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This chapter deals with major transboundary rivers discharging into the Black Sea and some of their transboundary tributaries. It also includes lakes located within the basin of the Black Sea.

TRANSBOUNDARY WATERS IN THE BASIN OF THE BLACK SEA[1]

Basin/sub-basin(s)	Total area (km²)	Recipient	Riparian countries	Lakes in the basin
Rezvaya	740	Black Sea	BG, TR	…
Danube	801,463	Black Sea	AL, AT, BA, BG, CH, CZ, DE, HU, HR, MD, ME, MK, IT, PL, RO, RS, SK, SI, UA	Lake Iron Gates I and II, Lake Neusiedl
- *Lech*	*4,125*	*Danube*	*AT, DE*	…
- *Inn*	*26,130*	*Danube*	*AT, CH, DE, IT*	…
- *Morava*	*26, 578*	*Danube*	*AT, CZ, PL, SK*	…
- *Raab/Raba*	*10,113*	*Danube*	*AU, HU*	…
- *Vah*	*19,661*	*Danube*	*PL, SK*	…
- Ipel/Ipoly	5,151	Danube	HU, SK	…
- *Drava and Mura*	*41,238*	*Danube*	*AT, HU, HR, IT, SI*	…
- Tisza	157,186	Danube	HU, RO, RS, SK, UA	…
- Somes/Szamos	16,046	Tisza	HU, RO	…
- Mures/Maros	30,195	Tisza	HU, RO	…
- Sava	95,713	Danube	AL, BA, HR, ME, RS, SI	…
- Velika Morava	37,444	Danube	BG, ME, MK, RS	…
- Timok	4,630	Danube	BG, RS	…
- Siret	47,610	Danube	RO, UA	…
- Prut	27,820	Danube	MD, RO, UA	Stanca-Costesti Reservoir
Kahul	…	Lake Kahul	MD, UA	*Lake Kahul*
Yalpuh	…	Lake Yalpuh	MD, UA	*Lake Yalpuh*
Cogilnik	6,100	Black Sea	MD, UA	…
Dniester	72,100	Black Sea	UA, MD	…
- *Yahorlyk*	*…*	*Dniester*	*UA, MD*	…
- Kuchurhan	…	Dniester	UA, MD	…
Dnieper	504,000	Black Sea	BY, RU, UA	…
- Pripyat	114,300	Dnieper	BY, UA	…

Elancik	*900*	*Black Sea*	*RU, UA*	…
Mius	*6,680*	*Black Sea*	*RU, UA*	…
Don	422,000	Black Sea	RU, UA	…
- Siversky Donets	98,900	Don	RU, UA	…
Psou	421	Black Sea	RU, GE	…
Chorokhi/Coruh	22,100	Black Sea	GE, TR	…
- Machakheliscкali	369	Chorokhi/Coruh	GE, TR	…

[1] The assessment of water bodies in italics was not included in the present publication.

REZVAYA RIVER BASIN[1]

The basin of the Rezvaya River, also known as Rezovska, is shared by Bulgaria and Greece. The basin covers an area of approximately 740 km². The river with a total length of 112 km springs from the Turkish part of the Strandja Mountain, where it is known under the name Passpalderessi. For almost its entire length, it forms the border between Bulgaria and Turkey. The river runs into the Black Sea near the village of Rezovo, district of Bourgas (Bulgaria).

The upper part of the river is in "natural conditions" and most of its downstream parts are in a "good ecological and chemical status".

DANUBE RIVER BASIN

Following provisions of the Water Framework Directive, watercourses in the Danube River basin, watercourses in the Romanian Black Sea river basins as well as Romanian-Ukrainian Black Sea coastal waters have been combined in the Danube River Basin District (RBD)[2]. The transboundary rivers and lakes included in this chapter belong to the Danube RBD, although hydrologist regard some of them as separate first-order rivers discharging directly into a final recipient of water.

[1] Based on information by the Ministry of Environment and Water, Bulgaria.
[2] Following the Water Framework Directive, a River Basin District means the area of land and sea, made up of one or more neighboring river basins together with their associated groundwaters and coastal waters, which is identified under Article 3 (1) as the main unit for management of river basins.

DANUBE RIVER [3]

Nineteen countries (Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Italy, Moldova, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Switzerland, The former Yugoslav Republic of Macedonia and Ukraine) share the basin of the Danube River, with a total area of 801,463 km^2.

Due to its geologic and geographic conditions, the Danube River basin is divided into three main parts:

- The *Upper Danube* that covers the area from the Black Forest Mountains to the Gate of Devín (east of Vienna), where the foothills of the Alps, the Small Carpathians and the Leitha Mountains meet;
- The *Middle Danube* that covers a large area reaching from the Gate of Devín to the impressive gorge of the Danube at the Iron Gate, which divides the Southern Carpathian Mountains to the north and the Balkan Mountains to the south;
- The *Lower Danube* that covers the Romanian-Bulgarian Danube sub-basin downstream of the Cazane Gorge and the sub-basins of the rivers Siret and Prut.

Basin of the Danube River			
Area	Country	Country's share	
801,463 km^2	Albania	126 km^2	<0.1 %
	Austria	80,423 km^2	10.0 %
	Bosnia and Herzegovina	36,636 km^2	4.6 %
	Bulgaria	47,413 km^2	5.9 %
	Croatia	34,965 km^2	4.4 %
	Czech Republic	21,688 km^2	2.9 %
	Germany	56,184 km^2	7.0 %
	Hungary	93,030 km^2	11.6 %
	Italy	565 km^2	<0.1 %
	Moldova	12,834 km^2	1.6 %
	Poland	430 km^2	<0.1 %
	Romania	232,193 km^2	29.0 %
	Serbia and Montenegro*	88,635 km^2	11.1 %
	Slovakia	47,084 km^2	5.9 %
	Slovenia	16,422 km^2	2.0 %
	Switzerland	1,809 km^2	0.2 %
	The former Yugoslav Republic of Macedonia	109 km^2	<0.1 %
	Ukraine	30,520 km^2	3.8 %

Source: The Danube River Basin District - River basin characteristics, impact of human activities and economic analysis required under Article 5, Annex II and Annex III, and inventory of protected areas required under Article 6, Annex IV of the Water Framework Directive (2000/60/EC), Part A – Basin-wide overview. International Commission for the Protection of the Danube River, Vienna, 18 March 2005. This publication is hereinafter referred to with its short title: "Danube Basin Analysis (WFD Roof Report 2004)".
* At the date of publication of the Danube Basin Analysis (WFD Roof Report 2004), Serbia and Montenegro still belonged to the same State.

[3] If not otherwise specified, information on the Danube River and its major tributaries, as well as the Danube delta, is based on information submitted by the International Commission for the Protection of the Danube River.

Hydrology

The confluence of two small rivers – the Brigach and the Breg – at Donaueschingen (Germany) is considered to be the beginning of the Danube. The river flows south-eastward for a distance of some 2,780 km before it empties into the Black Sea via the Danube delta in Romania.

The long-term average discharge of the Danube River is about 6,550 m^3/s (207 km^3/a).[4] The annual discharge in dry years is 4,600 m^3/s (95 % probability, one-in-20 dry years) and in wet years 8,820 m^3/s (5 % probability, one-in-20 wet years).[5]

Approximate distribution of Danube River basin runoff by country/group of countries

Country/group of countries	Annual volume of runoff (km^3/a)	Mean annual runoff (m^3/s)	Share of Danube water resources (%)	Ratio of outflow minus inflow ÷ outflow (%)
Austria	48.44	1,536	22.34	63.77
Bulgaria	7.32	232	3.99	7.35
Czech Republic	3.43	110	1.93	n.a.
Germany	25.26	801	11.65	90.71
Hungary	5.58	176	2.57	4.97
Romania	37.16	1,177	17.00	17.35
Slovakia	12.91	407	7.21	23.0
Bosnia and Herzegovina, Croatia and Slovenia	40.16	1,274	16.84	n.a.
Moldova and Ukraine	10.41	330	4.78	9.52
Montenegro and Serbia	23.5	746	10.70	13.19
Switzerland	1.40	44	0.64	86.67
Italy	0.54	17	0.25	100.00
Poland	0.10	3	0.04	100.00
Albania	0.13	4	0.06	100.00
Total	216.34	6,857	100.00	

Source: Danube Pollution Reduction Programme - Transboundary Analysis Report. International Commission for the Protection of the Danube River, June 1999.

Extremely high floods have hit certain areas of the Danube River basin in recent years. Floods in the Morava and Tisza sub-basins and in the Danube River itself have had severe impact on property and human health and safety. Changes in morphological characteristics and in river dynamics can also take place during large floods. After severe floods, dikes need to be reconstructed, which is often costly. The damage inflicted by large floods may influence the way flood-endangered areas are used.

Pressure factors

The activities of over 81 million people living in the Danube River basin greatly affect the natural environment of the basin, causing pressures on water quality, water quantity and biodiversity.

The most significant pressures fall into the following categories: organic pollution, nutrient pollution, pollution by hazardous substances, and hydromorphological alterations.

[4] Danube Basin Analysis (WFD Roof Report 2004).
[5] Danube Pollution Reduction Programme – Transboundary Analysis Report. International Commission for the Protection of the Danube River, June 1999

Significant point sources of pollution in the Danube River Basin District[6]													
Item	**Countries along the main watercourse and tributaries***												
	DE	**AT**	**CZ**	**SK**	**HU**	**SI**	**HR**	**BA**	**CS***	**BG**	**RO**	**MD**	**UA**
Municipal point sources: Wastewater treatment plants	2	5	1	9	11	3	10	3	4	6	45	0	1
Municipal point sources: Untreated wastewater	0	0	0	2	1	3	16	15	14	31	14	0	0
Industrial point sources	5	10	10	6	24	2	10	5	14	4	49	0	5
Agricultural point sources	0	0	0	0	0	1	0	0	0	0	17	0	0
Total	**7**	**15**	**11**	**17**	**36**	**9**	**36**	**23**	**32**	**41**	**125**	**0**	**6**

* CS was the ISO country code assigned to Serbia and Montenegro until its split in 2006.
Source: Danube Basin Analysis (WFD Roof Report 2004).

Insufficient treatment of wastewater from major municipalities is a significant cause of organic pollution. In parts of the Middle and Lower Danube, wastewater treatment plants are missing or the treatment is insufficient. Therefore, the building of wastewater treatment plants is a prime focus of the programme of measures which needs to be developed under the Water Framework Directive's river basin management plan by the end of 2009. Organic pollution (expressed as BOD_5 and COD_{Cr}) reaches its maximum-between Danube-Dunafoldvar (river kilometre 1,560 below Budapest) and Danube-Pristol/Novo Selo (river kilometre 834, just below the border of Serbia and Bulgaria). The most polluted tributaries from the point of view of degradable organic matter are the rivers Russenski Lom, Sio and Siret.[7] COD_{Cr}, ammonium-nitrogen and ortho-phosphate phosphorus reach the highest values in the Lower Danube.

[6] The Danube River Basin District with an area of 807,827 km² includes the basin of the Danube River (801,463 km²), Romanian Black Sea river basins (5,122 km²) and Romanian-Ukrainian Black Sea coastal waters (1,242 km²).
[7] Following more recent information by Romania, the Siret River (RO 10 – confluence Danube Sendreni, year 2005) was in class 2 for dissolved oxygen and BOD_5 and only for COD_{Cr}, in class 4.

The chemical, food, and pulp and paper industries are prominent industrial polluters, and wastewaters from these plants raise the levels of nutrients, heavy metals and organic micro-pollutants in the river network. Pollution loads of hazardous substances can be significant, although the International Commission for the Protection of the Danube River has not yet evaluated the full extent. Currently, there is little data available for such hazardous substances as heavy metals and pesticides.

Cadmium and lead can be considered as the most serious inorganic microcontaminants in the Danube River basin. Especially critical is cadmium, for which the target value under the TNMN [8, 9] is substantially exceeded in many locations downstream of river kilometre 1,071 (values are in many cases 2-10 times higher than the target value). The pollution of the Lower Danube by cadmium and lead can be regarded as a significant problem.

Agriculture has long been a major source of income for many people, and it has also been a source of pollution by fertilizers and pesticides. Many tributaries, such as the rivers Prut, Arges, Russenski Lom, Iskar, Jantra, Sio and Dyje, are considered as rather polluted by nitrogen compounds. Most of these are in the lower part of the Danube.

There are indications that the Middle Danube (from river kilometre 1,600 to 1,200) may be sensitive to eutrophication. Other sections of the Danube and its tributaries are apparently flowing too fast, and are too deep or too turbid to develop eutrophication problems. Like many large rivers, the impact of the high transboundary river nutrient loads in the Danube river basin is the most critical in the receiving coastal waters of the Black Sea; however, pressures from the coastal river basins directly affecting the coastal waters of the Danube RBD also need to be considered.

A substance of special concern in the lower Danube is p,p'-DDT. Here, the very low target values of the TNMN are often exceeded in the order of two magnitudes. This means that, despite a high analytical uncertainty, the level of p,p'-DDT is significant and gives a strong indication of potential risk of failure to reach the good status. For lindane, the results of the TNMN classification are not so alarming.[10] Some tributaries (the Sió, the Sajó and the Sava) show random occurrence of high concentrations of atrazine.

Transboundary impact

In the Danube basin, there are areas in "high and good status", but there are also stretches of river which fall under "heavily modified water bodies" and have been assessed as "polluted". As analysed in the above section, cadmium, lead, mercury, DDT, lindane and atrazine are among the most serious pollutants.

The Upper Danube, where chains of hydropower plants exist, is mainly impacted by hydromorphological alterations, and many water bodies have also been provisionally identified as "heavily modified water bodies".

The Middle Danube is classified as "possibly at risk" due to hazardous substances. The section of the Danube shared by Slovakia and Hungary is classified as "at risk" due to hydromorphological alterations. The section shared by Croatia and Serbia is "possibly at risk" in all categories, since not enough data is available for a sure assessment.

The Lower Danube is "at risk" due to nutrient pollution and hazardous substances, and in large parts due to hydromorphological alterations. It is "possibly at risk" due to organic pollution.

Trends

The water quality in the Danube basin has improved significantly during the last decade, hand-in-hand with improvements of the general environmental conditions in the Danube basin.

Improvements in water quality can be seen at several TNMN locations. A decrease of biodegradable organic pollution is visible in the Austrian-Slovakian section of the Danube and in a lower section downstream at Chiciu/Silistra. The tributaries Inn, Salzach, Dyje, Vah, Drava, Tisza (at Tiszasziget) and Arges show the same tendency.

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[8] The Transnational Monitoring Network (TNMN) constitutes the main data source on water quality of the Danube and its major tributaries. The main objective of the TNMN is to provide an overall view of pollution and long-term trends in water quality and pollution loads in the major rivers of the Danube River basin. Currently, the network consists of 78 water-quality monitoring sites with a minimum sampling frequency of 12 times per year for chemical determinands in water. The TNMN includes biological determinands with a minimum sampling frequency of twice a year. There are 23 sampling stations in the TNMN load assessment programme with a minimum sampling frequency of 24 times per year.

[9] The "target values" have been purposely developed for the presentation of results of the TNMN; in some way, the choices were made with arbitrariness and they do not represent any threshold-, limit- or standard values, which may be required by national law or EU legislation for the characterization of water bodies.

[10] At the time of writing, the International Commission for the Protection of the Danube River had not yet assessed the consequences of the newly set environmental-quality standards.

As for nutrients, ammonium-nitrogen decreases are evident in locations of the upper part of Danube down to Herceg-szanto (TNMN site H05), in tributaries of the upper section (Inn, Salzach, Morava, Dyje, Vah) as well as in the Drava, Tisza (at Tiszasziget), Sava and Arges. A significant decrease of ammonium-nitrogen is also apparent in the Danube at Silistra/Chiciu (TNMN site BG05), but is not supported by Romanian data at the same monitoring location. Nitrate-nitrogen decreases in several locations of the German-Austrian part of the Danube River, at Danube-Dunafoldvar and in some locations of the Lower Danube, such as Danubeus, Iskar-Bajkal and Danube/us.Arges. Nitrate-nitrogen decreases have also been seen in the tributaries Morava, Dyje, Vah and Drava, and in the Sava River at the confluence with the Una River at Jasenovac.

A decrease of ortho-phosphate phosphorus has been observed at Slovak monitoring locations, at Danube Szob, and at most downstream locations on the Danube River starting from the Reni Chilia/Kilia arm. An improvement can also be seen in the tributaries to the upper part of the river, and further in the rivers Drava, Siret and at the monitoring site Sava/Una rivers at Jasenovac.

Despite the achievements of the last 10 years, water and water-related ecosystems in the Danube River basin continue to be at risk from pollution and other negative factors. A period of more intensive farming, especially in the fertile areas of the new EU member States in the basin, may increase agricultural pollution. This calls for the development of a long-term strategy to address the problems of pollution, and especially diffuse pollution from agriculture.

As is the case in other basins, the frequency of serious flood events due to climatic changes could increase, which, in combination with unsustainable human practices, may cause substantial economic, social and environmental damage.

LAKE IRON GATE I[11]

Iron Gate is a gorge between the Carpathian and Balkan mountains on the Danube River on the border between Romania and Serbia. Earlier, it was an obstacle for shipping.

Iron Gate I (upstream of Turnu Severin) has one of Europe's largest hydroelectric power dams. The dam was built by Romania and the former Yugoslavia between 1970 and 1972.

The total area of the lake is 260 km^2 and the total volume 2.4 km^3. The lake is relatively shallow, the mean depth being 25 m and the deepest point being 40 m. The lake has been monitored for a number of physical, chemical, biological, microbiological and radiological determinands. The riparian countries consider that there are no major water-quality problems in Iron Gate I.

[11] Based on the Background document for the Guidelines on Monitoring and Assessment of Transboundary and International Lakes.

LAKE IRON GATE II[12]

Iron Gate II downstream of Turnu Severin is smaller (78 km²) than Iron Gate I; the total volume of the lake (0.8 km³) is one third of that of Iron Gate I. The lake is even shallower than Iron Gate I, the mean depth being 10 m and the deepest point being 25 m. The lake is also monitored similarly to Iron Gate I. The riparian countries consider that Iron Gate II has no serious water-quality or water-quantity problems.

LECH RIVER[13]

The Lech (254 km) is a left-hand tributary of the Danube. Its sub-basin (4,125 km²) covers parts of Austria and Germany. Its discharge at mouth is 115 m³/s (1982-2000).

INN RIVER[14]

The Inn (515 km) is the third largest by discharge and the seventh longest Danube tributary. At its mouth in Passau (Germany), it brings more water into the Danube (735 m³/s, 1921–1998) than the Danube itself although its sub-basin of 26,130 km² (shared by Austria, Germany, Italy and Switzerland) is only half as big as the Danube's basin at this point. The main tributary of the Inn is the Salzach River, shared by Austria and Germany.

MORAVA RIVER[15]

The Morava (329 km) is a left-hand tributary of the Danube. Its sub-basin of 26,578 km² covers parts of the Czech Republic, Slovakia and Austria. Its discharge at mouth is 111 m³/s (1961–2000).

RAAB/RABA RIVER[16]

The 311-km-long Raab/Raba is shared by Austria and Hungary (total area of the sub-basin 10,113 km2). Various rivers flowing from the Fischbacher Alps in Austria feed it. Its discharge at mouth is 88 m³/s (1901–2000).

VAH RIVER[17]

The Vah (398 km) is a right-hand tributary of the Danube. Its sub-basin of 19,661 km² covers parts of Poland and Slovakia. Its discharge at mouth is 194 m³/s (1961–2000).

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[12] Based on the Background document for the Guidelines on Monitoring and Assessment of Transboundary and International Lakes.
[13] Source: Danube Basin Analysis (WFD Roof Report 2004).
[14] Source: Danube Basin Analysis (WFD Roof Report 2004).
[15] Based on information by the Ministry of the Environment of the Slovak Republic. The figures are based on country information and deviate from the Danube Basin Analysis (WFD Roof Report 2004).
[16] Source: Danube Basin Analysis (WFD Roof Report 2004).
[17] Based on information by the Ministry of the Environment of the Slovak Republic. The figures are based on country information and deviate from the Danube Basin Analysis (WFD Roof Report 2004).

IPEL/IPOLY RIVER[18]

Slovakia (upstream country) and Hungary (downstream country) share the sub-basin of the Ipel/Ipoly River, with a total area of 5,151 km².

Sub-basin of the Ipel/Ipoly River			
Area	**Country**	**Country's share**	
5,151 km²	Slovakia	3,649 km²	70.8%
	Hungary	1,502 km²	29.2%

Source: Ministry of Environment and Water, Hungary, and Ministry of the Environment of the Slovak Republic. These figures deviate from the Danube Basin Analysis (WFD Roof Report 2004).

Hydrology

The 232-km-long Ipel/Ipoly[19] has its source in the Slovak Ore Mountains in central Slovakia. It flows south to the Hungarian border, and then southwest, west and again south along the border between Slovakia and Hungary until it flows into the Danube near Szob. Major cities along its course are Šahy (Slovakia) and Balassagyarmat (Hungary). Its discharge at mouth is 22 m³/s (1931–1980).

There are 14 reservoirs on the river.

The most serious water-quantity problems are flooding and temporary water scarcity.

Pressure factors

Diffuse pollution mainly stems from agriculture, but also from settlements that are not connected to sewer systems. The estimated total amount of nitrogen and phosphorus reaching surface waters in the Ipel/Ipoly sub-basin is 1,650 tons nitrogen/year and 62 tons phosphorus/year.

The most important and problematic pressure factor is inappropriate wastewater treatment. Point sources of pollution, which are mostly municipal wastewater treatment plants, discharge organic pollutants, nutrients and heavy metals into the river and its tributaries.

Pollution in the sub-basin of the Ipel/Ipoly River in 2000		
Determinands	**Discharges in the Slovak part [tons/year]**	**Discharges in the Hungarian part [tons/year]**
BOD_5	514.9	27.1
COD_{Cr}	1,283.5	98.4
Dissolved solids	6,507.1	2,017
Suspended solids	515.5	117
NH_4-N	159.9	7.5
Nitrate-N	…	145
Total discharged wastewater	**12,882,000 m³/year**	**1,959,000 m³ /year**

Source: Ministry of Environment and Water, Hungary, and Ministry of the Environment of the Slovak Republic.

Transboundary impact

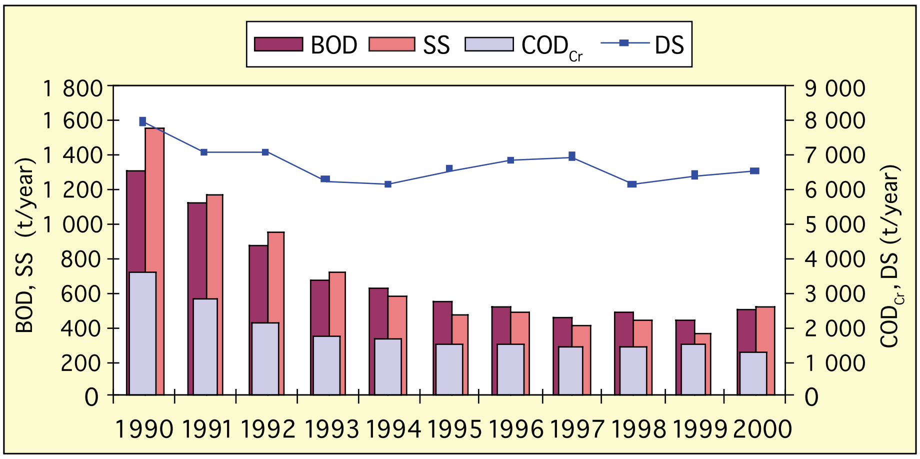
The most serious water-quality problems are eutrophication, organic pollution, bacterial pollution, and pollution by hazardous substances.

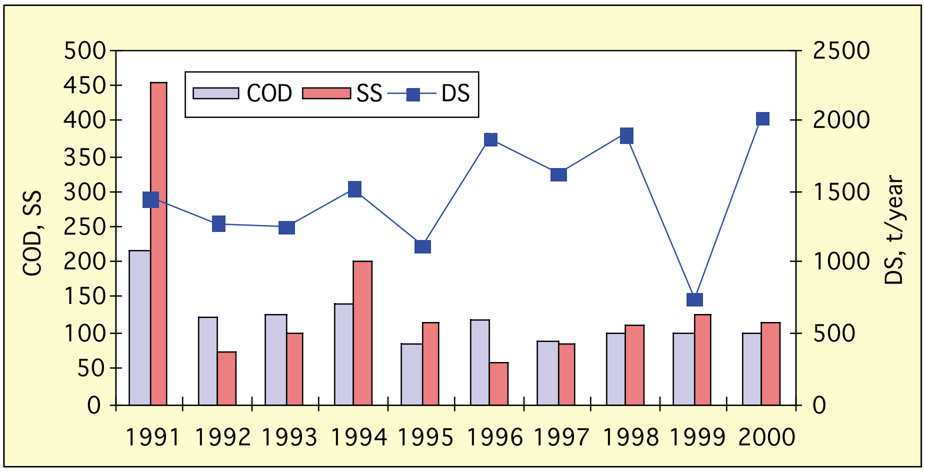
Owing to inappropriate wastewater treatment and agricultural practices, the content of nutrients in the waters of the transboundary section of the river is rather high and gives rise to the excessive growth of algae.

[18] Based on information by the Ministry of Environment and Water, Hungary, and the Ministry of Environment, Slovakia.
[19] Source: The Danube Basin Analysis (WFD Roof Report 2004) quotes a length of 197 km.

Organic pollution can have a negative impact on the ecosystem, irrigation, fishing and drinking-water quality. The BOD_5 values in the Ipel/Ipoly River sometimes exceed the limits of the water-quality criteria for drinking water and aquatic life. The primary sources of the biodegradable organic pollutants are wastewater discharges. Coliform bacteria, faecal coliforms and faecal streptococcus counts in the river also exceed the water-quality criteria for drinking water and bathing; the bacterial pollution, therefore, threatens these uses. Recreational use is directly affected, as compliance with bacteriological limit values is a prerequisite for bathing. Abstraction for drinking water is indirectly affected because flexible treatment technologies can eliminate a wide range of bacteria. The main sources of bacterial pollution are municipal wastewater discharges.

The occurrence of hazardous substances in waters presents a risk to biota and can affect almost all uses as well as the ecological functions of the river. Some specific pollutants – cadmium, petroleum hydrocarbons and phenols – were identified at concentrations exceeding those for drinking-water abstraction and irrigation.





Loads of selected determinands (BOD – biochemical oxygen demand; COD – chemical oxygen demand; SS – suspended solids; DS – dissolved solids) discharged into the Ipel/Ipoly River from the Slovak part (upper figure) and the Hungarian part (lower figure).

Trends

The Hungarian national sewerage collection and wastewater treatment plan for settlements envisages the construction or upgrading of sewerage systems and treatment plants in order to implement the requirements of the Council Directive of 21 May 1991 concerning urban wastewater treatment (91/271/EEC) by the year 2010. In Slovakia, implementation of the Council Directive is required by 2010 for wastewater treatment plants with more than 10,000 population equivalents (p.e.) and by 2015 for those with 2,000 to 10,000 p.e.

Thus, organic pollution and pollution by dangerous substances will substantially decrease. The trend of nutrient pollution from agriculture is still uncertain.

DRAVA AND MURA RIVER[20]

The transboundary river Drava (893 km) is the fourth largest and fourth longest Danube tributary. It rises in the Southern Alps in Italy, but is the dominant river of southern Austria, eastern Slovenia, southern Hungary and Croatia. The sub-basin covers an area of 41,238 km². One of the main transboundary tributaries is the Mura, with its mouth at the Croatian-Hungarian border. The discharge of the Drava at its mouth is 577 m^3/s (1946–1991).

TISZA RIVER[21]

Hungary, Romania, Slovakia, Serbia and Ukraine share the sub-basin of the Tisza, also known as Tysa and the Tisa. The sub-basin of the Tisza is the largest sub-basin of the Danube River basin.

Sub-basin of the Tisza River			
Area	**Country**	**Country's share**	
157,186 km^2	Ukraine	12,732 km^2	8.1
	Romania	72,620 km^2	46.2
	Slovakia	15,247 km^2	9.7
	Hungary	46,213 km^2	29.4
	Serbia	10,374 km^2	6.6

Source: Ministry of Environment and Water, Hungary.

Hydrology

The Tisza sub-basin has both a pronounced mountain and lowland character as it stretches over the Carpathians and the Great Hungarian lowland. The drainage basins of the tributaries of the Tisza River are rather different from each other in topography, soil composition, land use and hydrological characteristics. The 1,800-2,500 m high ridge of the Carpathian Mountains create in a half circle the northern, eastern and south-eastern boundary of the Tisza sub-basin. The western – south-western reach of the sub-basin is comparatively low, in some places – on its Hungarian and Serbian reaches – it is almost flat.

The sub-basin of the Tisza River can be divided into two main parts: the mountainous catchments of the Tisza and the tributaries in Ukraine, Romania and Eastern-Slovakia, and the lowland parts mainly in Hungary and in Serbia.

The Tisza River itself can be divided into three parts, the Upper-Tisza upstream the confluence of the Somes/Szamos River, the Middle-Tisza between the mouth of the Somes/Szamos and the Mures/Maros rivers, and the Lower-Tisza downstream the confluence of the Mures/Maros River.

Europe's largest flood defence system was created in the basin. It encompasses regulation of rivers, construction of flood embankments and flood walls, systems of drainage canals, pumping stations and designated flood detention reservoirs (polders).

Floods in the sub-basin are formed at any season and can be of rainstorm, snow or rain origin. Long observations of water levels and maximum flow provide evidence that the distribution of extremely high and severe floods in the sub-basin is different along the Upper-, Middle- and Lower-Tisza and its tributaries. Not every high flood in the upstream part causes severe floods along the Middle- or Lower-Tisza. On the other hand, multi-peak floods caused by repeated rainfall in the upstream parts due to the extremely mild slope of the river bed of the Middle- and Lower-Tisza may superimpose and result in high floods of long duration in April and May.

[20] Source: Danube Basin Analysis (WFD Roof Report 2004).
[21] Based on information by the Ministry of Environment and Water, Hungary, Ministry of the Environment of the Slovak Republic and Slovak Hydrometeorological Institute.

Discharge characteristics of the Tisza River at the gauging station Szeged (Hungary)		
Q_{av}	863 m³/s	Average for: 1960-2000
Q_{max}	~ 4,000 m³/s	1931
Q_{min}	57.8 m³/s	1990
Mean monthly values:		
October: 504 m³/s	November: 641 m³/s	December: 762 m³/s
January: 775 m³/s	February: 908 m³/s	March: 1,218 m³/s
April: 1,574 m³/s	May: 1,259 m³/s	June: 956 m³/s
July: 756 m³/s	August: 531 m³/s	September: 473 m³/s

Source: Ministry of Environment and Water, Hungary.

In the Tisza sub-basin, there are a great number of lakes, reservoirs, forests, wetlands and protected areas. Within the most important water-related protected areas for species and habitats in the upper Tisza, there are two Slovakian protected areas: a medium size (<50,000 ha) protected area (karst) in the Slana/Sajo River, partially shared with Hungary, and a small size (<10,000 ha) protected wetland on the Latorytsya River (upper Bodrog River), near the Ukrainian border.

In Romania, biosphere, nature reserves and national parks in the upper sub-basin represent a total surface of 194,271 ha. In these areas, many protected flora and fauna species mentioned in the national Red Book are found. In addition, there are plans to create a new protected area in the Upper Tisza sub-basin - the Maramures Mountains National Park.

In Ukraine, protected areas occupy 1,600 km² (more than 12 % of the Zakarpatska Oblast area) and there are plans to expand the network of nature conservation areas. The most prominent reserve is the Carpathian Biosphere Reserve, which covers a surface of 57,889 ha.

Five National Parks and several protected areas are located in the middle Tisza in Hungary. The National Parks Hortobagyi, Koros-Maros, Bukk, Kiskunsagi (with oxbow lakes), and Aggtelek contain numerous important environmentally sensitive areas of the country. In addition, a mosaic of Ramsar sites, important bird and landscape protection areas, and biosphere reserves can be found along the wetlands of the middle and lower Tisza River. The Ecsedi Lap Complex (Ukraine, Slovakia, Romania and Hungary) forms a river eco-corridor, which is 400 km long and has a size of 140,000 ha. There are also Ramsar sites within both the Hortobagy (23,121 ha) and Kiskunsag (3,903 ha) National Parks. In the lower Tisza, the Pusztaszer (Hungary) and Stari Begej (at the confluence of the Begej and the Tisza Rivers in Serbia) Ramsar sites are among the most valuable wetlands.

On Serbian territory, protected (or planned to be) areas are Selevenj-PalicLudas complex (including Selevenj steppe, Palic lake, Ludas lake – Ramsar site), Zobnatica forest, Rusanda pool, Titelski Breg hill, Jegricka swamp, Pastures of large Bustard near Mokrin, as well as Ramsar sites of Slano Kopovo marshes and Stari Begej (Old Bega) – Carska Bara.

Pressure factors

Land in the sub-basin is mainly used for agriculture, forestry, pastures (grassland), nature reserves, as well as urbanized areas (buildings, yards, roads, railroads). As a result of intensive agricultural development over the past decades, many natural ecosystems, particularly the Tisza floodplains, have been transformed into arable lands and pastures. In the upper part of the sub-basin, notably in Ukraine and Slovakia, deforestation in mountain areas is responsible for changes of the flow regime and typical habitats. In addition, extensive use of fertilisers and agro-chemicals led to soil and water contamination with heavy metals and POPs, and river and lake eutrophication from organic materials and biogenic substances. Main pressures arise from the sewerage, as the Urban Waste Water Treatment Directive has not yet been fully implemented in Hungary, Romania and Slovakia. Furthermore, industrial activities as metallurgy and mining activities including solid waste disposals, can contribute to the water resources deterioration in the Tisza sub-basin. Large storage tanks of chemicals and fuels are potential accidental risk spots in the area, as well.

Transboundary impact

Accidental pollution from the industrial sites is one issue causing transboundary impact in the Tisza River sub-basin. For example, the cyanide accident on 30 January 2000 proved that inadequate precautionary measures at the disposal sites could lead to massive harmful effects to humans as well as to the environment. Consequences of such events lead to significant economic impacts on entire region. The floods of August 2002 highlighted the problem of inundation of landfills, dump sites and storage facilities where harmful substances are deposited. Transfer of both pathogens and toxic substances into the water may occur posing an additional threat to the environment.

Thermal pollution by industry or power generation processes can cause deterioration of water quality or alterations of the sedimentary environment and water clarity. These can lead to increased growth of microalgae and other nuisance flora.

Water pollution from navigation is linked to several diffuse sources. These include poorly flushed waterways, boat maintenance, discharge of sewage from boats, storm water runoff from parking lots, and the physical alteration of shoreline, wetlands, and aquatic habitat during construction and operation.

The implementation of the WFD and other related directives are decisive steps to significantly improve the status of the Tisza and its tributaries in Hungary, Romania and Slovakia.

Trends

There were no significant changes in recent years (2000–2005). The implementation of the Urban Wastewater Treatment Directive[22] and the implementation of Nitrate Directive[23] are decisive steps to significantly improve the status of the Tisza in Hungary and its tributaries in Slovakia and Romania.

[22] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment.
[23] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources.

SOMES/SZAMOS[24]

The sub-basin of the river Somes/Szamos is shared by Romania (upstream) and Hungary (downstream).

Sub-basin of the Somes/Szamos River			
Area	Country	Country's share	
16,046 km^2	Romania	15,740 km^2	98%
	Hungary	306 km^2	2%

Source: Ministry of Environment and Water, Hungary.

Hydrology

The Somes/Szamos has its source in the Rodnei Mountains in Romania and ends up in the Tisza. The sub-basin has an average elevation of about 534 m above sea level.

Discharge characteristics of the Somes/Szamos River at the gauging station Satu Mare (Romania)		
Q_{av}	126 m^3/s	Average for: 1950-2005
Q_{max}	3342 m^3/s	15 May 1970
Q_{min}	4.90 m^3/s	18 December 1961
Mean monthly values:		
October: 59.5 m^3/s	November: 84.2 m^3/s	December: 110 m^3/s
January: 99.4 m^3/s	February: 152 m^3/s	March: 224 m^3/s
April: 240 m^3/s	May: 169 m^3/s	June: 139 m^3/s
July: 107 m^3/s	August: 68.7 m^3/s	September: 56.3 m^3/s

Source: National Administration "Apele Romane", Romania.

Reservoirs in the Romanian part include the Fantanele, Tarnita, Somes Cald, Gilau, Colibita and Stramtori-Firiza reservoirs. Fish ponds are numerous. There are two natural water bodies: the lakes Stiucilor and Bodi-Mogosa.

Pressure factors

In the Romania part of the sub-basin, the population density is 86 persons/km^2. Water use by sector is as follows: agriculture – 0.5%, urban uses – 0.5%, industrial uses – 0.2%, and energy production – 98.8%.

As concerns animal production, domestic animals have a density below the Danube basin average. In the rural areas, the most important diffuse pollution sources are situated in localities delineated as vulnerable areas.

In Romania, the most significant point pollution sources are the mining units located in the middle part of the sub-basin, which cause a degradation of downstream water quality due to heavy metals. Tailing dams for mining are an additional pollution source and generate diffuse pollution in the areas with developed mining activity. There is a potential risk of industrial accidents, especially in mining areas.

Discharges from manufacturing are insignificant, mainly due to a decrease in industrial production in the last decade.

There is still an environmental problem related to untreated or insufficiently treated urban wastewater, which increases the nitrogen concentration in the river. Uncontrolled waste dumpsites, especially located in rural areas, are an additional significant source of diffuse nutrient inputs into the watercourses.

As in other parts of the UNECE region, there is also a "natural pressure" due to hydrochemical processes in areas with mining activities.

[24] Based on information by the National Administration "Apele Romane", Romania.

Transboundary impact and trends

Nutrient species and heavy metals (Cu, Zn, Pb) cause transboundary impact.

Improving the status of the river requires investments in wastewater treatment technology and sewer systems. In urban areas, investments to expand capacity and/or rehabilitate sewerage treatment facilities are necessary. In rural areas, the connection rate to these facilities, which is very low, and should be increased.

Improving the status of the river also requires measures against pollution in mining areas. At the national level, there is already a step-by-step programme for closure of the mines and for the ecological rehabilitation of the affected areas.

MURES/MAROS RIVER[25]

The sub-basin of the Mures/Maros River is shared by Romania (upstream country) and Hungary (downstream country). The river ends up in the Tizsa.

Sub-basin of the Mures/Maros River			
Area	Country	Country's share	
30,195 km²	Hungary	1,885 km²	6.2%
	Romania	28,310 km²	93.8%

Source: National Administration "Apele Romane", Romania.

Hydrology

The basin has a pronounced hilly and mountainous character with an average elevation of about 600 m above sea level. A major transboundary tributary to the Mures/Maros is the river Ier with its source in Romania.

Discharge characteristics of the Mures/Maros River at Arad (Romania)		
Discharge characteristics	Discharge, m³/s	Period of time or date
Q_{av}	182	1950-2006
Q_{max}	2,320	1950-2006
Q_{min}	15.5	1950-2006

Source: National Administration "Apele Romane", Romania. The station has been in operation since 1861.

There are many man-made water bodies, but also natural water bodies, in the Romanian part of the sub-basin.

Pressure factors, transboundary impact and trends

In Romania, the dominant water user is the energy sector (75.1%). The share of other users is as follows: agriculture – 4%, urban uses – 10.9%, and industrial water use – 10.0%. Pressure factors of local significance include mining, manufacturing and sewerage as well as waste management and storage. Electricity supply generates thermal pollution, but this is only of local significance. It is possible that accidental water pollution by heavy metals can have a transboundary impact. With local exceptions, the Mures/Maros is being characterized as a river with a "medium to good status". Its trend is "stable".

In the Hungarian part of the sub-basin, the dominant water user is the agricultural sector, mainly for irrigational water use. The river is characterized as "at risk" due to hydromorphological alterations.

[25] Based on information by the National Administration "Apele Romane", Romania, and the Ministry of Environment and Water, Hungary.

SAVA RIVER[26]

The sub-basin of the Sava River covers considerable parts of Slovenia, Croatia, Bosnia and Herzegovina, northern Serbia, northern Montenegro and a small part of Albania.

Sub-basin of the Sava River			
Area	**Country**	**Country's share**	
97,713.2 km²	Slovenia	11,734.8 km²	12.0 %
	Croatia	25,373.5 km²	26.0 %
	Bosnia and Herzegovina	38,349.10 km²	39.2 %
	Serbia	15,147.0 km²	15.5 %
	Montenegro	6,929.8 km²	7.1 %
	Albania	179.0 km²	0.2 %

Source: International Sava River Basin Commission; Regional Sava CARDS Project.

The Sava is the third longest tributary and the largest by discharge tributary of the Danube. The length of the river from its main source in the mountains of western Slovenia to the river mouth at Belgrade is about 944 km. The average discharge at the mouth is 1,564 m^3/s (for the period 1946–1991).

The Sava is nowadays navigable for large vessel up to Slavonski Brod (river kilometre 377) and for small vessels up to Sisak (river kilometre 583). The Sava's main tributaries include the rivers Ljubljanica, Savinja, Krka, Sotla, Krapina, Kupa, Lonja, Ilova, Una, Vrbas, Orljava, Ukrina, Bosna, Tinja, Drina, Bosut and Kolubara.

The Sava sub-basin is known for its outstanding biological and landscape diversity. It hosts the largest complex of alluvial wetlands in the Danube basin (Posavina - Central Sava basin) and large lowland forest complexes. The Sava is a unique example of a river, where some of the floodplains are still intact, supporting both mitigation of floods and biodiversity. Four Ramsar sites, namely Cerkniško Jezero in Slovenia, Lonjsko Polje in Croatia, Bardača in Bosnia and Herzegovina, and Obedska Bara in Serbia have been designated and numerous other areas to protect birds and plants have been established at the national level and as NATURA 2000 sites.

Key water management issues in the Sava sub-basin include organic pollution, nutrient pollution, pollution by hazardous substances, and hydromorphological alterations. Additional issues for transboundary water cooperation are floods, water-demand management and drinking-water supply as well as sediment management (quality and quantity). Prevention of accidental pollution and emergency preparedness are further tasks for international cooperation. Morphological alterations due to dams and hydropower plants, and hydrological alterations due to water abstractions for agricultural and industrial purposes and hydropower operation, must also be dealt with. Invasive species are also of concern.

Unregulated disposal of municipal and mining waste remains as a major pressure factor. The development of hydro-engineering structures, including those for navigation, is expected to become an additional pressure factor.

[26] Based on information by the International Sava River Basin Commission. The figures on the size of the basin are those given by the Commission and slightly deviate from the Danube Basin Analysis (WFD Roof Report 2004).

VELIKA MORAVA[27]

The river Velika Morava (430 km) with a sub-basin of 37,444 km^2 is the last significant right-bank tributary before the Iron Gate (average discharge 232 m^3/s for 1946-1991). It is formed by the confluence of two tributaries, the Juzna Morava, draining the south-eastern part of the sub-basin, and the Zapadna Morava, draining the south-western part.

Sub-basin of the Velika Morava			
Area	**Country**	**Country's share**	
37,444 km^2	Bulgaria	1,237 km^2	3,3%
	Serbia and Montenegro*	36,163 km^2	96,6%
	The former Yugoslav Republic of Macedonia	44 km^2	0,1%

Source: The Danube River Basin District. Part B: report 2004, Serbia and Montenegro. International Commission for the Protection of the Danube River, Vienna.
* At the date of publication of the above report, Serbia and Montenegro were still belonging to the same State.

The mouth of the Velika Morava is critically polluted. The most significant transboundary tributary of the Juzna Morava is the 218 km long Nishava River (4,068 km^2 total area, from which 1,058 km^2 in Bulgaria). The Nishava rises on the southern side of the Stara Planina Mountain in Bulgaria. A tributary of Nishava River, the 74 km long river Erma/Jerma, is in south-eastern Serbia and western Bulgaria. It twice passes the Serbian-Bulgarian border.

Sub-basin of the Nishava River			
Area	**Country**	**Country's share**	
4,068 km^2	Serbia and Montenegro*	3,010 km^2	74%
	Bulgaria	1,058 km^2	26%

Source: The Danube River Basin District. Part B: report 2004, Serbia and Montenegro. International Commission for the Protection of the Danube River, Vienna.
* At the date of publication of the above report, Serbia and Montenegro were still belonging to the same State.

TIMOK RIVER[28]

The Timok River (180 km) is a right-bank tributary of Danube. Its area of 4,630 km^2 is shared by Serbia (98%) and Bulgaria (2%). On its most downstream part, the river forms for 17.5 km the border between Serbia and Bulgaria. At its mouth, the river discharge amounts to 31 m^3/s (1946-1991). Pollution by arsenic, cadmium, copper, nickel, zinc and lead is significant.

[27] Based on information from the publication: The Danube River Basin District. Part B: report 2004, Serbia and Montenegro. International Commission for the Protection of the Danube River, Vienna.
[28] Based on information from the publication: The Danube River Basin District. Part B: report 2004, Serbia and Montenegro. International Commission for the Protection of the Danube River, Vienna.

SIRET RIVER[29]

Ukraine (upstream country) and Romania (downstream country) share the sub-basin of the Siret River.

Sub-basin of the Siret River			
Area	Country	Country's share	
47, 610 km²	Romania	42,890 km²	90.1%
	Ukraine	4,720 km²	9.9%

Source: National Administration "Apele Romane", Romania.

Hydrology

Among the Danube tributaries, the 559-km-long Siret has the third largest sub-basin area, which is situated to the east of the Carpathians. The Siret's source lies in Ukraine and it flows through the territory of Ukraine and Romania.

The sub-basin has a pronounced lowland character.

Its main tributaries are the rivers Suceava, Moldova, Bistritsa, Trotus, Barlad and Buzau.

Discharge characteristics of the Siret River at the gauging station Lungoci (Romania)		
Q_{av}	210 m³/s	Average for 1950-2005
Q_{max}	4,650 m³/s	14 July 2005
Q_{min}	14.2 m³/s	27 December 1996
Mean monthly values:		
October – 136 m³/s	November – 128 m³/s	December – 124 m³/s
January – 110 m³/s	February – 135 m³/s	March – 217 m³/s
April – 375 m³/s	May – 337 m³/s	June – 332 m³/s
July – 256 m³/s	August – 215 m³/s	September – 178 m³/s

Source: National Administration "Apele Romane", Romania.

There are over 30 man-made lakes in the catchment area. Natural lakes in Romania include the Rosu, Lala, Balatau, Cuejdel, Vintileasca and Carpanoaia Lakes.

Hydropower is generated at over 25 sites along the river.

Pressure factors

In Romania, the main water users are agriculture (13%), urban uses (47%), industry (32%), and thermal power production (8%).

The mining industry is one of the most significant pressure factors, with copper, zinc and lead mining, coal mining and uranium mining in Romania. There are a number of storage facilities (including tailing dams for mining and industrial wastes) in the Siret sub-basin.

Manufacturing includes light industry, and the paper, wood, chemical and food industries.

Thermal power stations are located at Suceava, Bacau and Borzesti; but only the thermal power station at Borzesti contributes to thermal pollution.

Transboundary impact and trends

According to an earlier assessment[30], the Siret was among the most polluted Danube tributaries in terms of degradable organic matter. Following water classifications for 2005, the Siret (RO 10 - confluence Danube Sendreni) was in class 2 for dissolved oxygen and BOD_5 and only for COD_{Cr} in class 4. The river Râmnicu Sărat, a right-hand tributary of the Siret, has a high natural background pollution by salts (class 5) along its entire length of 136 km. The table below includes these new data and shows an increase in river kilometres that fall into class 2.

[29] Based on information by the National Administration "Apele Romane", Romania.
[30] Source: Danube Basin Analysis (WFD Roof Report 2004).

Classification of the Siret River in Romania			
Class/year	**2003**	**2004**	**2005**
Class 1	1245 km (45%)	1332 km (48.2%)	920 km (31.8%)
Class 2	628 km (22.7%)	921 km (33.3%)	1168 km (40.3%)
Class 3	641 km (23.2%)	297 km (10.7%)	555 km (19.2%)
Class 4	111 km (4%)	15 km (0.5%)	109 km (3.8%)
Class 5	139 km (5%)	199 km (7.2%)	145 km (5.0%)
Total length classified	**2,764 km**	**2,764 km**	**2,897 km**

Source: National Administration "Apele Romane", Romania.

PRUT RIVER[31]

Moldova, Romania and Ukraine share the Prut sub-basin.

Sub-basin of the Prut River			
Area	**Country**	**Country's share**	
27,820 km^2	Ukraine	8,840 km^2	31.8%
	Romania	10,990 km^2	39.5%
	Moldova	7,990 km^2	28.7%

Source: Ministry of Environment and Natural Resources, Moldova, and National Administration "Apele Romane", Romania. Figures for Ukraine are estimates. The Danube Basin Analysis (WFD Roof Report 2004) quotes an area of 27,540 km^2.

Hydrology

The Prut is the second longest (967 km) tributary of the Danube, with its mouth just upstream of the Danube delta. Its source is in the Ukrainian Carpathians. Later, the Prut forms the border between Romania and Moldova.

Discharge characteristics of the Prut River at the monitoring site Sirauti (Moldova)	
Q_{av}	1,060 m^3/s
Q_{max}	3,130 m^3/s
Q_{min}	3,73 m^3/s

Source: Ministry of Environment and Natural Resources, Moldova.

The rivers Lapatnic, Drageste and Racovet are transboundary tributaries in the Prut sub-basin; they cross the Ukrainian-Moldavan border. The Prut River's major national tributaries are the rivers Cheremosh and Derelui, (Ukraine), Jijia, Elanu and Liscov (Romania) and Ciugur, Camenca, Lapusna, Sarata[32] and Larga (Moldova). Most are regulated by reservoirs.

The biggest reservoir on the Prut is the hydropower station of Stanca-Costesti (total length – 70 km, maximal depth – 34 m, surface – 59 km^2, usable volume – 450 million m^3, total volume 735 million m^3), which is jointly operated by Romania and Moldova.

[31] Based on information by the Ministry of Environment and Natural Resources of Moldova.
[32] The above mentioned Sarata river is distinct from the transboundary river shared by Moldova and Ukraine also called Sarata.

Pressure factors

Agriculture, supported by large irrigation systems, is one of the most important economic activities in the sub-basin. The rate of soil erosion is high and nearly 50% of the land used in agriculture suffer from erosion, thus polluting the surface water by nutrients.

Environmental problems include insufficient treated municipal wastewater, discharged mostly from medium-sized and smaller treatment facilities, which require substantial rehabilitation, as well as wastewater discharges from industries, many of them with outdated modes of production.

In Moldova, in particular the standards for organic pollution, heavy metals, oil products, phenols and copper are exceeded. One should note, however, that these standards are more stringent than the standards usually applied in EU countries. During the warm season, a deficit of dissolved oxygen and increased BOD_5 levels also occur. Microbiological pollution is also of concern.

In general, there is "moderate pollution" in the upper and middle sections of the Prut; the lower part is "substantially polluted". All tributaries are also "substantially polluted".

Hydrochemical characteristics of the Prut River at the monitoring site Kahul (Moldova), located 78 km upstream of the river mouth

Determinands	MAC[33]	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	1.78	0.69	0.09	0.63	0.33	0.77
$N\text{-}NO_2$, mg/l	0.02	0.08	0.04	0.01	0.03	0.01	0.04
$N\text{-}NO_3$, mg/l	9.00	1.54	1.79	1.03	0.91	0.79	2.46
N mineral, mg/l	…	3.40	2.43	2.13	1.88	1.32	3.70
$P\text{-}PO_4$, mg/l	…	0.05	0.06	0.04	0.05	0.04	0.09
Cu, µg/l	1.0	3.78	5.00	<3.00	<3.00	4.60	3.51
Zn, µg/l	10.0	15.95	29.90	5.00	<3.00	<3.00	<3.00
DDT, µg/l	Absence	0.37	0.28	<0.05	<0.05	<0.05	<0.05
HCH, µg/l	Absence	0.07	…	<0.01	0.01	0.00	0.00

Source: Moldova Water Quality Monitoring Program 2001-2004.[34]

Transboundary impact

Apart from water pollution, flooding remains a problem, despite water regulation by the many reservoirs.

The large wetland floodplain in downstream Moldova has been drained in favour of agriculture, but nowadays the pumping stations and dykes are poorly maintained, thus productive agricultural land is subject to becoming waterlogged. Due to flow regulation and water abstractions, the water level in downstream river sections in southern Moldova, particularly in dry years, is low and the water flow to the natural floodplain lakes, including lakes designated as a Ramsar site, is often interrupted.

In case of significant increase of the Danube water level, flooding of downstream flood plains in Moldova can become a problem. Oil abstraction fields and oil installations located near Lake Beleu may thus be flooded and oil products may contaminate the Ramsar site.

Trends[35]

Following measurements by Moldova, there is a decreasing pollution level for almost all determinands, except for nitrogen compounds, copper containing substances, and zinc. The decrease of pollution is particularly obvious in the lower part of the river.

Despite the improvement of water quality in the last decade, mostly due to decreasing industrial production, significant water-quality problems remain. However, water-quality improvements in terms of nitrogen, microbiological pollution and the general chemical status are likely.

[33] The maximum allowable concentration of chemical determinands, except oxygen where it stands for the minimum oxygen content, needed to support aquatic life. This term is only used in EECCA countries. Other countries use the term "water-quality criteria".
[34] C. Mihailescu, M. A. Latif, A Overcenco: USAID/CNFA-Moldova Environmental Programs - Water Quality Monitoring 2001-2004. Chisinau, Moldova, 2006.
[35] Based on information by the Ministry of Environment and Natural Resources, Moldova.

STANCA-COSTESTI RESERVOIR[36]

The Stanca-Costesti Reservoir is a transboundary lake shared by Moldova and Romania. It is part of the sub-basin of the Prut, a transboundary tributary to the Danube. The reservoir was built for hydropower purposes during 1973 - 1978.

Constructed on the Prut approximately 580 km upstream of its confluence with the Danube, the dam (47 m high and 3,000 m long) retains a volume of 735 million m^3 at the normal water level. The discharge is 82.9 m^3/s (2.6 km^3 per annum). The area of the river basin upstream of the reservoir is 12,000 km^2. The surface area of the reservoir is 59 km^2, the mean depth 24 m and the deepest site 41.5 m. Water level changes are about 8 m between the normal and lowest levels. The theoretical retention time is 30 days during the spring floods and about 180 days during the rest of the year. The area in the vicinity of the reservoir is covered by arable lands (70%), perennial crops (17 %), forests and urban areas.

The Stanca-Costesti Reservoir has been monitored since 1984. Sampling sites are located near the dam (at surface and 10 m depth), in the middle of the reservoir (at surface and 5 m depth) and the end of the backwater. The sampling frequency is four times a year. Besides chemical and biological sampling of the water, the sediment is also sampled for a variety of determinands, especially hazardous substances.

Due to the high volume of water in the reservoir, the aquatic ecosystem has a substantial self-purification capacity and the reservoir can annihilate loadings of certain pollutants.

The main hydromorphological pressure due to the dam is discontinuity of flow and flow regulation.

Diffuse pollution by nutrients and accumulation of heavy metals are the most serious pressure factors. However, the overall water quality (for the majority of indicators) of the reservoir is classified as "1st category" under the Romanian water-quality classification system.

KAHUL RIVER[37]

The Kahul River originates in Moldova and flows in Ukraine into the Lake Kahul, a Danube lake shared by both countries. Usually, the river is considered as a separate first-order river. It has become, however, part of the Danube River Basin District.

The table below shows the river's hydrochemical regime and developments since the end of the 1980s. Compared to the 1980s, the concentration of water pollutants has fallen considerably.

Hydrochemical characteristics of the Kahul River at the monitoring site Vulcanesti (Moldova), located 15 km upstream of the lake

Determinands	MAC	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	8.90	…	0.70	1.64	0.77	0.47
$N\text{-}NO_2$, mg/l	0.02	0.82	…	0.19	0.04	0.07	0.09
$N\text{-}NO_3$, mg/l	9.00	6.49	…	4.33	0.30	4.07	5.08
N mineral, mg/l	…	16.21	…	5.70	2.24	5.47	6.39
$P\text{-}PO_4$, mg/l	…	0.33	…	0.13	0.03	0.03	0.04
Cu, µg/l	1.0	8.50	…	3.60	3.20	7.00	<3.00
Zn, µg/l	10.0	12.40	…	6.40	3.00	9.20	<3.00
DDT, µg/l	Absence	0.16	…	<0.05	<0.05	<0.05	<0.05
HCH, µg/l	Absence	0.08	…	0.01	0.02	0.02	<0.01

Source: Moldova Water Quality Monitoring Program 2001–2004.

[36] Based on information by the Ministry of Environment and Water Management, Romania.
[37] Based on information by the Ministry of Environment and Natural Resources, Moldova.

YALPUH RIVER[38]

The Yalpuh River originates in Moldova and flows into Ukraine's Lake Yalpuh, one of the Danube lakes. Usually, the river is considered as a separate first-order river. It has become, however, part of the Danube River Basin District.

The table below shows the river's hydrochemical regime and its developments since the end of the 1980s. Compared to the 1980s, the concentration of water pollutants has fallen considerably.

Hydrochemical characteristics of the Yalpuh River at the monitoring site Aluat (Moldova), located 12 km upstream of the lake

Determinands	MAC	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	1.17	…	0.12	1.50	0.60	0.20
$N\text{-}NO_2$, mg/l	0.02	0.25	…	0.00	0.05	0.00	0.01
$N\text{-}NO_3$, mg/l	9.00	4.31	…	0.59	3.23	0.94	1.75
N mineral, mg/l	…	5.74	…	1.32	5.26	4.15	2.35
$P\text{-}PO_4$, mg/l	…	0.15	…	0.07	0.02	0.04	0.02
Cu, µg/l	1.0	7.10	…	3.00	<3.00	3.00	<3.00
Zn, µg/l	10.0	23.20	…	<3.00	<3.00	<3.00	<3.00
DDT, µg/l	Absence	0.02	…	<0.05	<0.05	<0.05	<.0.5
HCH, µg/l	Absence	0.06	…	<0.01	0.02	<0.01	<0.01

Source: Moldova Water Quality Monitoring Program 2001-2004.

DANUBE DELTA[39]

The Danube delta is largely situated in Romania, with parts in Ukraine. It is a protected area, which covers 679,000 ha including floodplains and marine areas. The core of the reserve (312,400 ha) was established as a "World Nature Heritage" in 1991. There are 668 natural lakes larger than one hectare, covering 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 enabling 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 – a unique ecosystem.

LAKE NEUSIEDL

Lake Neusiedl (also known as Neusiedler See and Fertö-tó) is located in the east of Austria and shared with Hungary. It belongs to the Danube River Basin District.

The lake has an average surface area of 315 km² (depending on water fluctuations), of which 240 km² are located in Austria and 75 km² in Hungary. A fluctuation in the water level of the lake of +/- 1.0 cm changes the lake surface by up to 3 km². More than half of its total area consists of reed belts; in certain parts the reed belt is 3 to 5 km wide. In the past, the lake had no outflow and therefore extremely large fluctuations of its surface area were recorded. Later, the Hanság Main Canal was built as a lake outlet.

Lake Neusiedl has an average natural depth of 1.1 m; its maximal water depth is 1.8 m. In its history, it has dried out completely several times.

Since 1965, the water level is stabilized by the outlet sluice based on the 1965 agreement of the Hungarian-Austrian Water Commission (water level in April-August: 115.80 m above sea level; October-February: 115.70 m above sea

[38] Based on information by the Ministry of Environment and Natural Resources, Moldova.
[39] Source: Danube Basin Analysis (WFD Roof Report 2004).

level, transition period (March and September): 115.75 m above sea level). The main surface water input is through precipitation on the lake surface, as well as the Wulka River, Rákos Creek and other smaller tributaries. Groundwater inflow is insignificant.

Due to its low depth, the lake is quickly mixed by wind action, and is therefore naturally turbid. The lake water has "a high salt concentration".

COGILNIC RIVER BASIN[40]

Moldova (upstream county) and Ukraine (downstream country) share the basin of the Cogilnic River.

Basin of the Cogilnic River			
Area	**Country**	**Country's share**	
6,100 km²	Moldova	3,600 km²	57.8%
	Ukraine	2,600 km²	42.2%

Source: The United Nations World Water Development Report, 2003.

The Cogilnic has several small transboundary tributaries, including the Schinosa and the Ceaga.

Discharge characteristics of the Cogilnic River in Moldova upstream of the border with Ukraine	
Q_{av}	8.32 m³/s
Q_{max}	18.0 m³/s
Q_{min}	1.53 m³/s

Source: Ministry of Environment and Natural Resources, Moldova.

Over the observation period, the level of ammonium is permanently over the MAC and tends to grow. Concentrations of nitrogen have increased over the last years. Compared to the end of the 1980s and 1990s, concentrations of phosphorus increased considerably.

Hydrochemical characteristics of the Cogilnic River at the monitoring site Cimislia (Moldova)

Determinands	MAC	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	3.22	…	0.50	2.06	10.00	6.90
$N\text{-}NO_2$, mg/l	0.02	0.64	…	0.24	0.10	0.24	0.38
$N\text{-}NO_3$, mg/l	9.00	3.54	…	3.46	0.60	3.38	6.42
N mineral, mg/l	…	7.40	…	5.88	3.12	14.78	15.24
$P\text{-}PO_4$, mg/l	…	0.38	…	0.15	0.67	1.39	1.89
Cu, µg/l	1.0	7.40	…	11.80	4.10	<3.00	3.43
Zn, µg/l	10.0	12.00	…	49.10	31.50	215.50	<3.00
DDT, µg/l	Absence	…	…	<0.05	<0.05	0.01	<0,05
HCH, µg/l	Absence	0.01	…	0.01	0.03	<0.01	<0.01

Source: Moldova Water Quality Monitoring Program 2001-2004.

[40] Based on information by the Ministry of Environment and Natural Resources, Moldova.

DNIESTER RIVER BASIN

DNIESTER RIVER[41]

Ukraine and Moldova are usually considered as the basin countries as Poland's share of the basin is very small.

Basin of the Dniester River			
Area	Country	Country's share	
72,100 km²	Ukraine	52,700 km²	73.1%
	Moldova	19,400 km²	26.9%
	Poland	Poland's share is very small	

Source: Ministry of Environment and Natural Resources, Moldova.

Hydrology

The River Dniester, with a length of 1,362 km, has its source in the Ukrainian Carpathians; it flows through Moldova and reaches Ukraine again near the Black Sea coast.

At the river mouth, the discharge characteristics are as follows: 10.7 billion m^3 (during 50% of the year); 8.6 billion m^3 (during 75% of the year); and 6.6 billion m^3 (during 95% of the year). There is a significant, long-term trend of decreasing river flow, possibly due to climatic changes. The maximum water flow at the gauging stations Zaleshshiki and Bendery was observed in 1980 with 429 m^3/s and 610 m^3/s, respectively; and the minimum flow at Zaleshshiki (1961) was 97,6 m^3/s and at Bendery (1904) 142 m^3/s.

Flooding is common; up to five flood events occur each year with water levels rises of 3-4 meters, sometimes even more.

[41] Based on information by the Ministry of Environment and Natural Resources of Moldova.

Pressure factors

The Dniester flows through densely populated areas with highly developed industry (mining, wood-processing and food industry). Aquaculture, discharges of municipal wasterwaters and diffuse pollution from agriculture are the other main pressure factors. Nitrogen compounds, heavy metals, oil products, phenols and copper are the main pollutants. During the warm season, a deficit of dissolved oxygen and increased BOD_5 levels occur additionally. Microbiological pollution is also of concern.

Petrol mining and chemical industry (e.g. oil refining) cause water pollution by phenols and oil products. Their main sources are in the upper part of the basin, where petroleum mining takes place and oil-refineries are located. Due to the high migration ability of phenols and oil-products, elevated concentration are also found in the Middle Dniester.

Hydrochemical characteristics of the Dniester River near the Mereseuca village (600 km upstream of the river mouth)

Determinands	MAC	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	0.56	0.21	0.18	0.12	0.09	0.17
$N\text{-}NO_2$, mg/l	0.02	0.05	0.01	0.01	0.05	0.01	0.01
$N\text{-}NO_3$, mg/l	9.00	1.71	2.50	1.17	2.21	1.35	2.25
N mineral, mg/l	…	2.32	2.72	1.91	2.76	2.02	2.58
$P\text{-}PO_4$, mg/l	…	0.07	0.00	0.06	0.01	0.06	0.05
Cu, µg/l	1.0	6.00	9.00	<3.00	<3.00	<3.00	<3.00
Zn, µg/l	10.0	10.00	10.00	15.00	3.20	<3.00	<3.00
DDT, µg/l	Absence	0.34	…	<0.05	<0.05	<0.05	<0.05
HCH, µg/l	Absence	0.15	…	<0.01	<0.01	<0.01	<0.01

Source: Moldova Water Quality Monitoring Program 2001–2004.[42]

Hydrochemical characteristics of the Dniester River near the Rascaieti village (70 km upstream of the river mouth)

Determinands	MAC	End of 1980s	End of 1990s	September 2001	April 2002	September 2002	March 2003
$N\text{-}NH_4$, mg/l	0.39	0.83	0.36	<0.01	0.09	0.33	1.27
$N\text{-}NO_2$, mg/l	0.02	0.06	0.03	0.02	0.05	0.02	0.02
$N\text{-}NO_3$, mg/l	9.00	1.15	3.85	1.10	2.73	1.18	1.92
N mineral, mg/l	…	2.04	4.24	1.76	3.30	2.02	3.21
$P\text{-}PO_4$, mg/l	…	0.11	0.12	0.15	0.03	0.12	0.11
Cu, µg/l	1.0	20.00	10.00	<3.00	<3.00	4.20	4.00
Zn, µg/l	10.0	60.00	0.00	22.10	8.40	4.40	10.00
DDT, µg/l	Absence	0.37	…	<0.05	<0.05	<0.05	<0.05
HCH, µg/l	Absence	0.27	…	<0.05	<0.05	<0.05	<0.05

Source: Moldova Water Quality Monitoring Program 2001–2004.

[42] C. Mihailescu, M. A. Latif, A Overcenco: USAID/CNFA-Moldova Environmental Programs - Water Quality Monitoring 2001-2004. Chisinau, Moldova, 2006.

Transboundary impact

Moldova assesses that the upper and middle Dniester basin are moderately polluted, whereas the Lower Dniester and the Dniester tributaries are assessed as substantially polluted.

In recent years, the technical status of wastewater treatment plants in Moldova substantially decreased. Although wastewater treatment plants in cities continue to work with decreasing efficiency, most of the other treatment plants are out of order. For some cities (e.g. Soroki), new treatment plants are to be constructed. In addition, there is the great challenge to plan, create and correctly manage water protection zones in Moldova, including the abolishment of non-licensed dumpsites in rural areas.

Trends

Although there was an improvement of water quality over the last decade, mainly due to the decrease in economic activities, the water quality problems remain to be significant. A further decrease of water quality related to nitrogen and phosphorus compounds as well as the microbiological and the chemical status is to be expected.

In both countries, the construction of wastewater treatment plants and the enforcement of measures related to water protection zones are of utmost importance.

KUCHURHAN RIVER[43]

The Kuchurhan River originates in Ukraine, forms for some length the Ukrainian-Moldavian border and flows through the Kuchurhan reservoir, and empties into the Dniester on the territory of Ukraine.

Sampling at the Kuchurhan reservoir under a specific programme was conducted in autumn 2003, spring 2004 and autumn 2004. Compared to the samples taken in autumn 2003 and in spring 2004, the autumn 2004 samples showed an increase of nitrites (from MAC 0.4 to 1.7), no significant changes of ammonium, a decrease of detergent's concentrations, and a decrease of oil products (from MAC 1.6 to 0.4).

[43] C. Mihailescu, M. A. Latif, A Overcenco: USAID/CNFA-Moldova Environmental Programs - Water Quality Monitoring 2001–2004. Chisinau, Moldova, 2006.

DNIEPER RIVER BASIN

DNIEPER RIVER[44]

The Russian Federation, Belarus and Ukraine share the Dnieper basin as follows:

Basin of the Dnieper River			
Area	**Country**	**Country's share**	
504,000 km^2	Russian Federation	90,700 km^2	18%
	Belarus	121,000 km^2	24%
	Ukraine	292,300 km^2	58%

Source: UNDP-GEF Dnipro Basin Environment Programme.

Hydrology

The River Dnieper flows from the Russian Federation through Belarus and then Ukraine. It is the third largest in Europe (after the River Volga and the River Danube). Its length is 2,200 km, of which 115 km form the border between Belarus and Ukraine.

Over the last 800 km of the river, there is a chain of consecutive reservoirs. The Dnieper is connected with the Bug River through the Dnieper-Bug Canal.

Discharge characteristics of the Dnieper River at the gauging station Dnieper Hydropower Plant (observation period 1952-1984)	
Q_{av}	1,484 m^3/s
Q_{max}	8,080 m^3/s
Q_{min}	362 m^3/s

Source: UNDP-GEF Dnipro Basin Environment Programme.

At the river mouth, the discharge amounts to 1,670 m^3/s (52.7 km^3/a).

After the Chernobyl catastrophe, a large amount of radioactive caesium was deposited in reservoir sediment.

Pressure factors

In all three riparian countries, a great number of domestic waste dumps and industrial waste storage facilities are located in the Dnieper basin.

Following estimates in 2001, some 8.5 billion tonnes of industrial waste is accumulated in waste storage facilities (up to 50 % of these waste products are accumulated in the territory of Ukraine, up to 10 % in the territory of Belarus, and about 40 % in the territory of the Russian Federation). There is an estimated annual increase in accumulated industrial waste of 8 to 10 %.

The storage facilities contain up to 40 % of especially hazardous industrial waste, including salts of heavy and non-ferrous metals (lead, cadmium, nickel, chromium, etc.) as well as oil products (up to 2.5 %).

Transboundary impact

Discharges of insufficiently treated municipal and industrial wastewaters as well as pollution from waste disposal sites and from agriculture have an adverse impact on the water quality of the Dnieper River as well as its major transboundary tributaries.

Trends

Hydropower stations, nuclear power stations and manufacturing industries have caused ecological damage at a sub-regional scale. The environmental and human health problems both in the Dnieper river basin and the Black Sea region as a whole are worsened by large-scale development of timberland, and draining of waterlogged lands for agriculture, and the intensive growth of cities where sewage treatment is insufficient.

[44] Source: UNDP-GEF Dnipro Basin Environment Programme.

PRIPYAT RIVER

The River Pripyat (approximately 710 km length) rises in Ukraine in the region of the Shatsk Lakes. It flows into Belarus before re-entering Ukraine upstream of Chernobyl. A large number of smaller transboundary rivers are part of Pripyat's catchment area. There are some 50 dams in the Pripyat catchment area.

Sub-basin of the Pripyat River			
Area	**Country**	**Country's share**	
114,300 km^2	Ukraine	65,151 km^2	57%
	Belarus	49,149 km^2	43%

Source: Ministry for Environmental Protection of Ukraine.

Hydrology

The average flow of the River Pripyat at the gauging station "Mosyr" for the period 1881 to 2001 was 390 m^3/s (12.3 km^3/a). Little damage is being caused by the snow-melt flood, but occasional floods that are the result of spring or summer rainfall can be destructive.

Average flow characteristics at the station "Mosyr" on the Pripyat River

Pressure factors

The Pripyat is a largely rural basin, with little industrial development. However, there are a number of significant sources of pollution, including municipal sewage treatment works that are no longer working efficiently. This is most significant in the upper catchments of the Pripyat tributaries, especially in Ukraine, where larger settlements are located towards the edge of the basin.

Pollution by oil products in the lower catchment area from the oil processing plant at Mosyr and pollution from a salt pit and a fertilizer plant at Salihorsk are issues of concern.

Radioactive contamination following the accident at Chernobyl in 1986 remains a serious issue as the fallout was heaviest over the lower Pripyat catchment area, which is special "exclusion zone". Run-off from this area is still radioactive, and will be for many decades.

There are also a number of other anthropogenic causes of pollution sources, such as the use of agricultural chemicals (although the use of pesticides has considerably reduced in the last decade) as well as the drainage of water from peat areas.

Transboundary impact

The major issue in the lower Pripyat arises from the fall-out from the nuclear accident at Chernobyl in 1986, which contaminated much of the lower catchment, and radioactive material continues to work its way through the runoff processes into the river.

There is a threat of potential contamination by the nuclear power station at Rivno on the Styr River, a transboundary tributary, which is based on the same technology as the plant at Chernobyl.

Eutrophication of surface waters in the Pripyat river basin is caused by various factors, such as use of agrochemicals, lack of treatment of domestic wastewater and soil erosion.

Trends

Water-quality problems will continue to exist; they stem from poor natural water quality (high natural organic content, high acidity and colour), especially in areas where the density of peat and mires is highest, as well as from insufficient municipal wastewater treatment, and occasionally, industrial waste disposal and spillage problems.

DON RIVER BASIN

SIVERSKY DONETS[45]

The Russian Federation and Ukraine share the Siversky Donets basin as follows:

Sub-basin of the Siversky Donets River			
Area	**Country**	**Country's share**	
98,900 km²	Russian Federation	44,500 km²	45%
	Ukraine	54,400 km²	55%

Source: Joint River Management Programme Severski-Donez Basin Report.

Hydrology

The River Siversky Donets / Severskiy Donets originates in the central Russian upland, north of Belgorod, flows south-east through Ukraine (traversing the oblasts of Kharkiv, Donetsk and Luhansk) and then again into the Russian Federation to join the River Don in the Rostov oblast below Konstantinovsk, about 100 km from the Sea of Azov. Its length is 1,053 km. The average density of the river network is 0.21 km/km².

The maximum registered discharge of the Siversky Donets (gauging station Lisichansk) was 3,310 m^3/s. The minimum average discharges during the summer/autumn low-flow period are 2.9 m^3/s in the upper reaches (gauging station Chuguev), 14.0 m^3/s in the middle segment (Lisichansk town), and 15.8 m^3/s in the lower reaches (gauging station Belaya Kalitva).

Pressure factors

In the Russian Federation, the main pollution sources of the Siversky Donets and its tributaries on the territory of the Belgorod Oblast are domestic wastewaters and wastewaters from municipal sources, metal extraction and processing, the chemical industry and from the processing of agricultural products. On the territory of Rostov Oblast, the main pollution sources include coal mining, metallurgical and machine building plants, chemical enterprises,

[45] Source: Joint River Management Programme Severski-Donez Basin Report.

communal municipal services and enterprises for agricultural products' processing. In the Rostov Oblast, the river also passes through an area of well-developed agriculture.

In Ukraine (town of Volchansk and Kharkiv Oblast), the main pollution sources are municipal wastewater treatment plants, which increase the polluting load by BOD, ammonium and phosphates. Only some 20 % of wastewater discharges comply with the permit conditions. In the Donetsk and Lugansk oblasts, municipal wastewater treatment plants and a large number of chemical plants discharge into the river. Certain enterprises store liquid waste and release it during periods of flooding. Around 80 % of the Ukrainian part of the catchment is agricultural land.

Transboundary impact

The following table gives an overview on the chemical status of the river at the Ukrainian monitoring station "Ogurtsovo village" at the Ukrainian-Russian border (2001) in comparison with the Ukrainian MAC values. From the determinands monitored, total iron, manganese, copper, nitrites, sulphates, phenols, zinc, oil products, chromium (6+) and BOD_5 are of particular concern.

Chemical status of the Siversky Donets at the Ukrainian monitoring station "Ogurtsovo village" at the Ukrainian/Russian border in 2001 [46]

Determinands	Maximum concentration in mg/l	Minimum concentration in mg/l	Average concentration in mg/l	MAC for fish in mg/l	MAC for drinking water in mg/l
Ammonia	0.42	0.06	0.22	0.5	…
Iron, total	0.26	0	0.16	0.1	0.3
Manganese	45	14.6	23.0	40	…
Copper	0.01	0	0.003	0.001	1
Nitrates	11.3	0.09	3.55	40	45
Nitrites	0.195	0.016	0.109	0.08	3
Surfactants	0.081	0.009	0.031	0.3	0.5
Sulphates	144.1	86.5	106.9	100	500
Phenols	0.001	0	0.0002	0.001	0.25
Chlorides	47.9	28.4	38.7	300	350
Zinc	0.127	0.003	0.020	0.001	0.25
Calcium	112.2	80.2	95.5	180	…
Oil products	0.5	0	0.2	0.05	0.1
Dry residues	598	452	517	…	1000-1500
Phosphates	1.84	0.51	1.02	…	3.5
Chromium 6+	0.006	0	0.001	0.001	0.1
DDE	0	0	0	…	…
DDT	0	0	0	…	…
BOD_5	3.56	1.4	2.69	2	…
Suspended solids	26.7	4.7	8.6	…	…

Trends

The industrial decline since 1992 makes it very difficult for many industries to invest in pollution control measures.

In recent years, low flows in the river reduced dilution for pollutants.

[46] Source: Joint River Management Programme Severski-Donez Basin Report.

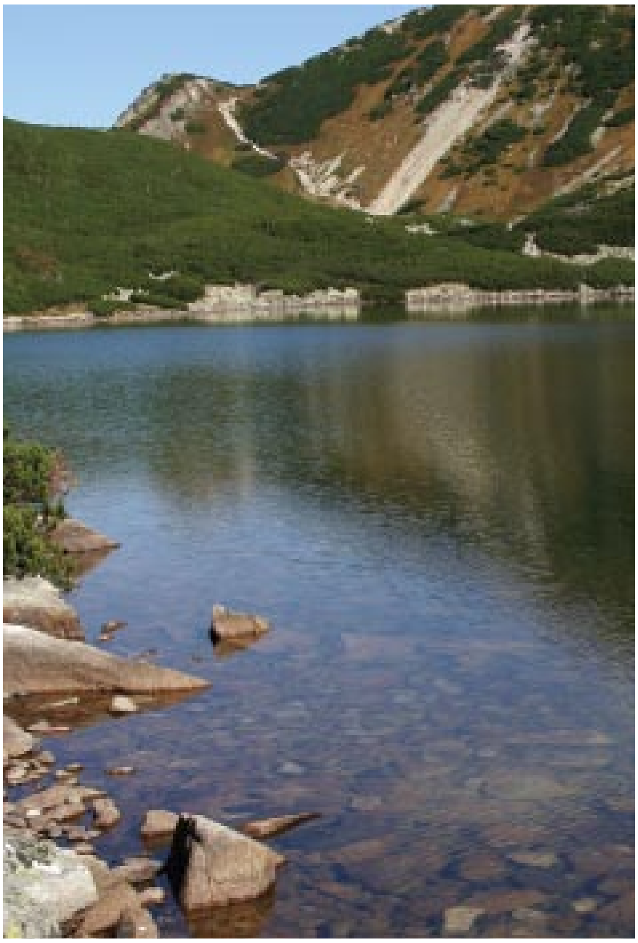
PSOU RIVER BASIN[47]

The Russian Federation and Georgia share the Psou River basin.

Basin of the Psou River			
Area	**Country**	**Country's share**	
421 km²	Georgia	232 km²	55.1%
	Russian Federation	189 km²	44.9%

Source: Ministry of Environment Protection and Natural Resources of Georgia.

The Psou River originates on the Mountain Aigba at a height of 2,517 m. It flows along the Georgian-Russian border and discharges into the Black Sea. The river length is 53 km and the average elevation of the basin is 1,110 m.



There are no transboundary tributaries to the Psou River. Its main left-hand side tributaries are the Besh (11 km long) and Pkhista (13 km long), both in Georgia. Altogether, 158 other very small tributaries have been identified.

The Psou River's flow velocity varies between 0.7 m/s and 2 m/s and its depth between 0.6 m and 2.1 m. The river is fed by snow, rainwater and groundwater. The river is characterized by spring floods, with a peak in May. In summer, a shortage of water often occurs.

The average temperature of the river water in January varies between 3.7 °C and 6.7 °C and in August between 14.8 °C and 21.7 °C.

A hydrological station on the Psou River, located at Leselidze (Georgia) 1.5 km upstream of the river mouth, was operational from 1913 to 1955.

Discharge characteristics of the Psou River at the gauging station at Leselidze (Georgia) (1.5 km upstream of the river mouth)		
Discharge characteristics	**Discharge**	**Period of time or date**
Q_{av}	17.3 m³/s	1913–1955
$Q_{absolute\ max}$	327 m³/s	18 May 1932
$Q_{absolute\ min}$	2.6 m³/s	6 February 1931; 26–27 September 1935

Sources: Ministry of Environment Protection and Natural Resources of Georgia.

[47] Based on information by the Ministry of Environment Protection and Natural Resources of Georgia.

CHOROKHI/CORUH RIVER BASIN[48]

CHOROKHI/CORUH RIVER

Turkey (upstream country) and Georgia (downstream country) share the basin of the Chorokhi River, also known as Coruh River, which has a total length of 438 km (412 km in Turkey; 26 km in Georgia).

Basin of the Chorokhi/Coruh River			
Area	Countries	Countries' share	
22,100 km²	Turkey	19,910 km²	90.5%
	Georgia	2,090 km²	9.5%

Source: Ministry of Environment Protection and Natural Resources of Georgia.

Hydrology[49]

The Chorokhi/Coruh is one of the most important rivers of the eastern coast of the Black Sea. It originates in Turkey at a height of 2,700 m. The river is 438 km long. Its depth varies between 1.5 and 4.8 m and its flow velocity between 0.7 m/s and 2.5 m/s. Floods often occur in spring and autumn. The relief of the basin is mainly mountainous.

From the former five gauging stations in Georgia, only one station (Mirveti) is currently operational and provides data on water levels, water temperature, water discharges (weekly or monthly) as well as suspended sediments. Hydrochemical and hydrobiological determinands are not measured.

Discharge characteristics of the Chorokhi/Coruh River at the Erge gauging station (Georgia)[50] (15 km upstream of the river mouth; latitude: 41° 33′; longitude: 41° 42′)		
Q_{av}	278 m³/s	1930–1992
Q_{max}	409 m³/s	1930–1992
Q_{min}	159 m³/s	1930–1992
$Q_{absolute\ max}$	3,840 m³/s	8 May 1942
$Q_{absolute\ min}$	44.4 m³/s	12 August 1955

Source: Ministry of Environment Protection and Natural Resources of Georgia.

Pressure factors in Georgia[51]

In Georgia, the river basin is covered by forests (oak, chestnut, fir) and used for agriculture. Due to lacking data, the impact of these forms of land use on the quality of the river and its biological characteristics is unknown.

Pressure factors in Turkey[52]

The rivers in the Turkish part of the Chorokhi/Coruh River basin have irregular flow regimes with a large variation in run-off parameters. This part of the river basin is also prone to floods. The Turkish Government has therefore decided to build 10 dams on the main watercourse in order to protect the residents of this area from the threats of floods with risk to their lives and material loss. The Yusufeli Dam and Hydroelectric Power Plant (HEPP) and the Deriner dam are two of the biggest projects among these 10 dams. The Yusufeli Dam and HEPP is planned to be built on the Chorokhi/Coruh River, about 40 km southwest of the Artvin city centre. The main purpose of the project is to produce electric power. The dam and HEPP also regulate the flow of the river and make downstream development projects in Turkey viable and more economical. An Environ-

[48] Based on information by the Ministry of Environment Protection and Natural Resources of Georgia and the Ministry of Foreign Affairs of Turkey.
[49] Based on information by the Ministry of Environment Protection and Natural Resources of Georgia.
[50] The gauging station ceased operation in 1992.
[51] Communication by the Ministry of Environment Protection and Natural Resources of Georgia.
[52] Communication by the Ministry of Foreign Affairs of Turkey.

mental Impact Assessment (EIA) report on the Yusufeli dam and HEPP was finalized (see below).

In Turkey, sediment transport is monitored twice a year. By 2006, altogether 15 sets of measurements were carried out, whose results were communicated to Georgia through diplomatic channels.

Transboundary impact[53]

Georgian authorities estimate that about half of the sediments transported by the Chorokhi/Coruh River form the sandy beaches at the Black Sea coast. The maintenance of the sediment transport is vital for tourism, which is of prime importance to Georgia's earnings.

Studies show that the development and the forming of the Black Sea coastal zone in Ajara (Georgia) depends on the quantity and quality characteristics of the alluvial deposit brought into the sea by the Chorokhi/Coruh River. The alluvial deposit is then moved to the north and takes part in the formation process of the beach in the Batumi sea front. It is estimated that the Chorokhi/Coruh carries 4.92 million m^3 solid sediment to the river mouth, whereby 2.31 million m^3 contribute to the formation of the coastal zone and the underground slope, and 2.61 million m^3 form sea sediments. In spite of the huge volume of the coastal sediments, the coastal zone near the river mouth has been experiencing a "washing away" problem. This problem may become worse due to the expected decreasing amount of sediment transport linked to the construction of the dams on Turkish territory.

The EIA report on the Yusufeli Dam and HEPP predicts that trapping of 83% of the suspended sediments in the cascade of dams would create changes in the river mouth. Due to a reduced amount of sediments arriving at the mouth, morphological changes would occur and, with all likelihood, the mouth of the Chorokhi/Coruh may gradually become estuary-shaped.

Conclusions

On the above issues meetings between both countries started as early as 1998 and joint work on the assessment of the consequences is ongoing. Georgia and Turkey are committed to further bilateral cooperation. Turkey communicated to the UNECE secretariat its commitment to take the EIA report and its recommendations into consideration during the construction and operation of the Yusufeli Dam and HEPP. Moreover, monitoring stations are being set up in the basin.

MACHAKHELISCKALI RIVER[54]

The Machakhelisckali River, a transboundary tributary to the Chorokhi/Coruh, has its source in Turkey at a height of 2,285 m. The length of the river is 37 km (Turkey – 16 km, Georgia – 21 km). The basin area is 369 km^2 (Turkey – 181 km^2, Georgia – 188 km^2).

The only hydrological station on the Machakhelisckali River at the village of Sindieti (Georgia) was in operation from 1940 to 1995. The station was located 2.2 km upstream of the mouth of Chorokhi/Coruh.

Discharge characteristics of the Machakhelisckali River at the Sindieti gauging station (2.2 km upstream of the Chorokhi/Coruh river's mouth)		
Q_{av}	20.6 m^3/s	1940–1995
Q_{max}	30.4 m^3/s	1940–1995
Q_{min}	9.12 m^3/s	1940–1995
$Q_{absolute\ max}$	430 m^3/s	12 September 1962
$Q_{absolute\ min}$	1.50 m^3/s	31 January – 10 February 1950

Source: Ministry of Environment Protection and Natural Resources of Georgia.

[53] Based on information by Georgia and Turkey and the Environment Impact Assessment for the construction of the Yusufeli Dam and HEPP Project, Turkish Environmental Consultancy Company "Encon".
[54] Based on information by the Ministry of Environment Protection and Natural Resources of Georgia.