Internet Database, 1996 Data (from Austrian Contribution GEF-Danube PRP Part B)

Czech Republic

Sub-river Basins & Sub-river Basin Areas	Population						Hot Spots***									Land Use in km²****						
	km²	Population	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Waters	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
4. Morava Sub-river Basin Basin Area																						
4.1 Morava	21.145	2.780.000	131		1	1	4	2	3	2	2	1	1	1	1	10.524	9.515	571	438	7.189	296	317
Total Czech Sub-river Basin	**21.145**	**2.780.000**	**131**		**1**	**1**	**4**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**10.524**	**9.515**	**571**	**438**	**7.189**	**296**	**322**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Brno, Olomouc
** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.
*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority
****Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Czech Republic

Sub-river Basins & Sub-river Basin Areas **Agriculture 10524 km²**

	Lifestock				Fertilisers			Pesticides	Main Cultures	
	cattle	pigs	poultry	sheeps	Nitrogens	Phosphates	K2O		Wheat	Barley
4. Morava River Sub-river Basin										
4.1 Morava										
Total Production in t/y/ha									5	4
Total number of Lifestock	414.867	1.253.165	8.468.617	13.321						
Total number of Lifestock/km²	39	119								
Total Fertiliser in kg/ha (1997)					61	12				
Total Fertiliser in kg/ha (1988)										
Total Application Fertilizer/country in t/y					56.045	15.129				
These data indicate only the use of mineral fertilizer! (no data available on manure fertilizer)										

Slovakia

Sub-river Basins & Sub-river Basin Areas **Population** **Hot Spots***** **Land Use in km²******

	km²	Population	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
5. Morava - Danube Sub-river Basin				XL	L	M	XL	L	M	XL	L	M	XL	L	M	Total	Arable L.	Mea-Pa	Other			
5.1 Morava	2.257																					
5.2 Danube	1.138													1	1							
Sub-Total	3.395	872.865	125		1									1	1	2.380	2.176	136	68	782	34	204
6. Vah Sub-river Basin																						
6.1 Nitra	4.380		0				1	1	1				1	1								
6.2 Váh	11.625		0					1	1													
Sub-Total	16.005	2.182.249	50				1	2	2				1	1		8.320	7.680	480	160	7.200	160	320
7. Hron sub-river Basin																						
7.1 Hron	5.465	476.809	87					1							3							
7.2 Ipel	3.647	210.732	58																			
7.3 Slaná	3.191	182.485	57																			
Sub-Total	12.303	870.026	71					1							3	6.027	5.658	246	123	5.904	123	246
8. Bodrog - Hornád Sub-river Basin																						
8.1 Hornád	4.427	655.000	148				1															
8.2 Bodrog	7.329	536.224	41			1		3					1	1								
8.3 Bodva	893	50.700	57																			
Sub-Total	12.649	1.241.924	98			1	1	3					1	1		6.432	5.040	1.265	127	5.670	123	246
Total Slovakia Sub-river Basins	**44.352**	**5.167.064**	**101**	**0**	**1**	**1**	**2**	**6**	**2**	**0**	**0**	**0**	**2**	**3**	**4**	**23.159**	**20.554**	**2.127**	**478**	**19.556**	**440**	**1.016**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Bratislava, Kosice.

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

*** No Information about Agricultural Hot Spots!

****Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Slovakia

Sub-river Basins & Sub-river Basin Areas **Agriculture 23.159km²**

5. Morava - Danube	Lifestock				Fertiliser			Pesticides	Main Cultures		
Sub-river Basin	Cattle	Pigs	Poultry	Sheep	Nitrogen	Phosphate	K2O		Sugar Beet	Potatoes	Grain Maize
5.1 Morava											
5.2 Danube											
Sub-Total											
6. Vah Sub-river Basin											
6.1 Nitra											
6.2 Váh											
Sub-Total											
7. Hron Sub-river Basin											
7.1 Hron											
7.2 Ipel											
7.3 Slaná											
Sub-Total											
8. Bodrog - Hornád Sub-river Ba											
8.1 Hornád											
8.2 Bodrog											
8.3 Bodva											
Sub-Total											
Total Production in t/y									1.695.000	777.000	750.000
Total number of Lifestock	891.991	1.985.223	14.147.000	419.000							
Total number of Lifestock/km²	37	83	611	18							
Total Fertiliser in kg/ha (1997)					33	9	7				
Total Fertiliser in kg/ha (1988)					63	31	30				
Total Application Fertilizer/country in t/y					74.456	20.030					
These data indicate only the use of mineral fertilizer! (no data available on manure fertilizer)											

Hungary

			Population				Hot Spots****									Land Use in km² *****						
	km²	Inhabitants	Density**	No. of cities in category***			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
9.Danube-Drava Sub-river Basin Area*																						
9.1 Györ	6.358	734.533	95			1	1	2	2		2			3	1							
9.2 Budapest	8.385	3.004.364	133	1			2		4		1			2								
9.3 Baja	5.584	292.653	52						1		1				1							
9.4 Székesfehérvár	12.703	1.065.668	75			1	1	2	4					3	1							
9.6 Pécs	9.874	699.115	54			1		2							2							
9.7 Szombathely	7.643	583.366	76					5			2											
Sub-Total	50.546	6.379.699	81	1		3	4	11	11		6		2	8	5	30.353	23.916	5.427	1.010	11.615	361	2.025
10. Tisza Sub-river Basin Area*																						
10.1 Nyíregyháza	5.498	538.114	77			1		1														
10.2 Mskolc	10.218	992.615	80			1		2	3													
10.3 Debrecen	7.029	591.449	54			1		1							2							
10.4 Szolnok	7.110	552.155	63			1			1		1				4							
10.5 Szeged	8.608	757.202	69			1		2			2				1							
10.6 Gyula	4.019	294.547	73					1														
Sub-Total	42.483	3.726.082	70			5	1	7	4		3		1	3	7	30.539	23.211	6.056	1.272	6.036	322	1.272
Total Hungarian Sub-river Basins Area	**93.029**	**10.105.781**	**76**	**1**	**0**	**8**	**5**	**18**	**15**	**0**	**9**	**0**	**3**	**11**	**12**	**60.892**	**47.127**	**11.483**	**2.282**	**17.651**	**683**	**3.297**

* Named according to the relevant water administration district

** Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Budapest, Debrecen, Miskolc, Szeged, Pécs, Györ, Nyíregyháza, Székesfehérvár and Kecskemét.

*** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

**** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

*****Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Hungary

Sub-river Basins & Sub-river Basin Areas **Agriculture 70.037 km²**

	Lifestock			Fertiliser		Pesticides	Main Cultures		
	Catlle	Pigs	Poultry	Nitrogen	Phosphate		sugar beet	wheat	maize
9.Danube-Drava Sub-river Basin Area									
9.1 Györ									
9.2 Budapest									
9.3 Bajar									
9.4 Székesfehérvár									
9.6 Pécs									
9.7 Szombathely									
Sub-Total	530.000	2.850.000	21.894.000						
10. Tisza Sub-river Basin Area									
10.1 Nyíregyháza									
10.2 Mskolc									
10.3 Debrecen									
10.4 Szolnok									
10.5 Szeged									
10.6 Gyula									
Sub-Total	422.000	2.673.000	10.541.000						
Total Production/t/y							4.677.117	3.910.186	5.989.220
Total number of Lifestock	952.000	5.523.000	32.435.000						
Total number of Lifestock/km²	14	79	463						
Total Fertiliser in kg/ha (1997)				14	3				
Total Fertiliser in kg/ha (1988)				20	3				
Total Application Fertilizer/country in t/y				233.000	21.600				
These data indicate the use of mineral fertilizer (N:203000 t/y, P: 15000 t/y) and of organic fertilizer (N: 30000 t/y, P: 6600 t/y)!									

Slovenia

Sub-riverBasins & Sub-river Basin Area	Population						Hot Spots***									Land Use in km² ****						
	km²	Inhabitants	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural L.				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
11. Sava Sub-river Basin Area																						
11.1 Sava	11.734	1.083.712	77		1		4	6	6	1			2	2	2	4.846	1.504					
Sub-Total	11.734	1.083.712	77		1		4	6	6	1			2	2	2	4.846	1.504					
12.Drava Sub-river Basin Area																						
12.1 Drava	3.430	415.000	74			1	2						1		1	1.428	561					
Sub-Total	3.430	415.000	74			1	2						1		1	1.428	561					
13. Mura Sub-river Basin Area																						
13.1 Mura	1.376	120.000	87				3			3			1			912	546					
Sub-Total	1.376	120.000	87				3			3			1			912	546					
Total Slovenia Sub-river Basins	**16.540**	**1.618.712**	**98**	**0**	**1**	**1**	**9**	**6**	**6**	**4**	**0**	**0**	**4**	**2**	**3**	**7.186**	**2.611**	**3.965**		**8.790**	**36**	**1.143**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Maribor and Ljubljana

*** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

**** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Slovenia

Sub-riverBasins & Sub-river Basin Area **Agriculture 7185,74 km²**

	Lifestock				Fertiliser			Pesticides	Main Cultures			
	cattle	pigs	poultry	sheep	Nitrogen	Phosphate	K2O		wheat	maize	potatoes	fruits
11. Sava Sub-river Basin Area												
11.1 Sava												
Sub-Total												
12.Drava Sub-river Basin Area												
12.1 Drava												
Sub-Total												
13. Mura Sub-river Basin Area												
13.1 Mura												
Sub-Total												
Total Production in t/y									144.672	299.849	399.348	149.253
Total number of Lifestock	435.870	557.186	8.975.700	25.380								
Total number of Lifestock/km²	61	78	1249	4								
Total Fertiliser in kg/ha (1997)					35,6	20,9	23,3	1,1				
Total Fertiliser in kg/ha (1988)												
Total Application Fertilizer/country in t/y					56.873	18.910						
These data indicate the use of mineral fertilizer (N:28800 t/y, P: 10233 t/y) and of organic fertilizer (N: 28073 t/y, P: 8677 t/y)!												

Croatia

Sub-river Basins & Sub-river Basin Areas	Population						Hot Spots****									Land Use in km² *****						
	km²*	Inhabitants	Density**	No. of cities in category***			Municipal			Agricultural			Industrial			Agricultural L.				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L	Mea-Pa	Other			
14. Danube & Drava Sub-river Basin Are																						
14.1 Danube	2.523	203.480	81						1													
14.2 Drava	6.888	705.721	102			1	2	2	2		1		2		1							
Sub-Total	9.411	909.201	97			1	2	2	3		1		2		1							
15. Sava Sub-river Basin Area																						
15.1 Sava	25.100	2.339.341	93		1		2	3		1		1	2	4	1	12.052				9.158		
Sub-Total	25.100	2.339.341	93		1		2	3		1		1	2	4	1							
Total Croatian Sub-river Basins	**34.511**	**3.248.542**	**94**	**0**	**1**	**1**	**4**	**5**	**3**	**1**	**1**	**1**	**4**	**4**	**2**	**16.247**		**2.906**				

*km²: National Report Data are given, New Data (01.04.99): Drava & Danube Sub-basin: 9,304 km² "Irrigation area", 5,709 km² agricultural area!

** Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Osijek and Zagreb

*** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

**** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

***** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)
estimated value!

Croatia

Sub-river Basins & Sub-river Basin Areas Agricultural Land 16,247 km²

	Lifestock				Fertiliser			Pesticides	Main Cultures		
	Cattle	Pigs	Poultry	Sheep	Nitrogen	Phosphate	K2O		Corn	Sugar Beet	Wheat
14. Danube & Drava Sub-river Basin A.											
14.1 Danube											
14.2 Drava											
Sub-Total											
15. Sava Sub-river Basin Area											
15.1 Sava											
Sub-Total											
Total number of Lifestock	288.283	1.408.439	5.567.203	91.387							
Total number of Lifestock/km²	22	108	1.916	30							
Total Fertiliser in kg/ha (1997)					41	17		3,25			
Total Fertiliser in kg/ha (1988)											
Total Application Fertilizer/country in t/y											
Total Production in t/y									2.044.847	962.882	863.163

Bosnia & Herzegovina

Sub-river Basins & Sub-river Basin Areas	Population			Hot Spots***												Land Use in km² ****						
	km²	Inhabitants	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural L.				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
16. Sava Sub-river Basin Area																						
16.1 Una with Sana	8.554	563.326	38			1																
16.2 Vrbas	5.806	230.492	40			1																
16.3 Bosna	14.641	1.906.853	74		1	3																
16.4 Drina	5.215	246.292	47																			
16.5 Sava	3.100	399.418	129																			
Total B. & H. Sub-river Basin	**37.316**	**3.346.381**	**90**		**1**	**5**	**3**	**2**	**2**	**1**	**2**	**2**	**5**	**2**	**2**	**18.285**	**8.935**	**4.014**		**17.574**	**31**	

* Density:The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Banja Luka, Tuzla, Zenica, Doboj, Prijedor and Sarajevo
** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.
*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority
**** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.): estimated values!

Bosnia & Herzegovina

Sub-river Basins & Sub-river Basin Areas **Agriculture 18.285 km²**

	Lifestock			Fertiliser			Pesticides	Main Cultures		
	Cattle	Pigs	Poultry	Nitrogen	Phosphate	K2O		fruits	cattle food	maize
16. Sava Sub-river Basin Area										
16.1 Una with Sana										
16.2 Vrbas										
16.3 Bosna										
16.4 Drina										
16.5 Sava										
Total Production in t/y								846.850	618.200	582.907
Total number of Lifestock	142.174	144.765	3.681.903							
Total number of Lifestock/km²	8	8	201							
Total Fertiliser in kg/ha (1997)				5	1,5		2,5 (5-6)*			
Total Fertiliser in kg/ha (1988)										
Total Application Fertilizer/country in t/y				1.715	no data!					
These data indicate only the use of mineral fertilizer! (no data available on manure fertilizer)										

* 2,5 kg/ha on private farms, 5-6 kg/ha on socially-owned farms
* The data given here were taken from the FAO Internet Database, 1996 Data (from Austrian Contribution GEF-Danube PRP Part B)

Yugoslavia

Sub-river Basins & Sub-river Basin Areas	Population			Hot Spots***											Land Use in km² ****						
	km²	Inhabitants	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
17.Danube Corridor Sub-river Basin Area																						
17.1 Danube	11.610	2.833.954	137	1		1	8	2	3	1	3	1	3									
Sub-Total	11.610	2.833.954	137	1		1	8	2	3	1	3	1	3									
18. Tisa Sub-river Basin Area																						
18.1 Tisa	8.994	809.755	79			1	4			3	5		1									
Sub-Total	8.994	809.755	79			1	4			3	5		1									
19. Sava Sub-river Basin Area																						
19.1 Sava	31.046	1.354.592	44				5	6	2	1	1		1									
Sub-Total	31.046	1.354.592	44				5	6	2	1	1		1									
20. Velika Morava Sub-river Basin Area																						
20.1 Velika Morava	37.269	4.081.046	96			3	13	9	1	3	1		4									
Sub-Total	37.269	4.081.046	96			3	13	9	1	3	1		4									
Total Yugoslavia Sub-river Basins	**88.919**	**9.079.347**	**56**	**1**	**0**	**5**	**30**	**17**	**6**	**8**	**10**	**1**	**9**	**0**	**6**	**56.871**	**37.560**	**17.280**	**2.840**	**25.210**	**367**	**4.445**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Novi Sad, Belgrade, Nis, Pristina, Subotica, Kragujevac

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

**** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.): data were estimated out of the total country area

Yugoslavia

Sub-river Basins & Sub-river Basin Areas **Agriculture**

	Lifestock				Fertiliser			Pesticides	Main Cultures		
	cattle	pigs	poultry	sheep	Nitrogen	Phosphate	K2O		(Fodder-) Crops	Industr.Plants	Vegetable Plants
17.Danube Corridor											
Sub-river Basin Area											
17.1 Danube											
Sub-Total											
18. Tisa Sub-river Basin Area											
18.1 Tisa											
Sub-Total											
19. Sava Sub-river Basin Area											
19.1 Sava											
Sub-Total											
20. Velika Morava											
Sub-river Basin Area											
20.1 Velika Morava											
Sub-Total											
Total Production in t/y									12400 000	5.450.000	1.550.000
Total number of Lifestock	1.700.000	4.000.000	25.000.000	2.000.000							
Total number of Lifestock/km²	30	70									
Total Fertiliser in kg/ha (1997)					52	25	22	1			
Total Fertiliser in kg/ha (1988)					147	62	57	3			
Total Application Fertilizer/country in t/y					215.000	30.500					
These data indicate the use of mineral fertilizer (N:115000 t/y, P: 4500 t/y) and of organic fertilizer (N: 100000 t/y, P: 26000 t/y)!											

Bulgaria

	Population						Hot Spots***								Land Use in km² ****						
	km²	Inhabitants	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	not classifie			HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
21. Western Region																						
Sub-river Basin Area																						
21.1 Ogosta (Zone B)	6.641	402.130	61				1	1					1									
21.2 Skat and Iskar (Zone C)	10.071	1.555.254	44	1			1	1						1	1							
21.3 Vidin Region (Zone A)	2.480	135.688	55						1													
Sub-Total	19.192	2.093.072	51	1			2	2	1				1	1	1	12.096	10.944	768	384	5.952	192	960
22. Central Region																						
Sub-river Basin Area																						
22.1 Vit and Ossam (Zone D)	6.577	412.659	44			1			1													
22.2 Yantra (Zone E)	8.659	550.040	64						1				1									
Sub-Total	15.236	962.699	55			1	5		2				1			8.360	7.600	456	304	6.080	152	608
23. Eastern Region																						
Sub-river Basin Area																						
23.1 Roussenski Lom (Zone F)	3.978	236.775	60					1	2				1									
23.2 Silistra & Dobritch Regions Z.G+A13	8.126	614.866	42			2			1													
Sub-Total	12.104	851.641	48			2		1	3				1			9.196	8.470	484	242	2.299	121	484
Total Bulgaria Sub-river Basi	**46.532**	**3.907.412**	**84**	**1**	**0**	**3**	**7**	**3**	**6**				**3**	**1**	**1**	**29.652**	**27.014**	**1.708**	**930**	**14.331**	**465**	**2.052**

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e Rousse, Pleven, Sofia, Dobritsch

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority
Agricultural Hot Spots were not classified!

**** Land Use information is based on CORINE Datas Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)
Bulgarian data: Utilised Agricultural Land: 30,344 km², Arable Land: 19,803 km² and forests 10,787 km²!

Bulgaria

Sub-river Basins & Sub-river Basin Areas **Agriculture 29.652 km²**

	Lifestock				Fertiliser			Pesticides	Main Cultures		
21. Western Region	cattle	pigs	poultry	sheeps	Nitrogens	Phosphate	K2O		Wheat, Barley	Maize	Barley
Sub-river Basin Area											
21.1 Ogosta (Zone B)											
21.2 Skat and Iskar (Zone C)											
21.3 Vidin Region (Zone A)											
Sub-Total											
22. Central Region											
Sub-river Basin Area											
22.1 Vit and Ossam (Zone D)											
22.2 Yantra (Zone E)											
Sub-Total											
23. Eastern Region											
Sub-river Basin Area											
23.1 Russenski Lom (Zone F)											
23.2 Silistra and Dobritch Regions Z.G+A1											
Sub-Total											
Total Production/t/y									1.366.000	938.000	271.000
Total number of Lifestock	263.555	964.922	10.546.640	1.532.939							
Total number of Lifestock/km²	11	33	346	55							
Total Fertiliser in kg/ha (1997)					35	2	0,7				
Total Fertiliser in kg/ha (1988)					48	8	1,08				
Total Application Fertilizer/country in t/y					165.258	9.108					
These data indicate only the use of mineral fertilizer! (no data were available on manure fertilizer)											

Romania

		Population					Hot Spots****									Land Use in km² *****						
	km²*	Population	Density**	No. of cities in category***			Municipal			Agricultura			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP	MP	LP	HP	MP	LP	Total	Arable L.	Mea-Pa	Other			
24. Transilvania																						
Sub-river Basin Area																						
24.1 Somes-Tisa	22.300	2.129.000	83			2	2		6		3	2		1	7							
24.2 Crisuri	14.860	1.269.000	48		1	1	1		1					1	5							
24.3 Mures-Arcana-Ier	29.390	2.275.000	65			2	1		7			2		6	18							
24.4 Bega-Timis-Caras-Nera	14.440	1.103.100	53		1		4		1		1	1			7							
Sub-Total	80.990	6.776.100	65		2	5	8		15		4	5	13	8	37	37.253	32.396	3.239	1.618	39.685	810	3.240
25. Muntenia																						
Sub-river Basin Area																						
25.1 Jiu-Cerna	11.440	1.655.031	118		1		1		2				1		4							
25.2 Olt	24.010	2.734.854	88		1	2		1	4				3	3	4							
25.3 Vedea-Arges	17.980	4.283.386	100	1	1	1	2		3				1	1	2							
25.4 Ialomita-Buzau	15.654	1.520.000	97					1	3	1			1	5	7							
25.5 DanubeBasin/ Black Sea shore	36.696	1.703.013	28		1	2	2		4	1	1	1	2	5	4							
Sub-Total	105.780	11.896.284	74	1	4	5	5	2	16	2	2	1	8	14	21	63.420	56021	4228	3171	33824	4228	4228
26. Moldova																						
Sub-river Basin Area																						
26.1 Siret	30.406	2.152.009	47		1	5			8	1		0	4	4	10							
26.2 Prut-Birlad	18.210	2.363.330	111		1		1		1	1		1	1		2							
Sub-Total	48.616	4.515.339	71		2	5	1		9	2		1	5	4	12	25.758	22.356	1.944	1.458	19.440	486	2.916
Total Romania S.-riverBasins	235.386	23.187.723	70	1	8	15	14	2	40	4	6	7	26	26	70	126.431	110.773	9.411	6.247	92.949	5.524	10.384

* the km² are partly only estimated by national experts

** Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants, i.e. without Baia Mare, Satu Mare, Oradea, Tangu Mures, Arad, Crajova, Pitesti, Constanta, Galati, Iasi, Bacau, Buzau, Bukarest, Timisoara, Cluj Napoca, Brasov, Braila, Sibiu, Bozosani, Dobreta, Piatra Neamt, Ploiesti, Suceava, R. Valcea.

*** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

**** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

***** Land Use information is based on CORINE Datas; Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Romanian data: Arable L.: 93,371 km², Past./ Mead.: 48,901, Forest: 62,447 km², Viney./Orcha.: 2,924/2776 km², Water/Wetlands: 7,452/2,953 km², Settlements: 2,949 km²

Romania

Sub-river Basins & Sub-river Basin Areas **Agriculture 126.431 km²**

24. Transsilvania	**Lifestock**				**Fertiliser**			**Pesticides**	**Main Cultures**		
Sub-river Basin Area	cattle	pigs	poultry	sheep	Nitrogen	Phosphate	K2O		Cereal Grains	Fodder Crops	Annuals
24.1 Somes-Tisa											
24.2 Crisuri											
24.3 Mures-Arcana-ler											
24.4 Bega-Timis-Caras-Nera											
Sub-Total											
25. Muntenia											
Sub-river Basin Area											
25.1 Jiu-Cerna											
25.2 Olt											
25.3 Vedea-Arges											
25.4 Lalomita-Buzau											
25.5 DanubeBasin/ Black Sea shore											
Sub-Total											
26. Moldova											
Sub-river Basin Area											
26.1 Siret											
26.2 Prut-Birlad											
Sub-Total											
Total Production in t/y									19.882.800	12.209.900	4.127.400
Total number of Lifestock	3.496.000	7.960.000	80.524.000	11.086.000							
Total number of Lifestock/km²	28	63	636	87							
Total Fertiliser in kg/ha (1997)					18	10	16	1			
Total Fertiliser in kg/ha (1988)					23	11	2				
Total Application Fertilizer/country in t/y					252.500	90.630					

These data indicate the use of mineral fertilizer (N:208,000 t/y, P: 89,000 t/y) and of organic fertilizer (N: 44,500 t/y, P: 1,630 t/y)!

Moldova

Sub-river Basins & Sub-river Basin Areas	Population			Hot Spots**											Land Use in km² ****						
	km²	Population	Density	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural L.				Forest	Waters	Urban
27.Upper Prut				XL	L	M	XL	L	M	XL	L	M	XL	L	M	Total	Arable L.	Mea-Pa	Other			
Sub-river Basin Area																						
27.1 Upper Prut River	4.442	422.000	95				1	2	4		1											
Sub-Total	4.442	422.000	95				1	2	4		1											
28. Lower Prut																						
Sub-river Basin Area																						
28.1 Lower Prut River	3.900	390.000	100				1	1	1													
Sub-Total	3.900	390.000	100				1	1	1													
29. Danubian Lakes																						
Sub-river Basin Area																						
29.1 Yalpugh and Cahul River Basin	3.785	250.000	66					2					1***									
Sub-Total	3.785	250.000	66					2					1									
Total Moldavia Sub-river Basi	**12.127**	**1.062.000**	**88**	**0**	**0**	**0**	**2**	**5**	**5**	**0**	**1**	**0**	**1**	**0**	**0**							

* city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority

*** This industrial Hot Spot was mentioned as " some deposited material and way of deposition in this part of the Danube".

**** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

Moldova

Sub-river Basins & Sub-river Basin Areas	Agriculture									
	Lifestock				Fertiliser			Pesticides	Main Cultures	
	cattle	pigs	poultry	sheeps	Nitrogen	Phosphate	K2O			
27.Upper Prut Sub-river Basin Area										
27.1 Upper Prut River										
Sub-Total										
28. Lower Prut Sub-river Basin Area										
28.1 Lower Prut River										
Sub-Total										
29. Danubian Lakes Sub-river Basin Area										
29.1 Yalpugh and Cahul River Basin										
Sub-Total										
Total number of Lifestock										
Total number of Lifestock/km²	25	37								
Total Fertiliser in kg/ha (1997)					10	1		3,5		
Total Fertiliser in kg/ha (1988)					200	20		11		
Total Application Fertilizer/country in t/y										
Total Production in t/y										

* The data given here were taken from the FAO Internet Database, 1996 Data (from Austrian Contribution to the GEF-Danube PRP, Part B).

UKRAINE

Sub-river Basins & Sub-river Basin Areas	Population						Hot Spots***									Land Use in km²*****						
	km²	Population	Density*	No. of cities in category**			Municipal			Agricultural			Industrial			Agricultural Land				Forest	Water	Urban
				XL	L	M	HP	MP	LP	HP***	MP***	LP****	HP***	MP	LP	Total	Arable L.	Mea-Pa	Other			
30. Transcarpathian Sub-river Basin Area																						
30.1 Tisa	12.800	1.133.340	89			1	1	1						1	2							
Sub-Total	12.800	1.133.340	89			1	1	1						1	2							
31. Prut Sub-river Basin Area																						
31.1 Upper Prut	11.600	1.300.000	90		1		2															
Sub-Total	11.600	1.300.000	90		1		2															
32. Lower Danube Sub-river Basin Area																						
32.1 Lower Danube	6.300	490.000	78					1														
Sub-Total	6.300	490.000	78					1														
Total Ukraine Sub-river Bas	30.700	2.923.340	83		1	1	3	2	0	0	0	2	0	1	2	19.051	5.105	5.053		11.753	432	149

* Density: The values given indicate inhabitants/km² without cities over 100,000 inhabitants i.e. Cernivci, Uzhgorod

** city categories: XL= over 1,000,000 inhabitants, L = 250,000 - 1,000,000 inh., M = 100,000 - 250,000 inh.

*** Hot Spots: number of Hot Spots in 3 categories: HP = high priority; MP = medium priority; LP = low priority
These Medium and High Priority Hot Spots were not yet assessed in the Ukraine!

**** Low Priority Agricultural Hot Spots: "Kylia Hot Spot and Liski Hot Spot do not have any direct discharge into the Danube River" (Part B chapter 2.2.3)

***** Mea-Pa = meadows and pastures; Other = special cultures (vineyards, orchards etc.)

UKRAINE

Sub-river Basins & Sub-river Basin Areas **Agricultur 19050,5 km²**

	Lifestock				Fertiliser			Pesticides	Main Cultures		
	cattle	pigs	poultry	sheeps	Nitrogen	Phosphate	K2O		Grain	Sugar Beets	Potatoes
30. Transcarpathian Sub-river Basin Area											
30.1 Tisa											
Sub-Total											
31. Prut Sub-river Basin Area											
31.1 Upper Prut											
Sub-Total											
32. Lower Danube Sub-river Basin Area											
32.1 Lower Danube											
Sub-Total											
Total Production in t/y									4.326.100	2.164.500	1.797.500
Total number of Lifestock	264.200	99.000	4.485.780	93.600							
Total number of Lifestock/km²	13	5	235	5							
Total Fertiliser in kg/ha (1997)					15	3					
Total Fertiliser in kg/ha (1988)					18	4					
Total Application Fertilizer/country in t/y											

Annex 2

Sequence of Significant Impact Areas (PRP Workshop in Hernstein/A)

Results of the Transboundary Analysis Workshop in Hernstein/Austria (working groups; revised tables).

IMPACT AREA	DESCRIPTION		
	EFFECTS	**WATER QUALITY INDICATORS**	**RELATION TO CAUSES (HOT SPOTS AND DIFFUSE SOURCES) ⇒ MAP**
1. MIDDLE MORAVA (CZ)	- groundwater sources - nature conservation - see restoration area no.4 - ∀ = 9 protected areas	- COD - nitrogen, phosphorous, - microbiological pollution, - mercury	M: Brno, Zlin, Hodonin, Uh.Hradiste, Otrokovice, Milotice, Dubnany
2. LOWER MORAVA (CZ)	- nature conservation - water ecosystems - floodplains - wetlands	- nitrogen – ammonium - sulphate - zinc - DIS - chloride	M: Senica nad Myjavov
3. SZIGETKÖZ (H / SK)	- drinking water sources - biodiversity - irrigation	- organic regime - nutrients - toxics	upstream hot spots in the Czech Morava basin, Austria + Bratislava
4. DANUBE BEND (H)	- drinking water - nature protection	- oxygen regime parameters - toxics	upstream domestic and transboundary sources
5. GEMENC – KOPACKI RIT (H / HR /YU)	- degradation of the Kopački Rit and Gemenc nature parks - limited water supply (Osijek)	- load approx. 1,200,000 P.E. (HR) - deteriorated water quality - increased level of nutrients - H: 800,000 PE	- lack of the treatment of wastewater of the cities of Osijek, Belišće and Bilje (HR) and - Veszprém, Székesfehérvár, Kaposvár, Pécs, Pétfürdô, Siófok, Szekszárd, Paks, Mohács and Simontornya (H)
6. MIDDLE DRAVA *(SLO / HR)*	- decrease of:water quality and biodiversity - microbiological pollution	- nutrients N, P - BOD and COD - SS - microbiological parameters	M: Maribor, Ptuj, Varaždin + import from Austria I: Dairy Maribor, Sugar Factory Ormož (already tackled but present in EMIS) + import from Austria A: dispersed pollution + import form Austria
7. LOWER MURA-DRAVA (SLO / HR / H)	- eutrophication - fast erosion of riverbed - because of hydropowerplant in Austria	- decreased water life and groundwater levels - reduced biodiversity - nutrients, BOD...	M: M. Sobota, Lendava, Ljutomer + import from Austria I: Pomurka M.S., Paloma + import from Austria A: Farms Podgrad, Nemščak, Rakičan

8. DANUBE AT NOVI SAD *(YU)*	- limited water supply - limited availability for recreation	- microbiological pollution - TOC conc. increasing - resistant organics - toxic substances	polluters within the upper part of the DRB
9. UPPER TISA (UA / RO)	- erosion - human health affected - biodiversity affected - economic losses - drinking water affected	- enthero viruses - phenolic and chlorinated - compounds - BOD - nutrients	- timber processing industries of Teresva, Velyky Bychkiv and Rakhiv - Mukachevo WWTP - threat of floods
10. SOMES (RO / H)	- water supply is affected/ decreased - frequent accidental pollution with heavy metals. - biodiversity is affected - reduction of the fish stock - eutrophication	- organic regime - nutrients - toxic substances	M:- Zalau (HP-HS) affecting Crasna river (water quality up/down is I-III) - Baia Mare, Cluj and Satu Mare with mixed industrial and municipal wastewaters I:- Phoenix Baia Mare - Terepia Cluj - Uranium mine, Stei Bihor - SOMES Dej - CLUJANA Cluj A:- Agrocomsuin Bontida - Comsuin Moftin - Aricola Satu Mare
11. Latorita (UA / SK)	- water quality - water diseases - biodiversity - economic losses	- pathogenic bacteria, - oil pollution, - nutrients	- Mukachevo WWTP - insufficient capacity - lack of rural treatment - old crude oil pipelines - frequent oil spills - deforestation due to inappropriate forestry practices
12. UZH (UA / SK)	- human health - economic losses - erosion - drinking water	- enthero viruses - oil pollution - heavy metals - BOD	- Uzhgorod municipal WWTP, oil pollution (from pipelines), - air pollution from heavy traffic - threat of floods

13. BODROG-TISZA (SK / UA / H)	- drinking water - nature protection are Bodrog wetlands (see restoration area no.6)	- organic regime - nutrients - toxic substances	- Bukocel Hencovce wood industry - Strazske chemical factory - Ukraine hot spots ⇒ oil hazard Municipal, industrial hot spots in Slovakia and Ukraine
14. HORNAD-SAJÓ (SK / H)	- limited supply of drinking water - limited availability for irrigation	- oxygen regime parameters - nutrients (nitrogen, phosphorous) - heavy metals - sulphate, chloride, total iron - organic pollutants - oil hazard	WWTP Kosice
15. KÖRÖS **(H / RO)**	- frequent accidental pollution with oil - water supply is affected - water quality in the receiver is decreased (according to RO STAS for river classification): '94 up/down: I/II; '95 up/down: I/III; '96 up/down: I/I - decreasing biodiversity - eutrophication	- organic regime - nutrients - toxics	I.- Petrom Suplac de Barcau - Sinteza Oradea - EM Borod - Non-ferrous mines, Stei - Oradea Metal Works M:- Oradea
16. UPPER MURES (RO)	- drinking water - human health - biological productivity - economic losses	- high levels of pollutants such as nutrients, heavy metals, toxic pollutants dissolved and associated to the bottom sediment	I: industries from this area, mainly chemicals, mines, nutrients (on HS list) A: animal farms (on HS list)
17. MIDDLE MURES (RO)	- losses of biodiversity - drinking water - economic losses	- nutrients - toxic pollutants - heavy metals	M: Deva I: industries (on HS list)
18. LOWER MURES - SZEGED (H / YU)	- deterioration of water quality - enrichment with nutrients - limitations in water supply - damage to ecosystems	- microbial pollution - high nutrients level - chlorinated organic comp. - oxygen depletion	low level of WW treatment at Szeged and in Romanian (Mures river basin) hot spots

19. PALIC & LUDOS LAKES (YU / H)	- increased level of nutrients - damage to ecosystem (bird reserve) - deterioration of water quality - build-up of sediments (anaerobic conditions frequently appear) - limited availability for recreation	- high nutrients level - anoxia - sludge deposits	Subotica town (YU) (Kereš creek, hot spots)
20. UPPER BANAT (YU / H)	- deterioration of water quality - limited water supply - limited socio-economics - damage of ecosystem	- high nutrients - anoxia - microbiological pollution - hazardous substances - oxygen depletion - algal blooms, fish kills	polluters in the watershed of the upper Tisza river
21. VRBAS - DTD CANAL (YU)	- deterioration of water quakity - limitation of water supply - build-up of sediments (anaerobic)	- nutrient enrichment - organic load (BOD) - microbiological pollution - oxygen depletion - fish killing	Vrbas city and industry, and pig farm "Farmacoop"
22. MIDDLE BANAT – BEGA & BIRZAVA *(RO / YU)*	- frequent accidental pollution with organic substances soil and vegetation - deterioration of water quality (Tisa) - limited water supply, even for irrigation - destroying ecosystem	- high nutrients - anoxia - microbiological pollution - hazardous substances	M:- Resita (affects Birzava river; water quality decreased up/down: I/II; COD: 3.8 / 6.5, NH_4: 0.31 / 1.53, P: 0.039 / 0.2 - Timisoara (affects Bega & Timis rivers; WQ is decreased up/down: I/III; BOD: 2.7 / 9.5, NH_4: 0.28 / 4.31 A:- Comsuin Beregsaru I:- Iron industries, mines (on HS list: low pr)
23. UPPER SAVA (SLO / HR)	eutrophication and reduced availability for: - water supply - fisheries - recreation - cooling of NPP Krško	- COD and BOD - nutrients - after construction of HEPP -> increase of temperature -> contaminated sediments	M: Ljubljana, Domzale, Novo Mesto, Celje and Vedenje I: Vrhnika, ICEC Krško, Breweries (Ljubjana. Lasko) A: Ihan
24. SUTLA *(SLO / HR)*	- high pollution load regarding recipient	- nutrients - BOD load - DO depletion	- Rogaska Slatina (city + industry) (SLO) - Dubravica (agricultural) (HR)

25. KUPA (SLO / HR)	- limitation of water supply - degradation of biodiversity	- aquatic and terrestrial wildlife - nutrients - Water supply (HR): Karlovac and Petrinja	Urban, agricultural and industrial
26. MIDDLE SAVA-KUPA (HR)	- limited water use - biodiversity - water quality - Lonjsko Polje (HR) nature park - impact on water supply: Petrinja, Karlovac - Crna Mlaka - ornithology reservation - impact on BiH - Kupa river	- BOD, COD, - N, P, - heavy metals - sulphides, mineral oils	- 1,500,000 ES discharged (Zagreb, Karlovac, Sisak) = ¼ of the total Croatian population - highly industrialised area (Kutina, Vrbovec)
27. MIDDLE SAVA - UNA & VRBAS (BiH / HR)	- decreased availability of water (water supply, irrigation, fishery)	- BOD - nutrients - SS	M: Banja Luka, Bugojno, Jajce, Prijedor, Bihac I: INCEL, CELPAK A: Nova Topola
28. LOWER SAVA - BOSNA (BiH)	- decreased possibility for water use (water supply, irrigation, fishery) - degradation of biodiversity	- organic compounds - toxicity - nutrients	M: Sarajevo, Tuzla, Zenica, Travnik, Doboj, Brod I: NATRON HAK., Koksara, Zenica, Teslic A: Tuzla, Sarajevo
29. TARA CANYON (YU)	- adverse effects on Tara river canyon - disturbed biodiversity (rare species)	- microbiological pollution - nutrient enrichment - organic load (BOD)	Mojkovac town Kolašin town mining dump site
30. LOWER SAVA - DRINA (BiH / YU)	- degradation of water quality - degradation of biodiversity	- organic load - nutrient	M: Goražde, Brčko, Bijeljina (Sava river) I: FOČA (Drina river) A: Brčko, Bijeljina (Sava river)
31. SAVA AT BEOGRAD (YU)	- limited water supply - limited recreation	- resistant organics - mineral oils, organic carbon - high nutrient level - high Chl-a - microbial pollution	cumulative effects of upstream hot spots

32. WESTERN & SOUTHERN MORAVA (YU)	- deterioration of water quality - limited water supply - limitations on any use of water - endangered ecosystem	- nutrients enrichment - organic load (BOD) - oxygen balance disturbed - presence of heavy metals - microbial pollution	- Nis City - towns of Leskovac, Kruševac, Čačak and Priština polluters in the V. Morava basin
33. DANUBE AT IRON GATE (YU / RO)	- build-up of sediments with pollutants (chemical "time bomb" effect) - damage of ecosystem - deterioration of water quality - reduced biodiversity	- inorganic & organic particles - nutrients (algal blooms) - various toxic and hazardous substances from entire upstream watershed	- cumulative effects of all upstream hot spots I: Romeg Tr. Severin
34. LOWER TIMOK (YU / BG)	- damage of river ecosystem - damage of arable land - deterioration of water quality for any use	- heavy metals - organic load - microbiological pollution	- Bor (town + mining industry) - Zaječar town
35. OGOSTA AT VRATZA (BG)	- adverse effect on the aquatic ecosystem - effect on shallow underground water - shortage of fresh water - limiting irrigation and animal breeding - high health risk	- BOD_5 - TN - TP - SS	- Town Vratza - Himco fertilizer plant
36. ISKAR AT SOFIJA (BG)	- adverse effect on aquatic ecosystem - unsuitable for irrigation, animal breeding and recreation	- BOD_5 - $N\text{-}NO_2$ - $N\text{-}NH_4$ - Oil products	- insufficient operating of the Sofia WWTP - discharge of untreated wastewaters from rest of Sofia agglomeration - Kremikovitzi metallurgical plant

37. OSSAM AT TROYAN (BG)	- river bank filtration water used for water supply, irrigation and animal breeding is unsuitable - health risk for more than 30,000 people in the area of Troyan	- BOD_5 - N-NH_4 (during the low flow) - SS - N-NO_3	- absence of WWTP - combined sewerage system - discharge of untreated industrial wastewater - "Lesoplast" factory
38. OSSAM AT LOVETCH (BG)	- river bank filtration water used for water supply, irrigation and animal breeding is unsuitable - health risk for more than 60,000 people in the area of Lovetch	- BOD_5 - TN - TP - COD	- absence of WWTP - wastewater from industry discharges into the municipal sewerage system - "Velur" leather factory - winery, canning industry, - milk and meat processing
39. ROSITZA AT SEVLIEVO (BG)	- unsuitable for irrigation - unsuitable for recreation - health risk -eutrophication of the reservoir Al. Stamboliiski	- BOD - COD - heavy metals - toxic substances - N and P	- Town of Sevlievo + industry - "Sevko" tannery
40. MIDDLE YANTRA *(BG)*	- unsuitable waters for irrigation - adverse effect on the Yantra ecosystem for more than 40 km - high health risk - affects groundwater	BOD COD N P	-Towns Gorna Oriahovitza and Liaskovetz - Sugar and alcohol factories
41. LOM RIVERS (BG)	- river bank filtration water is unsuitable for water supply (villages of Getzovo and Drianovetz + town of Razgrad) - increased health risk.	BOD_5 N-NO_3 N-NO_2 P-PO_4	insufficient waste water treatment from: - town of Razgrad - “Antibiotic” Co. Pharmaceutics Plant

42. ARGES AT BUCURESTI (RO)	- water quality in the Arges is decreased to the lowest category (BOD_5 up/down: 6.1 / 45.9 mg/l; NH_4 up/down: 1.6 / 11.5 mg/l) - Danube water quality affected: up (L0240) / down L0280; 94: II/II; 95: I/II; 96: I/II (river class) - water diseases - fish stocks affected - drinking water supply and irrigation are affected	- BOD_5 - NH_4	I:- Siderca Calarasi - Comcem Calarasi - Bucharest ind. area - Verachim Giurgiu A: Comsuin Ulmeni M: Bucharest
43. IALOMITA NEAR PLOIESTI (RO)	- surface waters and groundwaters are affected by oil pollution form extraction and oil processing	oil pollution is in the surface and groundwater in large quantities	M: Ploiesti, Baicoi, Valea Calugareasca I: in this area mainly oil processing and petrochemistry (listed on HS list)
44. UPPER SIRET (UA / RO)	- biodiversity - recreational resource - water diseases - diffuse pollution - economic losses	- pathogenic bacteria, - nutrients	- frequent floods, - deforestation, - erosion
45. MIDDLE SIRET-BISTRITA & TROTUS *(RO / MD)*	- drinking water - human health - economic losses	- toxic pollutants or chemicals - organic substances	I: industries, mainly chemicals (on HS list) A: animal farms (on HS list)
46. UPPER PRUT AREA (UA / RO)	- human health - erosion - drinking water - biodiversity	- enthero viruses - content of nutrient - phenolic and chlorinated compounds -economic losses	- Kolomya, Chernivtsy municipal WWTP, including industrial discharges into municipal system; - threat of floods

47. MIDDLE PRUT AT IASI *(RO / MD)*	- water quality in the receiver is degraded - biodiversity is affected / reduction of the fish stocks	BOD upstream: 40.6 down: 46.6 NH_4 up: 2.55 down: 5.87	Qef Qrec on BAHLUI river
48. LOWER PRUT (RO / MD)	- drinking water supply affected - reduction of biodiversity	- BOD - N - P	Municipal wastewater discharges
49. YALPUGH *(MD / RO)*	- deterioration of water quality in both Yalpugh river and lake - water cannot be used for irrigation (Yalpugh) - reduction of recreation capacities of artificial lakes	- BOD - N, P - TDS	- 3 dams with reservoirs on Yalpugh - Municipal wastewater discharges (Comrat, Taraclia), - irrigation
50. LOWER DANUBE – SIRET & PRUT *(RO / MD / UA*	- water quality in the receiver is decreased to the II category (BOD_5 up/down: 2.8 / 4.3; NH_4 up/down: 0.25 / 0.35 - water supply is affected - biodiversity is affected - reduction of the fish stock and species - water diseases in Danube Delta area	- BOD - NH_4 - bacteriological purification - heavy metals	I: Alum Tulcea Celohart Braila Sidex Galati M: Braila Galati A: Braigal Braila
51. UKRAINIAN DELTA & LIMAN LAKES (UA / RO)	- losses of recreation value - losses of biodiversity - human health - biological productivity decreased - drinking water	- chlorinated compounds - phenolic compounds - fishes & biodiversity - diseases - enthero and other viruses	- Izmail: cardboard factory, municipal WWTP, - agricultural pollution from farms in Kylia region and irrigation

Significant Impact Area	Size (km²)	Countries
1. Middle Morava	1.370	CZ
2. Lower Morava	380	CZ-SK-A
3. Szigetköz	750	H-SK
4. Danube Bend	350	H
5. Gemenc – Kopacki Rit	1.980	H-HR-YU
6. Middle Drava	450	SLO-HR
7. Lower Mura - Drava	1.410	SLO-H-HR
8. Danube At Novi Sad	160	YU
9. Upper Tisa	1.230	UA-RO-H
10. Somes	4.980	RO-H
11. Latorita	410	UA-SK
12. Uzh	380	UA-SK
13. Bodrog - Tisza	610	SK-H
14. Sajo - Hornad	2.210	SK-H
15. Körös	3.160	H-RO
16. Upper Mures	1.560	RO
17. Middle Mures	410	RO
18. Lower Mures - Szeged	2.860	RO-H
19. Palic - Ludos Lakes	330	YU
20. Upper Banat	3.290	YU
21. Vrbas - DTD Canal	290	YU
22. Middle Banat – Bega & Birzava	3.680	RO-YU
23. Upper Sava	670	SLO-HR
24. Sutla	230	SLO-HR
25. Kupa	500	SLO-HR
26. Middle Sava - Kupa	2.820	HR
27. Middle Sava - Una & Vrbas	1.770	HR-BIH
28. Lower Sava - Bosna	1.320	HR-BIH
29. Tara Canyon	660	YU
30. Lower Sava – Drina	960	BIH-YU
31. Sava at Beograde	260	YU
32. Western & Southern Morava	5.029	YU
33. Danube at Iron Gate	1.500	YU
34. Lower Timok	780	YU-BG
35. Ogosta at Vratza	300	BG
36. Iskar at Sofija	330	BG
37. Ossam at Troyan	300	BG
38. Ossam At Lovetch	100	BG
39. Rossitza at Sevlievo	20	BG
40. Middle Yantra	120	BG
41. Lom Rivers	620	BG
42. Arges at Bucuresti	3.180	RO
43. Ialomita near Ploiesti	2.350	RO
44. Upper Siret	380	UA
45. Middle Siret – Bistrita & Trotus	1.360	RO
46. Upper Prut	1.000	UA
47. Middle Prut	370	RO
48. Lower Prut	520	RO-MD
49. Yalpugh	259	MD
50. Lower Danube - Siret & Prut	1.590	RO-MD-UA
51. Ukrainian Delta & Liman Lakes	2.470	UA
Total area of all SIAs	**64.018**	

Danube Sub-river Basins	Countries	Size (km²)
1. Upper Danube	D - A	52.710
2. Inn	A - D -CH	26.130
3. Austrian Danube	A	24.170
4. Morava	CZ - A - SK - PL	26.660
5. Váh - Hron	SK - CZ - H - PL	28.060
6. Pannonian Central Danube	A - SK - H - HR - YU	57.250
7. Drava - Mura	A - SLO - H - HR	41.230
8. Sava	SLO - HR - BIH - YU	95.020
9. Tisa	UA - RO - SK - H - YU	157.220
10. Banat - Eastern Serbia	YU - RO	29.690
11. Velika Morava	YU - BG	36.710
12. Mizia - Dobrudzha	BG	43.180
13. Muntenia	RO	95.650
14. Prut - Siret	UA - MD - RO	76.060
15. Delta - Liman	MD - UA - RO	9.330
Sub-Total		**799.070**
Other Small Areas in CH,I,PL		8.360
Total Danube Catchment		**807.430**

Annex 3

Hot Spots in the Danube Sub-river Basins

Hot Spots in the Danube Sub-river Basins (see also Maps 8 & 9) Annex 3

Sub-river Basin	Sector	Priority	No	Hot Spot Name	Country
1. Upper Danube (D)	**Municipal**	*Medium*	1	Upper Laucherttal	D
			2	Mergelstetten	D
			3	Leutkirch	D
			4	Upper Iller	D
			5	München I	D
			6	MünchenII	D
			7	Lake Starnberg	D
	Industrial	*Medium*	1	ESSO Ingolstadt	D
2. Inn (D,A)	**Municipal**	*Medium*	1	Chiemsee	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
			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
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
			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
			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
	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
		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
			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 4

Major Hydraulic Structures and Description of Rivers in the Danube

Major Hydraulic Structures and Description of Rivers in the Danube Basin: GERMANY

Name	**Free-flowing section**	**Regulated/ canalised**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose/use**	**Economic Capacity**	**Economic Use**	**Operation Mode**
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume *rkm – rkm* of dam, polder or reservoir *at rkm*		Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW electricity m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion (RD), peak operation (PO), running mode (RM)
DANUBE 2,780 – 2,581					Series of 27 weirs between Donau-eschingen (rkm 2,780) and Ulm (rkm 2,588) Then, the following 22 dams:		HP, partly NA, ER			
2,581 – 2,200 (580 km)	183 km	139 km			*1,66 hm³ Ulm/Böfinger Halde 2,581*			Sum: 400 MW	Sum: 2,460 GWh/a	
					2,17 hm³ Oberelchingen 2,575					
					2,21 hm³ Leipheim 2,568					
					1,75 hm³ Günzburg 2,562					
					1,92 hm³ Offingen 2,556					
					130 hm³ *Gundelfingen* 2,551.95					
					4,02 hm³ Faimingen 2,545,6					
					2,06 hm³ Dillingen 2,538					
					2,93 hm³ Höchstädt2,530					
					2,25 hm³ Schwenningen 2,522					
					4,36 hm³ Donauwörth 2,511					
					5,56 hm³ Bertoldsheim 2,490					
					4,04 hm³ Bittenbrunn 2,480					
					4,82 hm³ Bergheim 2,469					
					6,49 hm³ Ingolstadt 2,459					
					9,70 hm³ Vohburg 2,444					
				2,411-2,200	*5,30 hm³ Bad Abbach 2,401*					
					15.68 hm³ Regensburg at 2,381.33					
					36.20 hm³ Geisling at 2,353.00					
					23.00 hm³ Straubing at 2,318.00					
					27.08 hm³ Kachlet at 2,230.50					
					44.57 hm³ Jochenstein 2,203,33					
RHINE-MAIN DANUBE Canal				166 - 0			16 dams, NA			
ILLER 147 km	58 km free flowing	44 km diverted					13 dams, HP, FP			
			There are altogether **15 dams** on the Iller – at the deadline of this paper, only this information was available (see Map 12): *Au, Untereichen Lautrach, Steinbach, Legau, Flohmühle, Illusried, Kemplen, Drohlzug, Felsenwebe, Hegge, Steigbachwerk, and Schwarzenbergwerk.*						

Cont. Germany

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume *rkm – rkm* of dam, polder or reservoir *at rkm*		Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW electricity m^3 water supply/d	MWh electricity/yr m^3/day drink. or irrigat.water	river diversion (RD), peak operation (PO), running mode (RM)
LECH **167.5km**	Except for 15 km German section is almost completely impounded	167.5		Not navigable	153.5	26 hydrodams	mainly HP, partly ER	Sum : 300 MW	Sum : 1,390 GWh/yr	RM and several RD
			There are altogether **32 dams** on the Lech (out of it 3 with running mode – e.g. Gersthofen and Meitingen and 29 with pik mode) – at the deadline of this paper only this information was available (see Map 12): *Feldheim, Rain, Ober-peiching, Ellgau, Heiligen, Langweid, Gersthofen, Wollzahnau, Herching, Unterbergen, Prillrithing, Scheiring, Schwabstadt, Kaulering, Landsberg, Pitzling, Dornstettten, Lechmühlen, Lerchblick, Eplach, Apfeldorf, Sperber, Finsterau, Dornau, Dessau, Urspring, Lechbruck, Rsem.,Füssen Horn, Hanfwerke, Forggensee*						
NAAB **98.3 km**	Mainly free-flowing			Not navigable	/					
ISAR **263.3 km**	59 km	Dyke system: 86 km, diversion system 55 km		Not navigable	63 km		10 hydrodams mainly HP, partly ER	Sum: 114 MW	Sum: 632 GWh/yr	
			There are altogether **17 dams** on the Isar – at the deadline of this paper only this information was available (see Map 12): *Pielweichs, Elling, Landau, Gollfrieding, Dingolfing, Gummering, Niederaschbach, Allheim, Uppernbornwerk I u. II., Pirombach, Eilling, Aufkirchen, Finsing, Südwerke, Puilach, Höllriegelskreuth, Mühltal, (Bad Tölz), (Sylvensteinwerk)*						
INN **217.6 km**	Practically none in D (22 km)	Regulated, 38 km diverted		Not navigable	200		Mainly HP, partly ER	Sum: 546 MW	Sum: 3,038 GWh/a	RM plus one RD
			There are altogether **15 dams** on the Inn – at the deadline of this paper only this information was available (see Map 12): *Passau-Ingling, Schärding Neuhaus, Eggling, Ering,, Braunau-Simbach, Stammham, Perach, Lögling, Gors, Teufelsbruck, Soyenserwerk, Wasserburg, Feldkirchen, Rosen-heim, Rüfldorf; Nußdorf and Oberaudorf-Eps (together with Austria)*						

Major Hydraulic Structures and Description of Rivers in the Danube Basin: AUSTRIA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m^3 water supply/d	MWh electricity/yr, m^3/day drink. or irrigat.water	river diversion, peak operation, running mode
DANUBE										
				Except for short periods (e.g. icy winters, extreme low water) the entire Austrian Danube is navigable!	Rkm 2,203-2,214	*Jochenstein rkm 2,203*	NA, HP	130	850,000	running
		2,186-2,203			Rkm 2,162-2,187	*Aschach rkm 2,162*	NA, HP	267	1,648,000	Running
327 km		2,156-2,162	Eferdinger B. 2,145-2,156 48km²		Rkm 2,146-2,156	*Ottensheim rkm 2,147*	NA, HP	183	1,143,000	running
		2,130-2,146			Rkm 2,119-2,130	*Abwinden rkm 2,119,5*	NA, HP	196	1,028,000	Running
rkm 2,200 – 1,873		2,106-2,119	Marchland 2,107-2,084 73,5 km²		Rkm 2,096-2,107	*Wallsee rkm 2,095*	NA, HP	213	1,320,000	Running
		2,072-2,095			Rkm 2,060-2,072	*Ybbs-Persenbeug rkm 2,060*	NA, HP	244	1,358,000	Running
		2,049-2,060			Rkm 2,038-2,049	*Melk rkm 2,038*	NA, HP	201	1,180,000	Running
	Rkm 2,038-2,010 (“Wachau”)									
		1,998-2,038	Tullnerfeld Nord 1,998-1,941 180 km²		Rkm 1,980-1,998	*Altenwörth rkm 1,980*	NA, HP	350	1,950,000	Running
		1,963-1,979			Rkm 1,949-1,963	*Greifenstein rkm 1,949*	NA, HP	313	1,720,000	Running
		1,929-1,949			Rkm 1,921-1,929	*Freudenau rkm 1,921*	NA, HP	182	1,037,000	running
		Rkm 1,921-1,873	East of Vienna 1,920-1,873 96 km²							

Cont. Austria

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity/yr, m³/day drink. or irrigat.water	river diversion, peak operation, running mode
INN **277 km**	70 km	133 km	There are altogether **4 dams** on the Inn– at the deadline of this paper only the following information was found (see Map 12):							
						Nußdorf,		11 MW	58 GWh (Austrian share)	
					74 km	*Oberaudorf-Eps*		30 MW	138 GWh (A share)	
						Kirchbichl		23 MW	134 GWh	
						Imst		81.5 MW	500 GWh	
SALZACH			There are altogether **11 dams** on the Salzach– at the deadline of this paper only the following information was found(seeMap 12)							
						Urstein		26 MW	110 GWh	
						Hallein		12 MW	66 GWh	
						Kruzbergm				
						Bischofshofen		16 MW	73 GWh	
						Urreiting		17 MW	80 GWh	
						St. Veit		17 MW	71 GWh	
						St. Johann		16.5 MW	75 GWh	
						Wagrain-St. Johann				
						Plankenau		11 MW	57 GWh	
						Wallnerau		17 MW	63 GWh	
						Schwarzach				
TRAUN **120 km**	40 km	40 km	There are altogether **4 dams** on the Traun– at the deadline of this paper only the following information was found(see Map 12):							
						Gmunden		12 MW	45 GWh	
						Kleinmünchen,		11 MW	65 GWh,	
					40 km	*Traun-Pucking,*		46 MW,	215 GWh	
						Marchtrenk		43 MW	45 GWh	

Cont. Austria

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity/yr, m³/day drink. or irrigat.water	river diversion, peak operation, running mode
ENNS **250 km**	123 km	30 km	There are altogether **14 dams** on the Enns– at the deadline of this paper only the following information was found (see Map 12)**:**							
					97 km	***Mühlrading***		24 MW	112 GWh	
						Staning		42 MW	195 GWh	
						Garsten		32 MW	143 GWh	
						St. Ulrich				
						Rosenau,		28 MW	134 GWh	
						Ternberg				
						Losenstein,		40 MW	170 GWh	
						Großraming		66 MW	245 GWh	
						Weyer,		18.5 MW	81 GWh,,	
						Schönau		26 MW	121 GWh,	
						Altenmarkt		21 MW	140 GWh	
						Krippau,		24 MW	159 GWh	
						Landl		23 MW	129 GWh,	
						Hieflau		63 MW	284 GWh	
MUR			There are altogether **13 dams** on the Mur– at the deadline of this paper only the following information was found (see Map 12):							
						Spielfeld		13 MW	67 GWh	
						Oberogau		13 MW	60 GWh	
						Gaberstdorf		15 MW	68 GWh	
						Gralla		14.5 MW	71 GWh	
						Lebring		20 MW	84 GWh	
						Mellach		16 MW	74 GWh	
						Weinzödl		15 MW	63 GWh	
						Peggau		13 MW	84 GWh	
						Rabenstein		14 MW	65 GWh	
						Laufnitzdorf		17 MW	108 GWh	
						Pernegg		18 MW	105 GWh	
						Dionysen		12 MW	70 GWh	
						Fisching				

Cont. AUSTRIA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity/yr, m³/day drink. or irrigat.water	river diversion, peak operation, running mode
DRAU **264 km**	104 km	20 km	There are all together **12 dams** on the DRAU– at the deadline of this paper only the following information was found (see Map 12):							
					140 km	*Lavamünd,*		28 MW	163 GWh	
						Schwabeck		60 MW	360 GWh	
						Etling		75 MW	405 GWh	
						Freibach				
						Ferlach – Maria Rain		75 MW	330 GWh	
						Annabrücke		45 MW	203 GWh	
						Rosegg		80 MW	255 GWh,-	
						St. Jakob, Villach		25 MW	104 GWh	
						Kellerberg		25 MW	101 GWh	
						Paternion		24 MW	98 GWh	
						Malta (Unterstufe)		41 MW	120 GWh,	
						Amlach		60 MW	225 GWh	

Major Hydraulic Structures and Description of Rivers in the Danube Basin: CZECH REPUBLIC

Name	**Free-flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose/use**	**Economic Capacity**	**Economic Use**	**Operation Mode**
River section *rkm-rkm*	 *rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	 *rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm storage Vol.*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER Releases R	in MW; m³ water supply/d	MWh electricity/yr, m³/day drink. or irrigat.water	river diversion, peak operation, running mode
MORAVA		70 – 108								
Czech territory	109 – 121			129 - 148		*HODONIN*	HP		5,688	Constant Load p p.
		121 – 221		157 – 166		*VESELI*	HP		1,906	-“-
	221 – 223					*SPYTHNEV*	HP		8,702	-“-
		223 – 226				*KROMERIZ*	HP		6,497	-“-
	226 – 230					*BOLELOUC*	HP		1,727	-“-
		230 – 243				*OLOMOUC*	HP		360	-“-
	243 – 260					*LITOVEL*	HP		723	-“-
		260 – 265								
	265-275									
		275 – 277								
	277 - 297									
		297 – 299								
	299 - 302									
		302 – 306								
	306 - 310									
		310 – 312								
	312 - 328									
		328 – 336								
	336 – 347									
		347 – 353								
	353 - 354									
DYJE	0 - 4									
Czech territory		4 – 5								
	5 –10									
		10 – 13								
	13 - 16									
		16 – 18								

Cont. Czech Republic

	18 - 22									
		22 – 29								
	29 – 31									
		31 – 41								
	41 – 44									
		44 – 46			46 – 53	*Nove Mlyny 1*	HP, FP, Irr, R	2,3 MW	8,5 m³/s 919	Constant load
					53 – 58	*N. Mlyny II*	FP, Irr.			
					58 – 67	*N.Mlyny III*	FP, Irr			
		64 – 97			Total 134 Mio. m³					
	97 - 99									
		99-109								
	109 - 131									
					132 – 138	*Znojmo*	HP, DW, Irr.,R	1.46 MW		Constant Load
		138 - 174								
					174 –204 Total 137 Mio. m³	*Vranov*	FP, HP, DW, Irr., R	3x5.4 MW		Peak Operation
Svratka	0 - 3									
		3 – 10								
	10 - 15									
		15 – 18								
	18 – 26									
		26 - 27								
	27 - 28									
		28 – 42								
	42 – 54									
		54 – 56								
					56 – 66	*Brno*	R, DW, HP, FP	2.88 MW	3.4m³	Peak operation
	67 - 80				21 Mio. m³					
		80 – 82								
	82 – 112									
					112 – 113	*VIR II*	Flow compensation	0.730 MW		Running Mode
					0.29 Mio. m³					
					112 – 125	*VIR I*	DW, FP, HP, R	2x6.0 MW	2.3 m³/s	Peak Operation
	125 - 165				56 Mio. m³					
		165 – 167								
	167 - 171									

Major Hydraulic Structures and Description of Rivers in the Danube Basin: SLOVAKIA

Name	Free-flowing section	Regulated/ canalised	Flood protection	Navigable section	Impounded river section	Name*	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *Rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER recreation RE, Irrigation IR	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
DANUBE 1,880 – 1.700		Dyke lines along the left river bank		1,880 – 1,700	196 mil. m³ 41 km	*Cunovo* *Gabcikovo*	Rkm 1851: HP, RE Rkm 1819: HP, NA	52 MW 720 MW	170/yr 2.,100/yr	RD, RM RM
MORAVA		Regulated, dyke lines locally along or near the whole river			/	/				
VAH		Dyke Lines along the whole river				*Liptovska Mara*	HP			
				Rkm 0 – 75 (PK Sered),(75 – 100 planned) rkm 100 – 250 (14 locks)	8,5 Mil. (2,53km² flooded area)	*Hricov*	HP			
					36 Mil. (5,7km² flooded area)	*Nosice*	HP, RE			
					2,1 Mil. (0,5 km² flooded area)	*Dolne Kockovce*	HP			
					1-10 mill. m³	*Cierny Vah*				
					3,3 Mil. (0.9km²)	*Trencianske Biskupice*	HP			
					12,3 Mil. (4,3 m²)	*Slinava*	HP, IR, RE			
					51,8 Mil. (11,7 km²)	*Kralova*	IR, RE, HP, FP			
						Selice	reservoir			
HRON					4,7 Mil. (1,48 km²	*Vel'ké Kozmalovce*	IR, RE			
HORNAD		Dyke Lines at Kosice city			50-100 mil. m³	*Ruzín*				
					1-10 mil. m³	*Mala Lodina*				
BODROG		Dyke Lines along Bodrog and Ondava		Rkm 65-50	Over100 mil.m³	*Besa*				
					Over 100 mil.m³	*Velka Domasa*				
					1-10 mil.m³	*Mala Domasa*				
					10 –50 mil.m³	*Starina*				
IPEL **rkm 172-75, 43-0**					24,9 Mil. (1,38 km²)	*Malinec*	DW, FP			
NITRA		Dyke Lines along the whole river		PLANNED						

* also: Bukovec (10-50 mil.m³), Pod Bukovcom (1-10 m³), Hrhov (1-10 mill m³), Palcmanská Masa (10-50 mill.m³), Teply Vrch (1-10 mill m³), Klenovec (1-10 mill m³), Luborec (1-10 mill m³)

Major Hydraulic Structures and Description of Rivers in the Danube Basin: HUNGARY

Name	Free-flowing section	Regulated/ canalised	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	 *rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	 *rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER, irrigation IR	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
DANUBE		1656-1633		entire Danube 1.850– ca. 1,450	8 km	*Dunakiliti 1,842*	IR			RD for wetlands
1,850-1,795	417 km	383 km	292							
1,642-1,480			1,864							
1,475-1,433			250							
TISZA		696-159		696-159	10 mil m³ 612-518 545-524rkm	*Tiszalök rkm 518.2*	NA, HP, IR	11.5 MW	54,000 (HP) 5,184,000 (IR)	Running
721-643			798							
621-543			784		105 mil. m³ 440-404	*Kisköre rkm 403.8*	NA, HP, IR	28.0 MW	103,000 (HP) 12,232,000 (IR)	
746-725			99							
521-432			1,578		245-160	*YU*				
415-335			1,898							
282-247			126							
245-160			1,187							
RABA **205**	86-61		94	29-0	104-100	*Ikervar rkm 100*	HP	1.2 MW		
	61-0		652							
					205-203	*Szentgothard*				
					73-69	*Nick rkm 68.5*	IR		691,200	
KÖRÖS			2,355		Rkm 138-135	*Gyula*	IR, ER			
138					Rkm 135-117	*Békés*	IR, ER			
	117-85			115						
					Rkm 85-47	*Békésszent-andras*	NA, IR			
					Rkm 47-5	*Bökeny*	NA, IR			
	0-5									

Cont. Hungary

Name	Free-flowing section	Regulated/ canalised	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (mil. m³) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER, irrigation IR	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
HERNAD					Rkm 18-14	*Kesznyeten 13.56 rkm*	HP	4,4 MW	23,500	R. Diversion
					Rkm 58-54	*Felsödobsza 54.35 rkm*	HP	0,2 MW	2,000	R. diversion
					Rkm 71-76	*Gibart 58.0 rkm*	HP	0,5 MW	2,800	R. Diversion
					Rkm 104-103	*Hernádszurdok*	IR, ER			
SIÒ 121-0				Balaton-Danube						
SOMES										
50-0			423							
Mures										
50-0			704							
DRAVA	141-60		194							

Major Hydraulic Structures and Description of Rivers in the Danube Basin: SLOVENIA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
SAVA	126	92							3,366 MWh	
					0,008	*Moste*	HP	21		
						Medvode	HP	20		
						Mavcice	HP	38		
						Vrhovo	*HP*			
Trziska Bistrica	22	5								
Kokra	29	5								
Kamniska Bistrica	7	26								
Ljubljanicas Pivko	13	27								
Savinja	66	36								
Sotla	55	35				*Sotelsko, Jezero*	DW			
Kolpa	101	10								
Krka	94	0				*Mokro Polje*	FP			
Drava	0	142							25,176Wh	
					0,007	*Dravograd*				
					0,014	*Vucenica*				
					0,019	*Vuhred*				
					0,013	*Ozbolt*				

Cont. Slovenia

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
Drava (cont.)					0.003	*Fala*				
					0.019	*Mariborski Otok*				
					0.005	*Ormosko Jezero*				
						Ptujsko Jezero				
Meza	12	29								
Dravinja	51	22								
						Statenberg				
						Stepihovec				
Polskava	15	25								
Pesnica	5	60								
Mura	44	51								
Scavnica	22	34								
Ledava	13	55								

Major Hydraulic Structures and Description of Rivers in the Danube Basin: CROATIA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*Rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER water supply WS Irrigation IR Recreation RE	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
DANUBE **1,433 – 1,300**		42.7 km dykes		Entire Danube is navigable	9.2 mil m³	*Borovik*	FP, IR, RE			
SAVA				Sava is navigable from rkm 0 – 593	12 mil. m³	*Pakra*	WS, FP			
207-725					11.4 mil. m³	*Vonarje*	WS, FP, RE			
DRAVA		95.4 dykes (left bank)		Drava is navigable from rkm 150 – 0	10 mil. m³	*Varazdin*	HP			
					51 mil. m³	*Cakovec*	HP			
					93.5 mil. m³	*Dubrava*	HP			
MURA		46.3 dykes (right bank)								

Major Hydraulic Structures and Description of Rivers in the Danube Basin: BOSNIA & HERZEGOVINA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	 *rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	 *Rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
SAVA (563-207)	92 km free flowing	Total length of dykes on the right bank is 264 km	Protected area on the right bank is 636 km²	Rkm 563 – 207						
UNA (214 – 0)	214 – 20 rkm	Artificial bank 1;dykes(rkm 20)								
VRBAS (240-0)	240 – 136			Not navigable						
					3,5 mil. m³ (rkm 136-131)	*Jajcell (rkm 131)*	*HP*	27	170	
	131 – 128	Artificial bank – 3 km								
					52,7 mil. m³ (rkm 128 – 110)	*Bocac (rkm 110)*	HP	110	307	
	110 – 20 rkm									
		Dykes rkm 20-0								
BOSNA (271 – 0)	271 – 6,5 rkm									
		Artificial bank – 6 Dykes (rkm 6.5-0)								
DRINA (346-0)	346 – 290			Not navigable						
					161 (rkm 290 – 254)	*Vinegrad (rkm 254)*	HP, FP	315	1120	
					335 (rkm 254 – 200)	*Banja Basta (rkm 200)*	HP	241.2	1221.4	
	200 – 116									
					89 (rkm 116 – 92)	*Zvornik (rkm 92)*	HP, ER	47.8	262.4	
	92 – 18 rkm									
		Dykes rkm 18-0								

Major Hydraulic Structures and Description of Rivers in the Danube Basin: FR of YUGOSLAVIA

Name	**Free-flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose/use**	**Economic Capacity**	**Economic Use**	**Operation Mode**
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking waterDW, navigation NA, flood protection FP erosion control	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
Danube YU 1,433 - 845	1,215-1,433	414 km embankments		1,433 - 845	2.55 (rkm 943-1215)	*Iron Gate I Rkm 943*	HP, NA,FP	2100	6,490 GWh	
					868 (rkm 863-943)	*Iron Gate II Rkm 863*	HP, NA,FP	432		
						Bezdan rkm 1425				
						Impounded Bogojevo rkm 1364				
DTD CANAL Start at Dan. Rkm 1,425 – Mouth at rkm 1,076	None	fully		Fully, 250 km			NA, IR			
SAVA (207-0)	100-207	650 km embankments		0-207	No	*None*				
TISA (163-0)	None	fully: 269 km embankments		0-163	160	*Podej at rkm 105*				
					(rkm 63.5-163)	*N. Becej Gate, 63.5*	NA, IR, FP			
Velika Morava (Main Course plus South & West Morava)	None	1,180 km embankments		None	none					
Drina (size:17,500 km2)	0-107			None	340	*Bajina Basta*	HP, FP, ER			
					86	*Zvornik*	HP, FP, ER			
					900	*Mratinje (Piva Riv.)*	HP, FP, ER			
Bega (size-4,717 km2) **YU part rkm 0-68**	None See info enclosed	fully		0-68		*Four weirs (2 in RO, two in FR YU)*				
Timis (size: 9,717 km2), **YU part rkm 0-118)**	None	fully		0-7	fully	*Two weirs in FR YU*				
Timok (size-4,200 km2)	fully	None		None	none	*No*				

Major Hydraulic Structures and Description of Rivers in the Danube Basin: BULGARIA

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion, peak operation, running mode
DANUBE rkm 850-ca 375	The "Iron Gate" I at km 942.95 and "Iron Gate" II at km 863.00 upstream the BG reach (845 - 375) have a big influence on the entire hydraulic and sediment regime as well as on the biodiversity of the aquatic ecosystem. Unsteady flow as a result of specific dam operation for power production causes severe bottom and bank erosion. The natural river flow is strongly disturbed[1]			The entire Bulgarian Danube is navigable		*Nikopol-Turnu Magurele*	HP	402	2,193	
ISKAR 0-368						*Cascade "Sreden Iskar"*	HP	43.560	242.4	
LOM						*3 Small HP*	*HP*	990	3.67	
OGOSTA Rkm 0-144						*7 Small HP*	HP	3.885	13.3	
ISKAR Tributaries						*6 Small HP*	HP	3.410	9.82	
VIT rkm 0-189						*3 Small HP*	HP	4.047	9.05	
OSAM Rkm 0-314						*1 Small HP*	HP	0.924	2.11	
YANTRA Rkm 0-286						*2 Small HP*	HP	1.519	2.35	

[1] *regulated BG banks (longer than 1 km!): at km 810 - 808.5, at km 804 - 802, at km 791 - 790, at km 776.8 - 775.3, at km 742.4 - 744, at km 742 – 140 km, at km 678 – 320 + 5,900 m, at km 607.5 - 550 + 6,600 m, at km 597.5 - 100 + 3,000 m, at km 558.6 - 200 + 1,500 m ,at km 554.65 - 553.7 - 950 m, at km 520 - 516 - 4,000 m; at km 497 - 496 – 1,900 m, at km 99 - 498 – 1,000 m, at km 497.6 - 494, at km 490 - 489 – 1 km, at km 485 - 484 - 1 km, at km 486 - 482, at km 389.6 - 399.4 – 1,200 m, at km 382 - 380 – 2,000 m, at km 379 - 375.5 - 250 + 3,250 m. ***All lowlands on the Danube Bulgarian terrace are protected by dikes and levees. !!***

Cont. Bulgaria

Name	Free-flowing section	Regulated/ canalized	Flood protection	Navigable section	Impounded river section	Name	Purpose/use	Economic Capacity	Economic Use	Operation Mode
River section *rkm-rkm*	*rkm-rkm*	artificial bank, dyke line along main river bed etc.) *rkm-rkm*	Dry polder, wet polder open arms *Size in km², Min. 50 km²!!*	*rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam, polder or reservoir *at rkm*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	in MW; m^3 water supply/d	MWh electricity m^3/day drink. or irrigat.water	river diversion, peak operation, running mode
Lom Medovnitza				-	F - 12 D - 0.52 U - 11.48	Drenovetz H=27.5 m C=176 m	irrigation -1963	9,388 10^6 m^3/yr	1,201 m^3/s	
Topolovetz				-	F - 20.25 D - 0.75 U - 19.5	Kula H=32.5 m C=204.5 m	irrigation -1967 industrial water supply - 1967		0,339 m^3/s	
Voinishka Selska bara					F - 17.5 D - 1.30 U - 16.2	Poletkovtzi 2	irrigation - 1971			
Archar Rabisha					F - 45 D - 2.4 U - 42.6	Rabisha H=13 m C=297 m	irrigation - 1963			
Ogosta Dabnika					F - 9.34 D - 0.24 U - 9.10	Dabnika H=18.6 m C=341.6 m	industrial water supply - 1963			
Ogosta Srechenska bara					F - 15.5 D - 1 U - 14.5	Srechenska bara H=51 m	drinking water supply - 1985			
Iskar Dere					F - 37.6 D - 0.2 U - 37.4	Enitza H=34 m C=286.2 m	Irrigation - 1969	0,4996 m^3/s	155,52. 10^6 m^3/yr	
Iskar Lesnovska					F - 36 D - 4 U - 32	Ognianovo H=29 m	irrigation; industrial water supply			
Iskar Bebresh					F - 15 D -1.09 U - 13.91	Bebresh* H=48.6 m	industrial water. irrigation. sport.recreation:1987			
Iskar Suho dere					F - 11.22 D -0.17 U - 11.05	Devetz* H=37.4 m C=216.9 m	irrigation			
Iskar					F - 15.10 D - 0.40 U - 14.70	Beli Iskar	drinking water supply - 1946			
Iskar					F - 663 D -90 U -573	Iskar H=67.7 m C=817.7 m	Drinking water 1960; irrigation – 1955; industrial water, power			

Iskar					F - 6.7 D -0.3 U - 6.4	Pancharevo H=22 m C=602 m	Industrial water-1957 ; irrigation – 1957			
Lom Nechinska bara					F - 9.5 D -0.6 U - 8.9	Hristo Smirnenski H=33.62 m C=155 m	Irrigation – 1969	0.51 m^3/s	3.825. 10^6 m^3/yr	
Tzibritza Dere					F - 7.86 D -0.12 U - 7.74	Kovachitza H=22.55 m C=117.7 m	Irrigation – 1972			
Ogosta					F - 505 D -67 U - 438	Ogosta H=58.5 m C=201 m	Irrigation. Sport. Recreation.Retentio: 1987; power			
Ogosta					F - 15 D -1 U - 14	Asparuhovval H=23 m C=203 m	Irrigation – 1966			
Vit Dere					F - 130 D -0.8 U - 129.2	Gorni Dabnik H=40.4 m C=174.5 m	Irrigation			
Vit Kalnik					F - 61.3 D -1.3 U - 60	Sopot H=24.3 m C=366.6 m	irrigation – 1962 water			
Vit Dere					F - 16 D -0.2 U - 15.8	Telish H=31.5 m C=221 m	irrigation - 1969 power			
Osam Dere					F - 8.30 D - 0.40 U - 7.90	Aleksandrovo	Irrigation - 1963	0.939 m^3/s	6.245.10^6 m^3/yr	
Osam Pelishatska bara - dere					F - 10.75 D -0.08 U - 10.67	Kamenetz 4 H=16.4 m	Irrigation - 1960	1.245 m^3/s	10.239.10^6 m^3/yr	
Osam Dere					F - 10.02 D - 1.11 U - 11.13	Malchika H=24.1 m C=108 m	Industrial water 1970; Retention			
Yantra Rositza					F - 222 D - 20 U - 202	Aleksander Stamboliiski H=66 m C=190.75 m	Retention – 1953; Irrigationpower water supply			
Yantra					F -18.7 D - 4.20 U - 14.5	Hristo Smirnenski H=56 m	drinking water industrial water 1966			
Yantra Rositza					F - 17.8 D - 1.5 U - 16.3	Krapetz H=27.27 m	irrigation – 1969	0.28 m^3/s	3. 10^6 m^3/yr	

Yantra Dere					F - 8.5 D - 0.1 U - 8.4	Kazaldere H=24 m C=128 m	irrigation – 1961			
Yantra Dere					F -10.3 D - 0.81 U - 9.49	Karaisen H=19.2 m C=106.2 m	Water Irrigation			
Yantra Veselina					F -92.2 D - 9 U - 83.2	Yovkovtzi H=66.2 m	Drinking water 1979			
Yantra Goliama reka					F -62.8 D - 3.9 U - 58.9	Yastrebino H=40.67 m C=341.47 m	Irrigation – 1967 Water		$9.91 . 10^6$ m^3/yr	
Rusenski Lom Kayadzik					F - 5.145 D -0.15 U - 4.995	Boyka* H=15.9 m C=256.4 m	Irrigation – 1966	0.149 m^3/s	$1.5. 10^6$ m^3/yr	
Rusenski Lom Baniski Lom					F - 9.5 D -0.25 U - 9.25	Baniska* H=19.88 m				
Rusenski Lom Beli Lom					F - 25.5 D -3.2 U - 22.3	Beli Lom H=21.24 m C=281.9 m	Irrigation - 1961 Water	1.004 m^3/s	$11.217. 10^6$ m^3/yr	

F - total storage in $m^{3.}10^6$
D - dead sorage in $m^{3.}10^{6.}$
U - useful storage in $m^{3.}10^6$
* These dams are not shown on the map.

Major Hydraulic Structures and Description of Rivers in the Danube Basin: MOLDOVA AND UKRAINE

Name	**Free-flowing section**	**Regulated/ channalised**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose/use**	**Economic Capacity**	**Economic Use**	**Operation Mode**
River section *rkm-rkm*	*rkm-rkm*	artificial bank. dyke line along main river bed etc.) *rkm-rkm*	Dry polder. wet polder open arms *Size in km². Min. 50 km²!!*	*Rkm-rkm*	Storage volume (*mil. m³*) *rkm – rkm*	of dam. polder or reservoir *at rkm*	Hydropower HP. drinking water DW. navigation NA. flood protection FP. erosion control ER	in MW; m³ water supply/d	MWh electricity m³/day drink. or irrigat.water	river diversion. peak operation. running mode
Danube MD 145-144		2		2						
Danube UA 0-144	170.2	25 km	25.8	170.2						
UA Delta canal 8 km		8 km in the Kilia arm		8						
Prut 0-289	0-289	41	5	None						
Siret 0-100	0-100	10.5		None						
Tisa 0-201	0-201	201.3	3.7	None						
Danube Lakes (along the river bed, connected with the main river by locks)						Yalpug. Kytaj. Katabukh. Kahul. Kartal. Sasyk	Fisheries. recreation. biodiversity. flood protection. (low) irrigation			
Latorytia. 0-144	0-144	109.2	45.7							
Borjava. 0-106	0-106	45.2	2.7							
Uzh. 0-107	32.2									
Teresva. 0-56	0-56	26.0	14.0							
Tereblia 0-91	0-91	12.0			24.0	Tereblia Riksqke	Hydropower. flood protection			
Rine 0-92	0-92	22.8								

Major Hydraulic Structures and Description of Rivers in the Danube Basin: ROMANIA (Overview)

Rivers in ROMANIA	**Total length of the river** ***rkm - rkm (source to mouth)***	**Total free flowing sections** ***rkm - rkm*** [1]	**Total regulated sections** ***rkm - rkm*** [1]	**Total impounded sections** ***rkm - rkm*** [1]	**Total Navigable section** ***rkm -rkm***	**No. dams /reservoirs**	**No. dams /reservoirs > 15 m**	**No. Hydropower dams**
Dunãre (RO)	1740 - 2815	-	863	212	0 - 1075**	2/2	2/2	2
Tisa (RO)	79 - 140	19	42	-	-	-	-	-
Somes (RO)	0 - 376	248.5	127.5	-	-	-	-	-
Crisul Alb (RO)	0 - 234	147.5	82	-	-	-	-	-
Mures (RO)	0 - 761	682	79	-	-	4	-	-
- Tarnava*	0 - 246	157.1	80	9	-	4/2	2/2	-
Timis (RO)	0 - 244	110.5	131	2.5	-	1	-	-
Jiu	0 - 339	105	211	23	-	7/3	3/3	-
Olt	0 - 615	152	463	***	-	26/26	26/26	25
Arges	0 - 350	280	7.5	62.5	-	13/13	13/13	13
- Vedea*	0 - 224	191	33	-	-	-	-	-
Ialomita	0 - 417	212.5	192	12.5	-	3/3	3/3	3
- Buzau*	0 - 302	162.5	128	11.5	-	2/2	1/1	2
Siret (RO)	167 -726	230	267	62	-	7/6	5/5	6
- Moldova*	0 - 213	164	49	-	-	-	-	-
- Bistrita*	0 - 283	212	13	58	-	10/10	8/8	8
- Trotus*	0 - 162	147	15	-	-	-	-	-
Prut (RO)	241- 983	384	288	70	-	1/1	1/1	1-
- Jijia (RO)*	10 - 285	222	51	4	-	1/1	-	-
- Barlad*	0 - 207	33	174	-	-	-	-	-

RO - designates the length of rivers on the Romanian territory
* - Second Class Tributaries with a catchment area of over 4,000 km^2
** - The navigable section of Danube is measured from mouth towards source
*** - Impounded sections are included in the regulated sections of the Olt river
[1] - The total free flowing sections and total regulated sections are made of several sections, whose beginning and ending points will be noted in the second table.

Major Hydraulic Structures and Description of Rivers in the Danube Basin: ROMANIA

Danube	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/yr m^3/day drinking or irrigation	river diversion, peak operation, running mode
1,740-1,872	-	-	-	943 –1,075	2,400 mil m^3 1,740-1,872	Iron Gate I 1872 km	HP, NA	1,050 -	5,518,800 -	running mode
1,872-1,952	-	-	-	863 -943	830 mil m^3 1,872-1,952	Iron Gate II 1952	HP, NA	216 -	662,256 -	running mode
1,952-2,815	-	1,952 – 2,815	-	0 - 863	-	-	-	-	-	-

Danube-Black Sea Canal	-	-	-	total	total		NA			

Tisa	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable Section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
79 - 82	-	79 - 82	-	-	-					
82 - 84	82 - 84	-	-	-	-					
84 - 88	-	84 - 88	-	-	-					
88 - 95	88 - 95	--	-	-	-					
95 - 99	-	95 - 99	-	-	-					
99 -101	99 -101	-	-	-	-					
101 - 114	-	101 - 114	-	-	-					
114 - 117	114- 117	-	-	-	-					
117 - 126	-	116.8- 126								
126 -127	126 -127	-	-	-	-					
127 -134	-	127 - 134	-	-	-					
134 -136	134 -139	-	-	-	-					
139 - 140	-	139 - 140	-	-	-					

Somes	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable Section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	*rkm - rkm*	*Size in km^2*	*rkm - rkm*	Storage Vol. (mil. m^3) *rkm - rkm*	*at km*	HydroPower, Drink. Water , NAvigation , Flood Protect, ERosion	In MW; m^3 water supply/day	MWh electricity/Yr m^3/d water	river diversion, peak operation running mode
0 - 13	0 - 15	-	-	-	-					
15 -17	-	15 -17	-	-	-					
17 - 20	17 - 20	-	-	-	-					
20 - 24	-	20 - 24	-	-	-					
24 - 25	24 - 25	-	-	-	-					
25 - 27	-	25 - 27	-	-	-					
27 - 30	27 - 30	-	-	-	-					
30 - 39	-	30 - 39	-	-	-					
39 - 41	39 – 41	-	-	-	-					
41 - 45	-	41 - 45	-	-	-					
45 - 54	45 - 54	-	-	-	-					
54 - 56	-	54 - 56	-	-	-					
56 -61	56 -61	-	-	-	-					
61 - 63	-	61 – 63	-	-	-					
63 - 74	63 – 74	-	-	-	-					
74 - 75	-	74 – 75	-	-	-					
75 - 77	75 - 77	-	-	-	-					
77 - 78	-	77 – 78	-	-	-					
78 - 94	78- 94	-	-	-	-					
94 - 101	-	94 – 101	-	-	-					
101 - 123	101 - 123	-	-	-	-					
123 - 127	-	123 – 127	-	-	-					
127 - 133	127 - 133	-	-	-	-					
133 - 135	-	133 – 135	-	-	-					
135 – 222	135 - 222	-	-	-	-					
222 – 228	-	222 – 228	-	-	-					
228 - 295	228 - 295	-	-	-	-					
295 – 376	-	295 - 376								

Crisul Alb	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section Rkm - rkm	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/ Yr m^3/day drinking or irrigation	river diversion, peak operation, running mode
0 - 28	0 - 28	-	-	-	-					
28 - 30	-	-	-	-	- 28 - 33	Mihaileni* 28	HP, DW, FP, ER	2 70,000		
30 - 35	33 - 35	-	-	-	-					
35 - 38	-	35 - 38	-	-	-					
38 - 40	38 - 40	-	-	-	-					
40 - 41	-	40 - 41	-	-	-					
41 - 42	41 - 42	-	-	-	-					
42 - 44	-	42 - 44	-	-	-					
44 - 95	44 - 95	-	-	-	-					
95 - 98	-	95 - 98	-	-	-					
98 - 128	98 - 128	-	-	-	-					
128 - 131	-	128 - 131	-	-	-					
131 - 144	130 - 144	-	-	-	-					
144 - 212	-	144 - 212	-	-	-					
212 - 234	212 - 234	-	-	-	-					

* - dam under construction

Mures	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section Rkm - rkm	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam, polder or reservoir *at km*	Hydropower HP, drinking water DW, navigation NA, flood protection FP erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yr m^3/day drinking water or irrigation	river diversion, peak operation, running mode
0 - 25	0 - 25									
25 - 50		25 - 50								
50 - 150	50 - 150									
150 - 161		150 - 161								
161 - 193	161 - 193					Tg. Mures1 Intake dam Tg. Mures2 Intake dam	DW DW	247,104 317,952	91,498 519,26	Running mode Running mode
193 - 212		193 - 212								
212-276	212-276					Iernut Intake dam	DW	2,393,280	860,268	Running mode
276 - 283		276 - 283								
283 - 315	283 - 315									
315 - 318		315 - 318								
318 - 394	318 - 394									
394 - 400.6		394 - 400.6								
400.6 - 479	400.6 - 479									
479 – 483.4		479 - 483.4								
483.4- 628	483.4- 628					Mintia Intake dam	DW	5,184,000	790,733	Running mode
628 – 631		628 - 631								
631 – 761	631 - 761									

Tarnava *Mare*	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section Rkm - rkm	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir at km	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/ Year m^3/day drinkg water or irrigation	river diversion, peak oper-ation,runnin g mode
0 - 20.5	0 - 20.5	-	-	-	-					
20.5 - 24	-	-	-	-	44 20.5 - 24	Zetea 24	FP, DW	-	-	Peak Operation
0 - 20.5	0 - 20.5	-	-	-	-					
44 - 64	-	44 - 64	-	-	-					
64 - 97.5	64 - 97.5	-	-	-	-					
97 - 103	-	-	-	-	25, 97 - 103	Vanatori 103	FP	-	-	Peak operation
103 -105	103 -105	-	-	-	-	Albesti 105 Intake dam	DW	31,104	14,211	Running mode
105 –121	-	105 –121	-	-	-					
121 - 128	121 - 128	-	-	-	-					
128 – 136	-	128 – 136	-	-						
136 - 165	136 - 165	-	-	-	-					
165 - 175	-	165 – 175	-	-	-					
175 - 178	175 - 178	-	-	-	-					
178 –192	-	178 –192	-	-	-	Copsa Mica Intake dam/187	DW	77,760	4,589	Running Mode
193 - 205	193 - 205	-	-	-	-					
205 - 208	-	205 – 208	-	-	-					
207 - 217	208 - 217	-	-	-	-					
217 - 223	-	217 – 223	-	-	-					
223 - 227	223 – 227	-	-	-	-					
227 – 230	-	227 – 230	-	-	-					
230 -246	230 –246	-	-	-	-					

Timis	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section Rkm - rkm	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir at km	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/ Year m^3/day drinking water or irrigation	river diversion, peak operation, running mode
0 - 4	0 – 4	-	-	-	-					
4 -7	-	-	-	-	4.5 -7	Timis Trei Ape/7	DW	51,840	-	Running mode
7 -113	7 -113	-	-	-	-	Costei	-	-	-	Diversion dam
113 - 244	-	113 - 244	-	-	-					

JIU	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
0 - 46	0 - 46		-	-	-					
46 -47	-	-	-	-	0.230 46 -47	Paroseni	DW	- -	- -	Running mode
47 – 81	47 – 81	-	-	-	-					
81 - 86	-	-	-	-	306 81.5 - 86	Valea Sadului*				Under construction
86 – 94	-	86 - 94.5	-	-	-					
94- 98	-	-	-	-	4.5 94.5 - 98	Vadeni	HP	11.8	27,000 .	Running mode
98 – 102	-	98 – 102	-	-	-					
102 -105	-	-	-	-	1 102.3 -105	Targu Jiu	HP	11.8	23,000	Running mode
120 -124	-	-	-	-	100 120 -124	Rovinari	FP	-	-	Running mode
124 -128	-	124 -128	-	-	0.569 -	Rovinari intake		- 5,529,000		Running mode

128 - 145.8	-	128 -145.8	-	-	-					
145.8 - 153	-	-	-	-	7.4 145.8 - 153	Turceni	HP, DW	10 -	33,000	Running mode
153 -172	153 -172	-	-	-	0.569 -	Turceni intake	DW	- 8,294,000		Running mode
172 - 238	-	172 - 238	-	-	1.5 -	Isalnita intake	DW	- 3,369,,600		Running mode
238 – 243	238 - 243	-	-	-	-					
243 - 339	-	243 - 339	-	-	-					

* - dam under construction

Olt	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2* *Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm**	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigation NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yr m^3/day drinking water or irrigation	River diversion, peak operation, running mode
0 - 5.8	0 - 5.8									
5.8 -7					0.435; 5.8 -7	Mesteacan	DW	10368	10,368	running mode
7.0 – 27		7.0 - 26.8								
27 – 48		26.8 - 48.1								
48 – 60	48.1 - 60.0									
60 – 87		60.0 - 87.4								
88- 89					0.11; 88 - 89.5	Bixad-89. 5	HP	1.89	6,600	peak operatio
89 - 103	89 – 103									
105-115	105-115									
115 - 125		115 – 125								
125 - 137	125-137									
137 – 257		137 - 257								
257 - 277		257 - 277								

277 - 284	277-284									
284 - 295		284 - 295			12.30	Voila - 295	HP	14.2	29,100	peak op.
295 - 298		295 – 298			4.30	Vistea - 298	HP	14.2	33,300	peak op.
298 - 308		298 - 308			7.30	Arpasu- 308	HP	14.2	36,460	peak op.
308 – 312		308 - 312			5.20	Scorei 312.8	HP	14.2	37,060	peak op.
312 - 323		312 - 323			10. 80	Avrig 323.8	HP	14.2	38,760	peak op.
323 - 399	323-399									
399 - 407		399.- 407			3.29	G.Lotrului 407	HP	27	58,000	peak op.
407 - 418		407 - 418			79	Turnu 418	HP	70	194,000	peak op.
418 - 422		418 - 422			3.21	Calimanesti 422	HP	38	196,000	peak op.
422 - 429		422 - 429			7.32	Daesti 429	HP	37	107,000	peak op.
429 - 437		429 - 437			194	Rm.Valcea 437	HP	46	134,000	peak op.
437 - 446		437 - 446			70	Raureni 446	HP	48	141,000	peak op.
446 – 453		446 - 453			130	Govora 453	HP	45	135,000	peak op.
453 – 461		453 - 461			51.8	Babeni 461	HP	37	120,000	peak op.
461 – 468		461 - 468			24.94	Ionesti 468	HP	38	125,000	peak op.
468 – 477		468 - 477			456	Zavideni477	HP	38	120,000	peak op.
477 – 488		477 – 488			480	Dragasani 488	HP	45	140,000	peak op.
488 - 505		488 - 505			202.70	Strejesti 504.8	HP	52	173,000	peak op.
505 - 515		505 - 515			434	Arcesti 515	HP	38	122,000	peak op.
515 - 521		515 - 521			15.61	Slatina 521	HP	26	80,000	peak op.
515 - 521		521 -537			1100	Ipotesti 537	HP	53	92,000	peak op.
537 - 550		537 - 550			76.70	Draganesti 550	HP	53	98,000	peak op.
550 - 565		550 - 565			962	Frunzaru 565	HP	53	104,000	peak op.
565 - 580		565 - 580			782	Rusanesti 580	HP	53	106,000	peak op.
580 - 595		580 - 595			74.65	Izbiceni 595	HP	53	110,000	peak op.
595 - 608	595-608									
608 - 615		608 - 615								

* - impounded sections are included in the regulated sections of the Olt river

Arges	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigaþion NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yea r m^3/day drinking or irrigation water	River diversion, peak operation, running mode
0 – 20	0 - 20	-	-	-	-	-	-	-	-	-
20 - 31	-	-	-	-	450.62 20-31	Vidraru 31	HP,FP,DW,ER	220/ 1,416,960	400,000/ 1,416,960	Running mode
31 - 47	31 - 47	-	-	-	-	-	-	-	-	-
47 - 49	-	-	-	-	1.5; 47 - 49	Oiesti; 49	HP, FP,ER	15/-	28,160	Running
49 - 51	49 - 51	-	-	-	-	-	-	-	-	-
51 –53,5	-	-	-	-	06 51 –53	Cerbureni 53	HP/FP,DW, ER	15/ 103,680	290,00/ 103,680	Running mode
53 – 59	53 – 59	-	-	-	-	-	-	-	-	-
59 – 59	-	-	-	-	05 59 – 59,6	Curtea de Arges 59,6	HP,FP,DW, ER	7,7/ 164,160	15/ 164,160	Running mode
60 – 65	60 – 65	-	-	-	-	-	-	-	-	-
65 - 68	-	-	-	-	10 64,9 - 68	Zigoneni 68	HP/FP,DW, ER	15/ 34,560	20,500/ 34,560	Running mode
68 – 77	68 – 77	-	-	-	-	-	-	-	-	-
77 - 84	-	-	-	-	41,6 77 - 84	Valcele 84	DW / FP, HP, ER	15 / 194,400	29,600 / 194,400	Running mode
84 - 85	-	84 - 85	-	-	-	-	-	-	-	-
85 -93	85 - 93	-	-	-	-	-	-	-	-	-
93 - 99	-	-	-	-	27,8 93 - 99	Budeasa 99	DW / FP, HP, ER	11/ 345,600	23,000/ 345,600	Running mode
99 - 101	-	-	-	-	1 99 - 101	Bascov 101	DW / FP, HP, ER	7,7 / 216,000	14300 / 216000	Running mode
101-107	-	101-107	-	-	-	-	-	-	-	-
107 - 110	-	-	-	-	1 107 - 110	Prundu 110	DW / FP, HP, ER	7,7 / 518,400	19,600 / 518,400	Running mode
110 - 117	-	-	-	-	55 110 - 117	Golesti 117	DW / FP, HP, ER	8 / 518,400	33,000 / 518,400	Running mode

117 - 159	117 - 159	-	-	-	-	-	-	-	-	-
159 - 164	-	-	-	-	0,840 159 - 164	Zavoiu Orbului 164	DW/ FP, ER	- 3,801,600	- 3,801,600	Running mode
164 – 216	164 – 216	-	-	-	-	-	-	-	-	-
216 - 220	-	-	-	-	-; 216 - 220	Ogrezeni* 220	DW / FP, ER	-	-	-
220 - 236	220 - 236	-	-	-	-	-	-	-	-	-
236 - 247	-	-	-	-	25,8; 236 - 247	Mihailesti 247	FP / HP, ER	11	13,600	Running mode

* - under construction

Vedea	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2* *Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigation NA, flood protect. FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yr m^3/day drinking water or irrigation	River diversion, peak operation running mode
0 -192	0 -192	-	-	-	-	-	-	-	-	-
192 - 224	-	192 - 224	-	-	-	-	-	-	-	-

Ialomita	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
0-13	0-13	-	-	-	-					
13-15	-	-	-	-	19 13-15	Bolboci, 15	HP, DW, FP	12/ 103,680	22,000/ 34,700	Running mode
15-52	15-52	-	-	-	-					
52-54	-	-	-	-	6 52-54	Pucioasa4	HP, DW	2/ 194,400	7,700/ 75,273	Running mode
54-217	54-217	-	-	-	-					
217-225	-	-	-	-	45 217-225	Dridu25	HP, FP	2/,129,600	4,700/ 36,500	Running mode
225-417	-	225-417	-	-	-					

Buzau	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *Rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, etc.) *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *At km*	Hydropower HP, drinking water DW, navigaþion NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/ Year m^3/day drinking water or irrigation	River diversion, peak operation, running mode
0-53	0-53	-	-	-						
53-60	-	-	-	-	125 52,8-60	Siriu, 60	HP, DW, FP	42/216000	750,00/ 14,030	Running mode
60-122	60-122	-	-	-	-					
122-126					4; 122-126	Candesti26	HP	11	21,000	Running
126-174	126-174	-	-	-	-					
174-302	-	174-302	-	-	-					

Siret	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
167 - 179	167 - 179	-	-	-	-					
179 -189					56; 179 -189	Rogojesti; 189	HP	3.6	9,000	running
189 - 208		189 - 208	-	-	-					
208 -217					25,0 208 -217	Bucecea 217	DW	820,800	-	running mode
217 – 326	217 – 326	-	-	-	-	-	-	-	-	-
326 -341	326 -341	-	-	-	-	Priza Pascani	DW	345,600	-	running mode
341 - 397		341 - 397								
397 – 436	397 – 436	-	-	-	-	-	-	-	-	-
436 - 453	-	436 - 453	-	-	-	-	-	-	-	-
453 – 508	453 – 508	-	-	-	-	-	-	-	-	-
508 - 515					70.6 508 - 515	Galbeni 515	HP	29	79,000	running mode
515 – 528	-	-	-	-	148.6 515 – 528	Racaciuni 528	HP	44.6	115,000	running mode
528 - 554	-	528 - 554	-	-	-	-	-	-	-	-

Siret	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
554 - 570					160 554 - 570	Beresti 570	HP	43	110,000	running mode
570 - 590	-	570 - 590	-	-	-	-	-	-	-	-
590 - 598					52 590 - 598	Calimanesti 598	HP	40	79,000	running mode
598 – 726	-	598 – 726	-	-	-	-	-	-	-	-

Moldova	**Free--flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed, *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2* *Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigaþion NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yr m^3/day drinking water or irrigation	River diversion peak operation running mode
0-71	0-71	-	-	-	-					
71-97	-	71-97	-	-	-					
97-190	97-190		-	-	-					
190 - 213	-	190 - 213	-	-	-					

Bistrita	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
0 – 148	0 – 148	-	-	-	-	-	-	-	-	-
148 – 178	-	-	-	-	1,230 148 – 178	Izvorul Muntelui/178	HP	210	435,000	running mode
178 - 194	178 - 194	-	-	-	-	-	-	-	-	-
194 - 197	-	-	-	-	7.6 194 - 197	Pingarati 197	HP	23	570,00	running mode
197- 201	-	-	-	-	5.9 197- 201	Vaduri ~~201~~	HP	44	90,000	running mode
201 - 208	201 - 208	-	-	-	-	-	-	-	-	-
208 - 212	-	-	-	-	9 208 - 210	Bitca Doamnei 210	HP	11	52,000 MWh	running mode

Bistrita	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
					210 - 212	Reconstruc-tia/212	DW	535680	535,680	
212 - 249	212 - 249	-	-	-	-	-	-	-	-	-
249 - 252	-	249-252	-	-	11 249 - 252	Racova 252	HP	23 MW	60,000 MWh	running mode
252 - 258	-	252-258	-	-	-	-	-	-	-	-
258 - 262	-	-	-	-	5 258 - 262	Girleni 262	HP	23	61,000 MWh	running mode
262 - 266	-	-	-	-	10 262 - 266	Lilieci 266	HP	23	56,000	running mode
266 - 272	-	-	-	-	-					
272 - 277	-	-	-	-	6 272 - 277	Bacau 2	HP	30	74,000	running mode
277 - 279	-	-	-	-	2.6 277 - 279	Redresare UHE Bacau	DW	86400	86,400	running mode
279 –283	-	279 -283	-	-	-					

Trotus	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
0-26	0-26	-	-	-	-					
26 -28	-	26 -28	-	-	-					
28 - 33	28 - 33	-	-	-	-					
33 - 40		33 - 40	-	-	-					
40 - 93	40 - 93	-	-	-	-					
93 - 95		93 - 95	-	-	-					
95 - 158	95 – 158	-	-	-	-					
158 - 162	-	158 - 162	-	-	-					

Prut	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
River section *rkm - rkm*	*rkm - rkm*	Artificial bank, dyke line along main river bed *rkm - rkm*	Dry polder, wet polder, open arms *Size in km^2 Min. 50 km^2*	*rkm - rkm*	Storage Volume (mil. m^3) *rkm - rkm*	of dam polder or reservoir *at km*	Hydropower HP, drinking water DW, navigaþion NA, flood protection FP, erosion control ER	In MW; m^3 water supply/day	MWh electricity/Yr m^3/day drinking water or irrigation	River diversion peak operation running
241 -337	241 -337	-	-	-	-					
337 -407	-	-	-	-	735; 337 -407	Stanca 407	HP, DW, FP	16.6;28,000	66,000;28,000	Running
407 -567	407 -567	-	-	-	-					
567 -673	-	567 -673	-	-	-					
673 - 686	673 - 686	-	-	-	-					
686 - 689	-	686 - 689	-	-	-					
689 -698	689 -698	-	-	-	-					
698 - 792	-	698 - 792	-	-	-					
792 - 843	792 - 843	-	-	-	-					
843 - 853	-	843 - 853	-	-	-					
853 - 909	853 - 909	-	-	-	-					
909 - 983	-	909 - 983								

Jijia	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
10 - 12	10 - 12	-	-	-	-					
12 -16	-	-	-	-	3.6; 12 -16	Iezer 16	FP, ER	-	-	running
16 -181	16 -181	-	-	-	-					
181 -232	-	181 -232	-	-	-					
232 - 285	232 - 285	-	-	-	-					

Barlad	**Free flowing section**	**Regulated/ canalized**	**Flood protection**	**Navigable section**	**Impounded river section**	**Name**	**Purpose /use**	**Economic Capacity**	**Economic use**	**Operation Mode**
0 - 17	0 -17	-	-	-	-					
17 - 24	-	17 - 24	-	-	-					
24 - 40	24 - 40	-	-	-	-					
40 - 207	-	40 -207	-	-	-					